

**Test Report No. 7191091960-EEC14/05**  
**dated 02 Oct 2014**



PSB Singapore

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**FORMAL REPORT ON TESTING IN ACCORDANCE WITH**  
**47 CFR FCC Parts 2, 15, and 25 : 2012**  
**OF A**  
**MARITIME SATELLITE TERMINAL**  
**[ Model : ATLAS IP ]**  
**[ FCC ID : QO4-AVIATLASIP ]**

**TEST FACILITY**

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**FCC REG. NO.**

99142 (3m and 10m Semi-Anechoic Chamber, Science Park)  
160581 (3m and 10m Semi-Anechoic Chamber, International Business Park)

**IND. CANADA REG. NO.**

2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park)  
2932N-1 (10m Semi-Anechoic Chamber, International Business Park)

**PREPARED FOR**

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**QUOTATION NUMBER**

2191000786


**JOB NUMBER**

7191091760

**TEST PERIOD**

14 Jul 2014 – 23 Sep 2014

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LA-2007-0380-A  
LA-2007-0381-F  
LA-2007-0382-B  
LA-2007-0382-B-1  
LA-2007-0383-G  
LA-2007-0383-G-1

LA-2007-0384-G  
LA-2007-0385-E  
LA-2007-0386-C  
LA-2010-0464-D  
FFT-2013-0002-A

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme. Tests/Calibrations marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.

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## TEST SUMMARY

The product was tested in accordance with the customer's specifications.

### Test Results Summary

Test Standard	Description	Pass / Fail
47 CFR FCC Parts 2, 15 and 25: 2012		
15.107(a), 15.207	Conducted Emissions	Not Applicable *See Note 3
15.109	Radiated Emissions (Class B)	Pass
2.1046(a), 25.204	RF Output Power	Pass
2.1051, 25.202(f)	Unwanted Emissions at Antenna Terminal	Pass
2.1053, 25.202(f)	Radiated Spurious Emissions	Pass
25.216(h)(i)(j)	Protection of Aeronautical Radio Navigation Satellite Service	Pass
2.1055, 25.202(d)	Frequency Stability (Temperature Variation)	Pass
2.1055, 25.202(d)	Frequency Stability (Voltage Variation)	Pass
1.1310	Maximum Permissible Exposure	Refer to page 310 for details

## TEST SUMMARY

### Notes

1. Three channels as listed below, which respectively represent the lower, middle and upper channels (transmit and receive) of the Equipment Under Test (EUT) when it was configured to operate under test mode condition.

<u>Transmit Channel</u>	<u>Frequency (GHz)</u>	<u>Receive Channel</u>	<u>Frequency (GHz)</u>
Lower Channel	1.6265	Lower Channel	1.5250
Middle Channel	1.6435	Middle Channel	1.5421
Upper Channel	1.6605	Upper Channel	1.5590

2. The following tests were based on conducted measurement method:
  - a. RF Output Power
  - b. Unwanted Emissions at Antenna Terminal
  - c. Frequency Stability (Temperature Variation)
  - d. Frequency Stability (Voltage Variation)
3. The Equipment Under Test (EUT) is a DC operated device and contains no provision for public utility connections (for Conducted Emissions)
4. All test measurement procedures are according to ANSI/TIA-603-B-2002.
5. The EUT is a Class B device when in non-transmitting state and meets the FCC Part15B Class B requirements.

### Modifications

No modifications were made.

## PRODUCT DESCRIPTION

Description	: The Equipment Under Test (EUT) is a <b>MARITIME SATELLITE TERMINAL.</b>
Applicant	: Addvalue Innovation Pte Ltd 8 Tai Seng Link, Level 5 (Wing 2) Singapore 534158
Manufacturer	: Addvalue Innovation Pte Ltd 8 Tai Seng Link, Level 5 (Wing 2) Singapore 534158
Factor (ies)	: PNE Electric Sdn. Bhd. No.23,Jalan Firma 1, Kawasan Perindustrian Tebrau 1, 81100 Johor Bahru, Johor, Malaysia
Brand	: THURAYA
Model Number	: ATLAS IP
FCC ID	: QO4-AVIATLASIP
Serial Number	: Nil
Microprocessor	: Samsung S3C2410
Operating / Transmitting Frequency	: 1626.5MHz – 1660.5MHz 1525MHz – 1559MHz 15275MHz (GPS) 2412MHz – 2462MHz (WiFi)
Clock / Oscillator Frequency	: 200MHz, 266MHz (Voice Main Board) 25MHz, 12MHz, 3.686MHz, 32.768kHz (Interface, Core Module Board)
Modulation / Emissions Designator	: 16 Amplitude Phase-Shift Keying (APSK) , $\pi/4$ -Coherent Quadrature Phase- Shift Keying (CQPSK)
Antenna Gain	: 10.0dBi
Port / Connectors	: 3 x RJ 45 Ethernet 1 x RJ45 PoE 1 x RJ50 Handset 1 x DB9 Serial com 1 x 20-pin IO port 1 x Mini USB
Rated Input Power	: 12Vdc,10A / 24Vdc,5A ( 120W max)
Accessories	: Refer to manufacturer

**SUPPORTING EQUIPMENT DESCRIPTION**

<b>Equipment Description (Including Brand Name)</b>	<b>Model, Serial &amp; FCC ID Number</b>	<b>Cable Description (List Length, Type &amp; Purpose)</b>
Acer TravelMate 4750 Laptop	M/N: MS2335 S/N: LXV420302411500 FCC ID: DoC	Nil
Chicony AC Adapter	M/N: CPA09-A065N1 S/N: F14051211003775 FCC ID: DoC	1.80m unshielded power cable
Seagull Handset	M/N: Seagull 5000i-HS S/N: AHS5KIM111000212 FCC ID: Nil	1.50m unshielded signal cable
Motolite Maintenance Free Battery	M/N: MFN100R S/N: 3064923 FCC ID: Nil	Nil
GW Instek Programmable Power Supply	M/N: PSH-3630A S/N: RK200163 FCC ID: Nil	1.50m unshielded signal cable
Thuraya Above Deck unit	M/N: AD321AT S/N: BVZ14090003 FCC ID: DoC	Nil

## EUT OPERATING CONDITIONS

### 47 CFR FCC Parts 2, 15 and 25

1. RF Output Power
2. Unwanted Emissions at Antenna Terminal
3. Radiated Spurious Emissions
4. Protection of Aeronautical Radio Navigation Satellite Service
5. Frequency Stability (Temperature Variation)
6. Frequency Stability (Voltage Variation)
7. Maximum Permissible Exposure

The EUT was exercised by operating in following modes with the EUT simulating the transmission and reception using the client's provided test programs, "SIGTERM"

#### Satellite Transmission Mode

- Continuous RF transmission at lower channel at maximum RF power
- Continuous maximum RF transmission at middle channel at maximum RF power
- Continuous maximum RF transmission at upper channel at maximum RF power

#### Satellite Reception (Receive) Mode

- Continuous RF reception at lower channel
- Continuous RF reception at middle channel
- Continuous RF reception at upper channel

#### GPS Reception (Receive) Mode

- Continuous GPS signal reception

**RADIATED EMISSION TEST**

**47 CFR FCC Part 15.109 Radiated Emission Limits (Class B)**

Frequency Range (MHz)	Quasi-Peak Limit Values (dBµV/m) @ 3m
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
Above 960	54.0*

\* Above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply.

**47 CFR FCC Part 15.109 Radiated Emission Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Rohde & Schwarz EMI Test Receiver (20Hz – 26.5GHz)	ESMI	829550/004 829214/005	04 Nov 2014
TDK RF Solutions Hybrid Log Periodic Antenna (30MHz-3GHz)	HLP-3003C	130237	17 Mar 2015
Eletro-Metrics Double Ridged Antenna (Horn) Antenna (1-18GHz)	EM-6961	6525	23 Apr 2015
Schwarzbeck Horn Antenna (6-18GHz) / Pre-amplifier assembly HAP-series	BBHA 9120 C / HAP06-18W	9120C-372 / 00000004	09 Aug 2015
Sonoma Preamplifier (9kHz – 1GHz)	310N	270640	26 May 2015
Toyo MicroWave Preamplifier (1GHz - 8GHz)	TPA0108-40	0636	09 Jun 2015
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	04 Oct 2015
ETS Horn Antenna(18GHz-40GHz)(Ref)	3116	0004-2474	16 Oct 2014
K&L Microwave Bandreject Filter	3TNF-1000/2000-N/N	436	Output Monitor



## RADIATED EMISSION TEST

### 47 CFR FCC Part 15.109 Radiated Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard as shown in the setup photos.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

### 47 CFR FCC Part 15.109 Radiated Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
3. The test was carried out at the selected frequency points obtained from the prescan in step 2. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from 30MHz to 10<sup>th</sup> harmonic of the highest frequency used or generated by the EUT, using the Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

### **Sample Calculation Example**

At 300 MHz

Q-P limit = 37.0 dB $\mu$ V/m

Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB

Q-P reading obtained directly from EMI Receiver = 31.0 dB $\mu$ V/m  
(Calibrated level including antenna factors & cable losses)

Therefore, Q-P margin = 37.0 - 31.0 = 6.0

i.e. 6.0 dB below Q-P limit

**RADIATED EMISSION TEST**

**47 CFR FCC Part 15.109 Radiated Emission Results**

Operating Mode	Continuous Transmission	Temperature	17°C
Test Input Power	12Vdc	Relative Humidity	57%
Test Distance	3m	Atmospheric Pressure	1035mbar
Type Bearer	PNB512_23_16APSK (Worst)	Tested By	Jason Lai

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBμV/m)	Q-P Limit (dBμV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Channel
31.9560	27.4	40.0	12.6	100	130	V	1
49.8440	27.9	40.0	12.1	100	275	V	1
130.6020	42.1	43.5	1.4	101	309	V	1
257.1080	37.0	46.0	9.0	313	1	H	1
257.2300	41.2	46.0	4.8	101	70	V	1
324.4870	35.3	46.0	10.7	101	204	H	1

Spurious Emissions above 1GHz - 18GHz

Freq (GHz)	Peak Value (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	AV Value (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
1.9314	37.2	74.0	36.8	32.4	54.0	21.6	200	340	V	1
5.2991	50.1	74.0	23.9	46.2	54.0	7.8	313	19	H	1
5.4780	50.2	74.0	23.8	46.4	54.0	7.6	288	343	V	1
5.5698	49.5	74.0	24.5	46.2	54.0	7.8	101	354	V	1
5.6751	50.3	74.0	23.7	46.5	54.0	7.5	101	292	V	1
12.2485	45.1	74.0	28.9	32.1	54.0	21.9	203	69	V	1

**Notes**

- All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
- A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
30MHz - 1GHz  
RBW: 120kHz VBW: 1MHz  
>1GHz  
RBW: 1MHz VBW: 1MHz
- Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25.0GHz is ±4.0dB.

**RF OUTPUT POWER TEST**

**47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Test Limits**

1. 25.204 Power Limits
  - (a) In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1GHz and 5GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:  
 $+40\text{dBW}$  in any 4kHz band for  $\theta: 0^\circ$   
 $+40\text{dBW} + 3.0\text{dBW}$  in any 4kHz band for  $0^\circ < \theta \leq 5^\circ$   
where  $\theta$  is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.
  - (c) For angles of evaluation of the horizon greater than  $5^\circ$  there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.
  - (d) Notwithstanding the e.i.r.p and e.i.r.p density limits specified in the station authorization, each earth station transmission shall be conducted at the lowest power level that will provide the required signal quality as indicated in the application and further amended by coordination agreements.
2. 2.1046 Measurements Required: RF Power Output
  - (a) For transmission other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.
  - (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

**47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	14 Nov 2014
Bird 20dB 25W RF Attenuator	25-A-MFN-20	Nil	Output Monitor
Instock Divider / Combiner	PD7120	Nil	Output Monitor

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**RF OUTPUT POWER TEST**

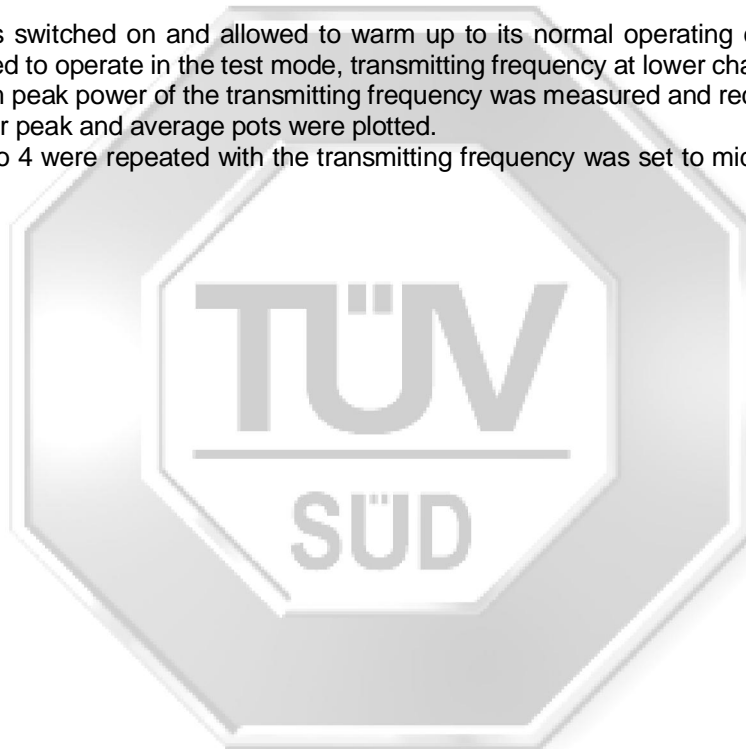
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**47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Test Setup**

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the Universal Radio Communication Tester, which set into power analyser mode via a RF attenuator and a low-loss coaxial cable.
4. The spectrum analyser was then calibrated to the power meter level as shown by the Universal Radio Communicator Tester with a calibrated RF signal source.
5. All other supporting equipment were powered separately from another filtered mains.

**47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, transmitting frequency at lower channel.
2. The maximum peak power of the transmitting frequency was measured and recorded.
3. The RF carrier peak and average pots were plotted.
4. The steps 2 to 4 were repeated with the transmitting frequency was set to middle and upper channels respectively.





RF OUTPUT POWER TEST

47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Results

Operating Mode	Continuous Satellite Transmit	Temperature	24°C
Test Input Power	12Vdc	Relative Humidity	60%
Antenna Gain	10.0dBi	Atmospheric Pressure	1030mbar
Attached Plots	1 – 54	Tested By	Li Chelmin, Liao LeeYin

Frequency (GHz)	Channel	Peak Output Power (dBm)		Average Output Power (dBm)		Bearer Type
		EIRP	ERP	EIRP	ERP	
1.6265	Lower	30.53	28.38	30.32	28.17	RACH
1.6435	Middle	30.38	28.23	30.47	28.32	
1.6605	Upper	30.62	28.47	30.67	28.52	
1.6265	Lower	30.92	28.77	30.84	28.69	AGCH
1.6435	Middle	30.24	28.09	30.62	28.47	
1.6605	Upper	31.08	28.93	30.74	28.59	
1.6265	Lower	30.31	28.16	30.27	28.12	FACCH
1.6435	Middle	30.05	27.90	29.91	27.76	
1.6605	Upper	30.20	28.05	30.09	27.94	
1.6265	Lower	30.94	28.79	30.54	28.39	TCH3
1.6435	Middle	30.97	28.82	30.82	28.67	
1.6605	Upper	30.21	28.06	30.98	28.83	
1.6265	Lower	30.45	28.30	30.76	28.61	FACCH9
1.6435	Middle	30.50	28.35	30.53	28.38	
1.6605	Upper	30.73	28.58	30.83	28.68	
1.6265	Lower	30.74	28.59	30.87	28.72	TCH9
1.6435	Middle	30.35	28.20	30.45	28.30	
1.6605	Upper	30.65	28.50	30.71	28.56	
1.6265	Lower	30.80	28.65	30.49	28.34	PAB
1.6435	Middle	30.42	28.27	30.64	28.49	
1.6605	Upper	30.46	28.31	30.64	28.49	
1.6265	Lower	38.38	36.23	38.05	35.90	PNB512_12_QPSK
1.6435	Middle	39.41	37.26	38.77	36.62	
1.6605	Upper	38.66	36.51	38.53	36.38	
1.6265	Lower	39.76	37.61	38.94	36.79	PNB512_23_16APSK
1.6435	Middle	38.86	36.71	39.35	37.20	
1.6605	Upper	37.99	35.84	38.20	36.05	



RF OUTPUT POWER TEST

47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Results

Operating Mode	Continuous Satellite Transmit	Temperature	24°C
Test Input Power	12Vdc	Relative Humidity	60%
Antenna Gain	10.0dBi	Atmospheric Pressure	1030mbar
Attached Plots	55 – 108	Tested By	Li Chelmin, Liao LeeYin

Frequency (GHz)	Channel	Peak Output Power (dBm)		Average Output Power (dBm)		Bearer Type
		EIRP	ERP	EIRP	ERP	
1.6265	Lower	37.87	35.72	38.08	35.93	PNB512_23_QPSK
1.6435	Middle	38.31	36.16	39.22	37.07	
1.6605	Upper	38.84	36.69	38.53	36.38	
1.6265	Lower	39.20	37.05	39.16	37.01	PNB512_45_16APSK
1.6435	Middle	39.12	36.97	38.63	36.48	
1.6605	Upper	39.00	36.85	38.55	36.40	
1.6265	Lower	38.35	36.20	38.40	36.25	PNB512_45_QPSK
1.6435	Middle	38.45	36.30	38.60	36.45	
1.6605	Upper	39.10	36.95	38.87	36.72	
1.6265	Lower	39.72	37.57	38.65	36.50	PNB512_910_16APSK
1.6435	Middle	38.43	36.28	38.79	36.64	
1.6605	Upper	39.18	37.03	39.52	37.37	
1.6265	Lower	38.48	36.33	38.34	36.19	PNB512_910_QPSK
1.6435	Middle	38.90	36.75	38.86	36.71	
1.6605	Upper	40.09	37.94	40.18	38.03	
1.6265	Lower	38.47	36.32	38.61	36.46	PNB53_12_QPSK
1.6435	Middle	37.32	35.17	38.46	36.31	
1.6605	Upper	38.23	36.08	37.71	35.56	
1.6265	Lower	39.79	37.64	39.35	37.20	PNB53_23_16APSK
1.6435	Middle	38.22	36.07	38.73	36.58	
1.6605	Upper	39.14	36.99	38.77	36.62	
1.6265	Lower	38.74	36.59	38.39	36.24	PNB53_23_QPSK
1.6435	Middle	38.81	36.66	39.33	37.18	
1.6605	Upper	37.65	35.50	37.83	35.68	
1.6265	Lower	40.08	37.93	40.39	38.24	PNB53_45_16APSK
1.6435	Middle	39.96	37.81	39.46	37.31	
1.6605	Upper	39.59	37.44	39.39	37.24	



RF OUTPUT POWER TEST

47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Results

Operating Mode	Continuous Satellite Transmit	Temperature	24°C
Test Input Power	12Vdc	Relative Humidity	60%
Antenna Gain	10.0dBi	Atmospheric Pressure	1030mbar
Attached Plots	109 – 126	Tested By	Li Chelmin, Liao LeeYin

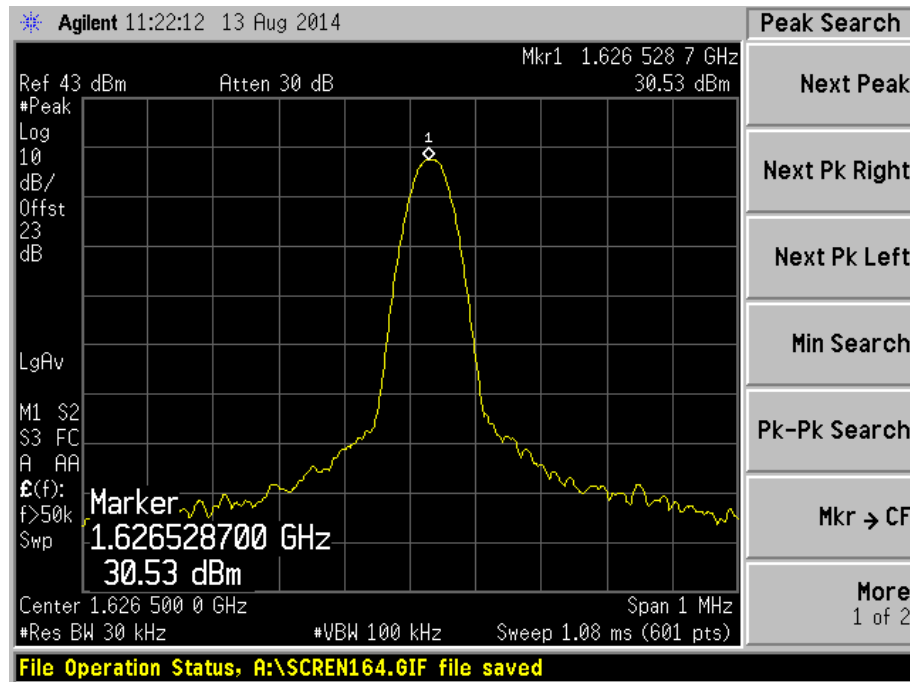
Frequency (GHz)	Channel	Peak Output Power (dBm)		Average Output Power (dBm)		Bearer Type
		EIRP	ERP	EIRP	ERP	
1.6265	Lower	38.35	36.20	38.60	36.45	PNB53_45_QPSK
1.6435	Middle	38.74	36.59	38.74	36.59	
1.6605	Upper	38.43	36.28	38.93	36.78	
1.6265	Lower	39.04	36.89	39.44	37.29	PNB53_910_16APSK
1.6435	Middle	38.28	36.13	38.49	36.34	
1.6605	Upper	38.71	36.56	37.91	35.76	
1.6265	Lower	38.62	36.47	38.24	36.09	PNB53_910_QPSK
1.6435	Middle	38.32	36.17	39.13	36.98	
1.6605	Upper	38.62	36.47	39.01	36.86	

Notes

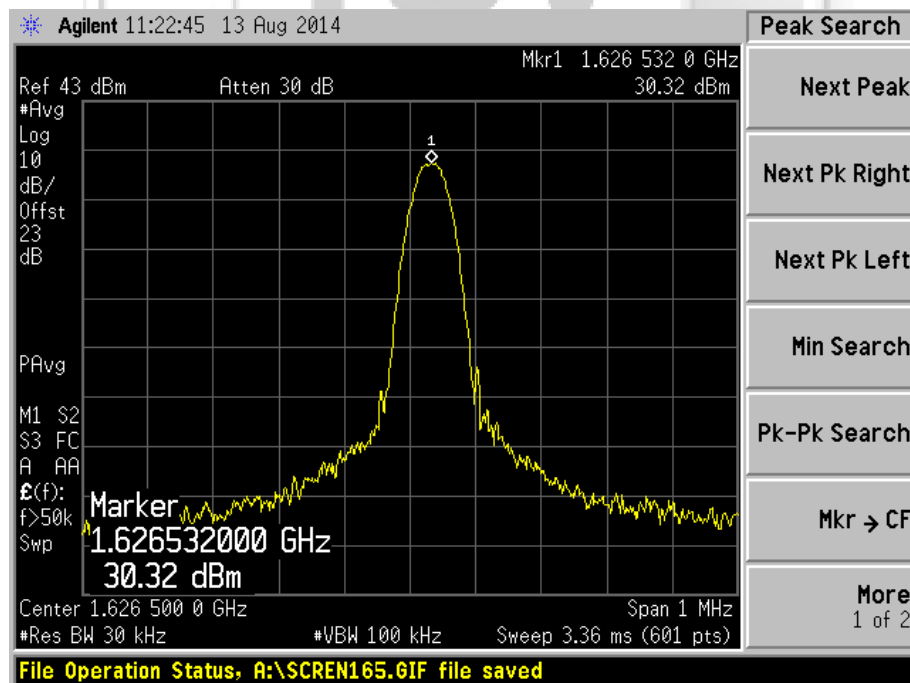
1. RF Output Power Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of 95%, with a coverage factor of 2 is  $\pm 1.0\text{dB}$ .

RF OUTPUT POWER TEST

Output Power Plots – RACH



Plot 1 – Lower Channel (Peak)

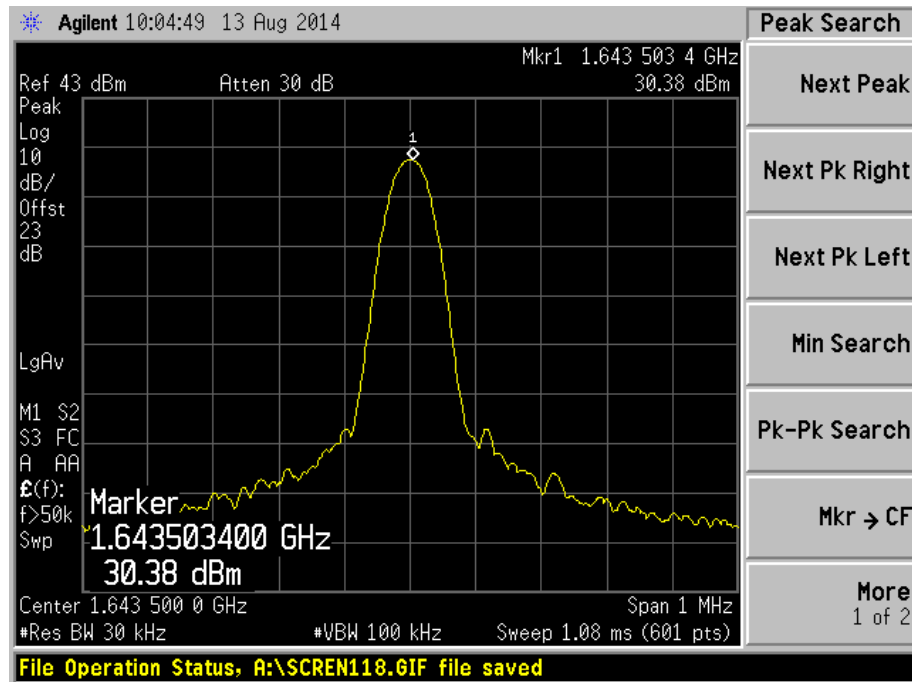


Plot 2 – Lower Channel (Average)

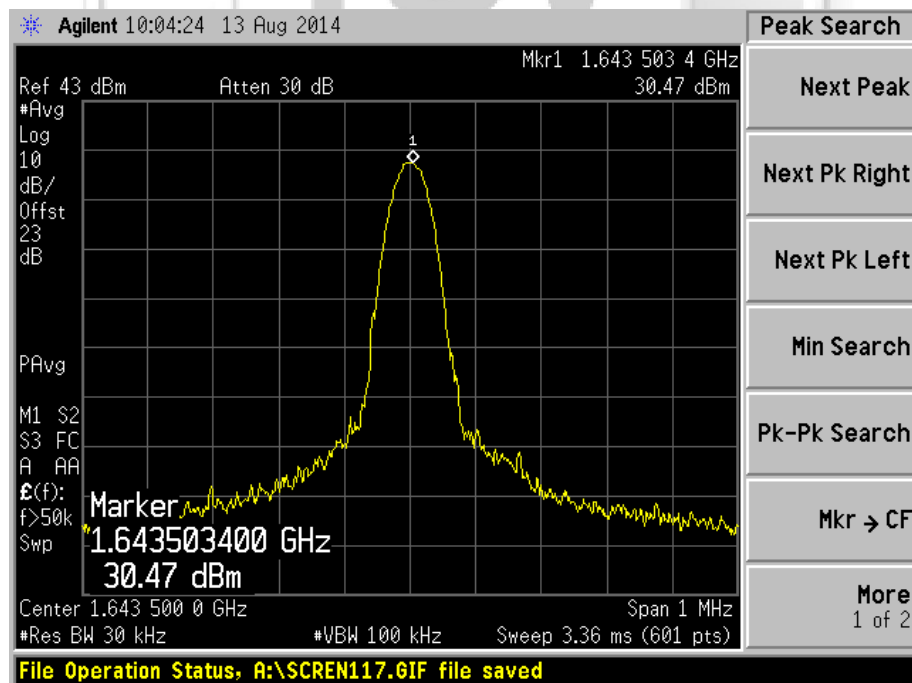


RF OUTPUT POWER TEST

Output Power Plots – RACH



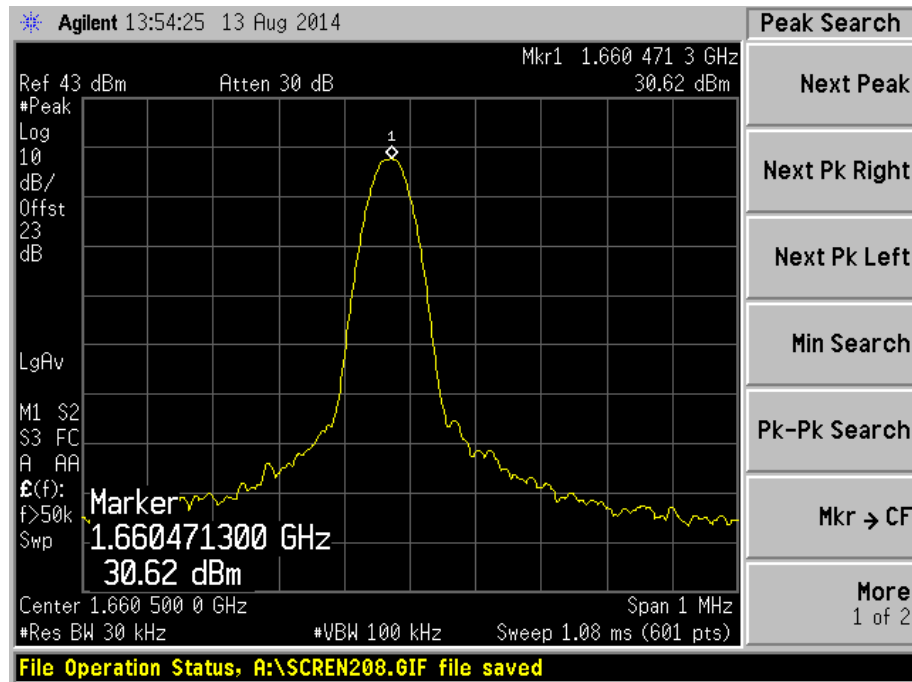
Plot 3 – Middle Channel (Peak)



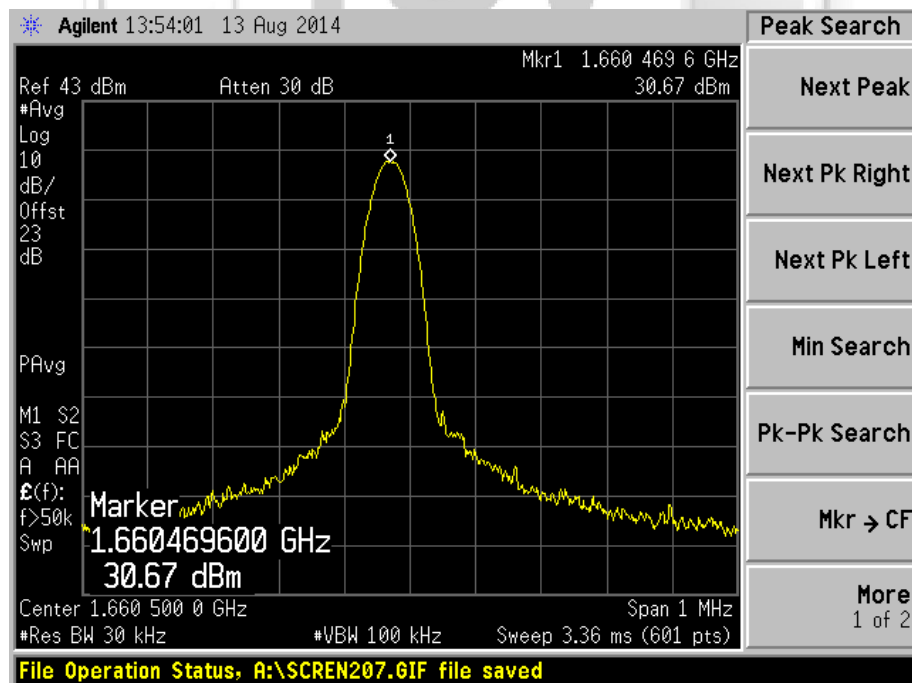
Plot 4 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – RACH



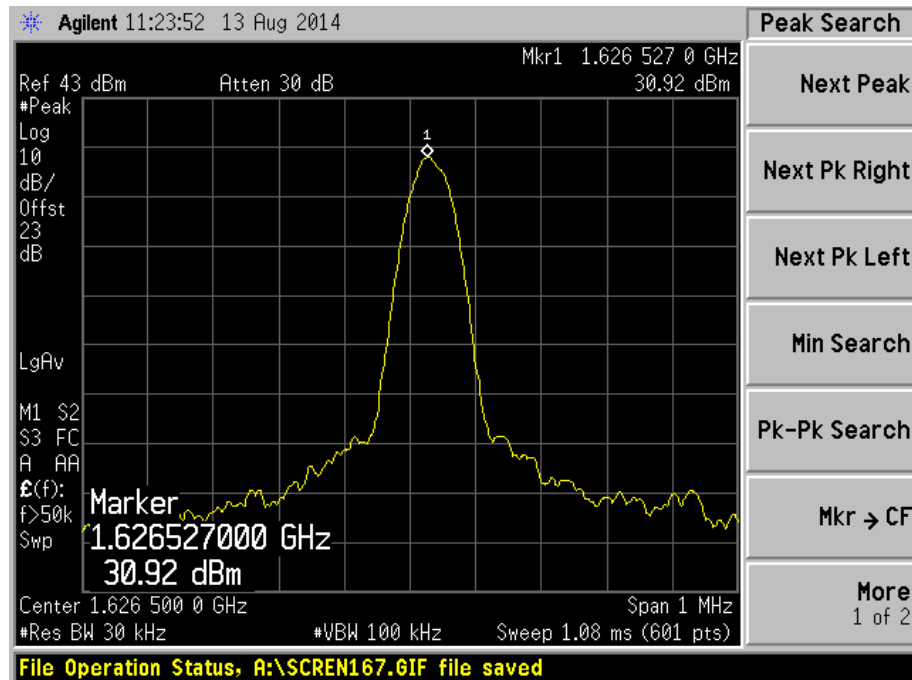
Plot 5 – Upper Channel (Peak)



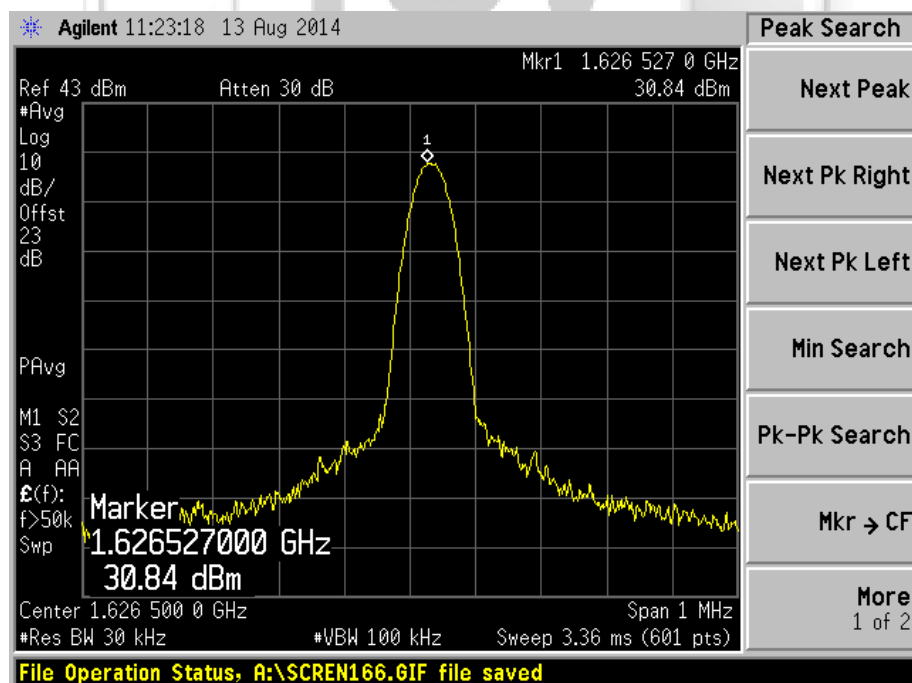
Plot 6 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – AGCH



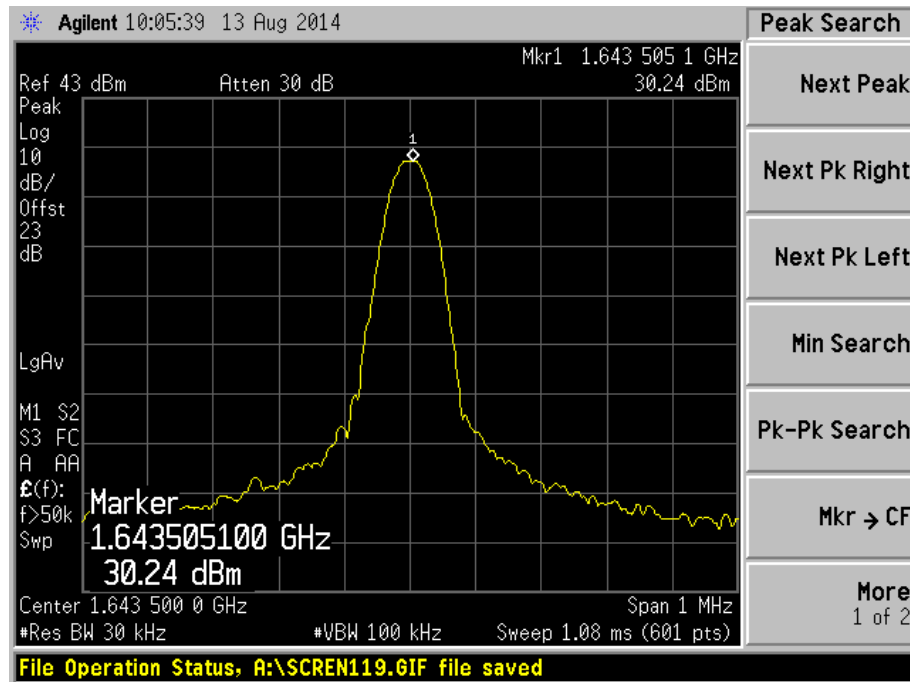
Plot 7 – Lower Channel (Peak)



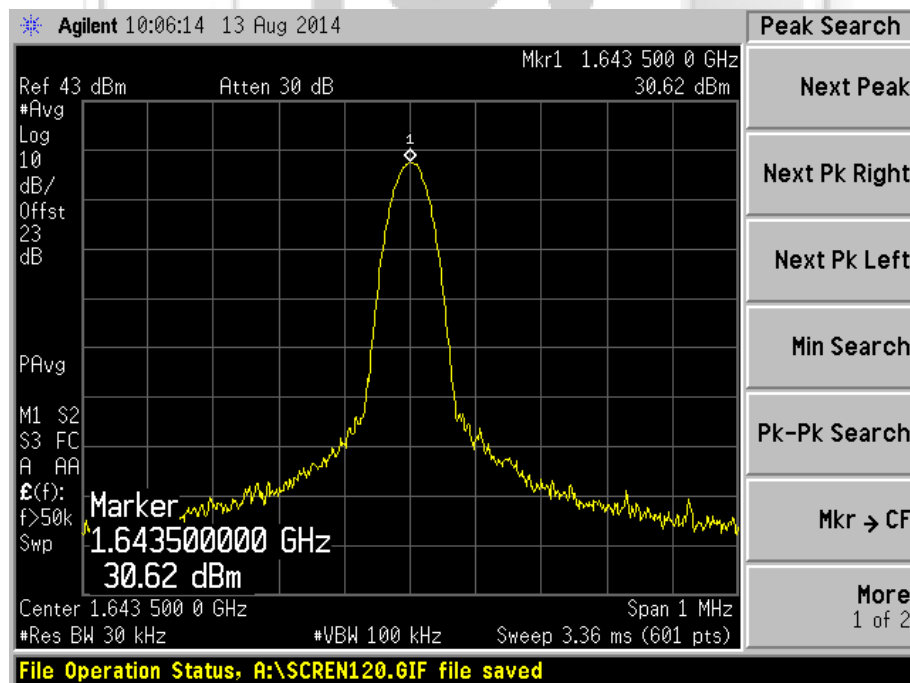
Plot 8 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – AGCH



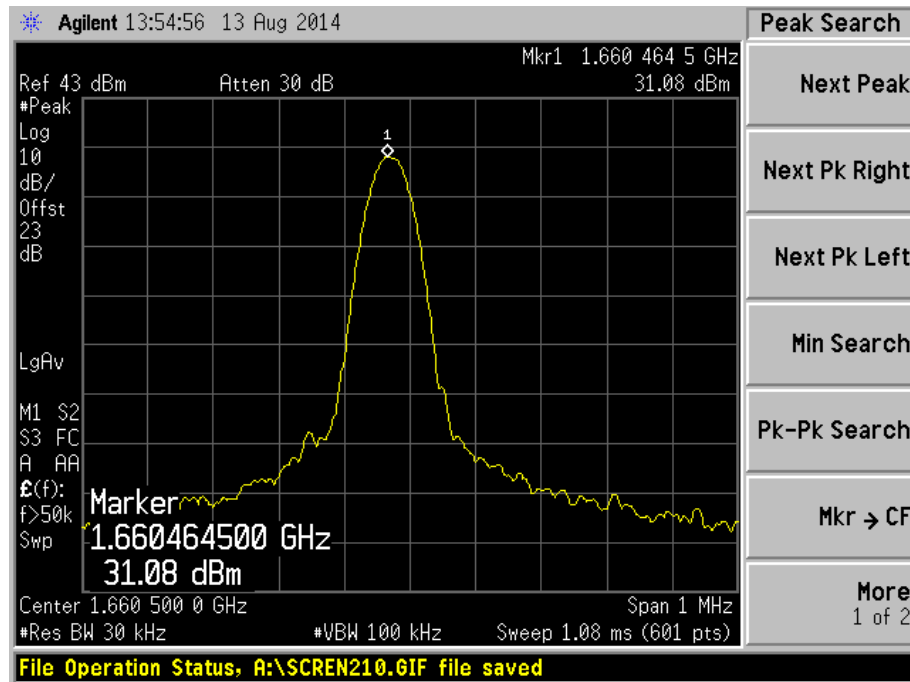
Plot 9 – Middle Channel (Peak)



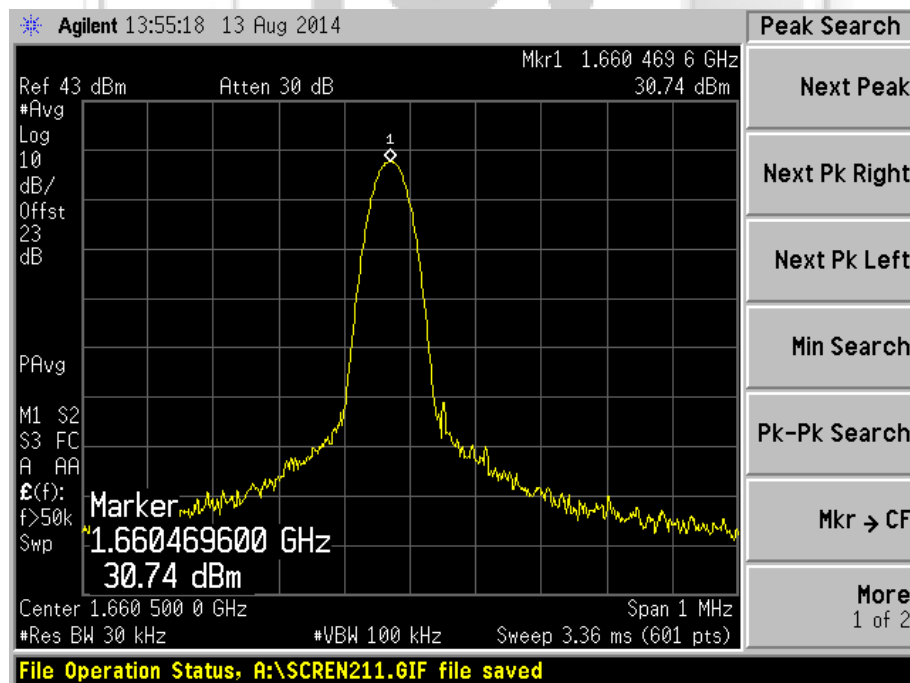
Plot 10 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – AGCH



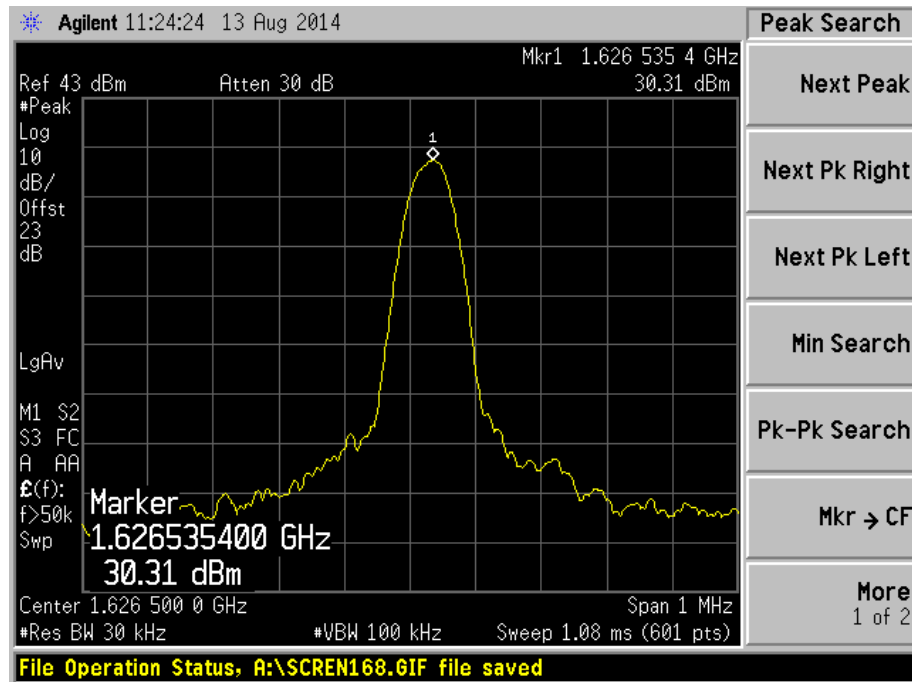
Plot 11 – Upper Channel (Peak)



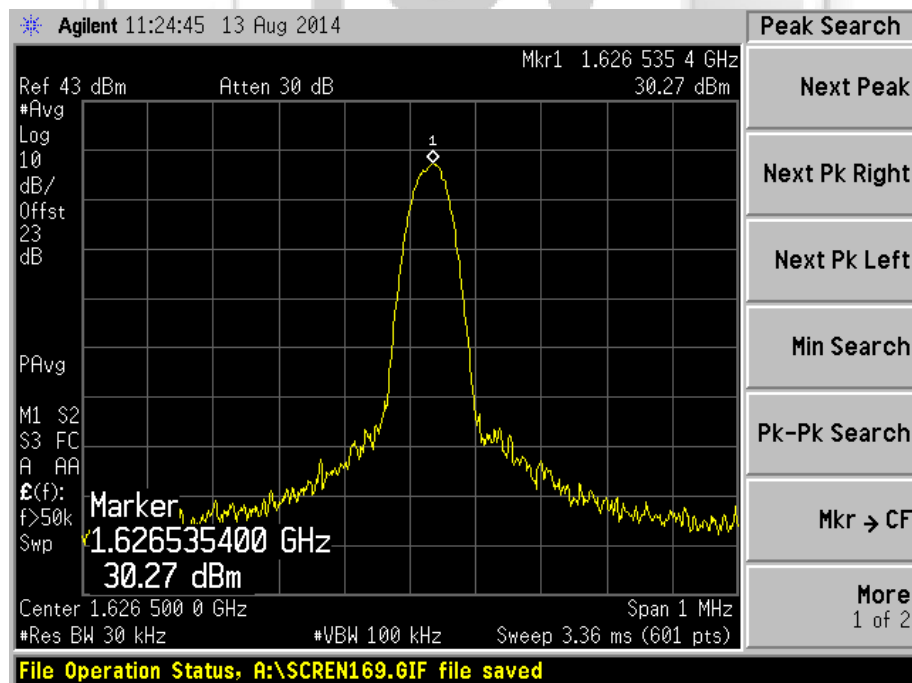
Plot 12 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – FACCH



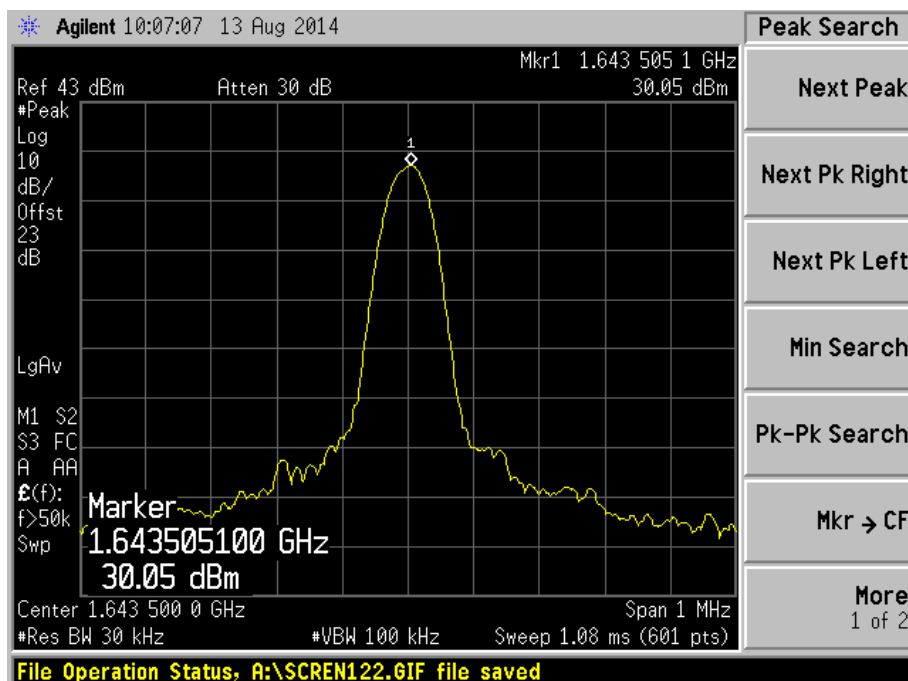
Plot 13 – Lower Channel (Peak)



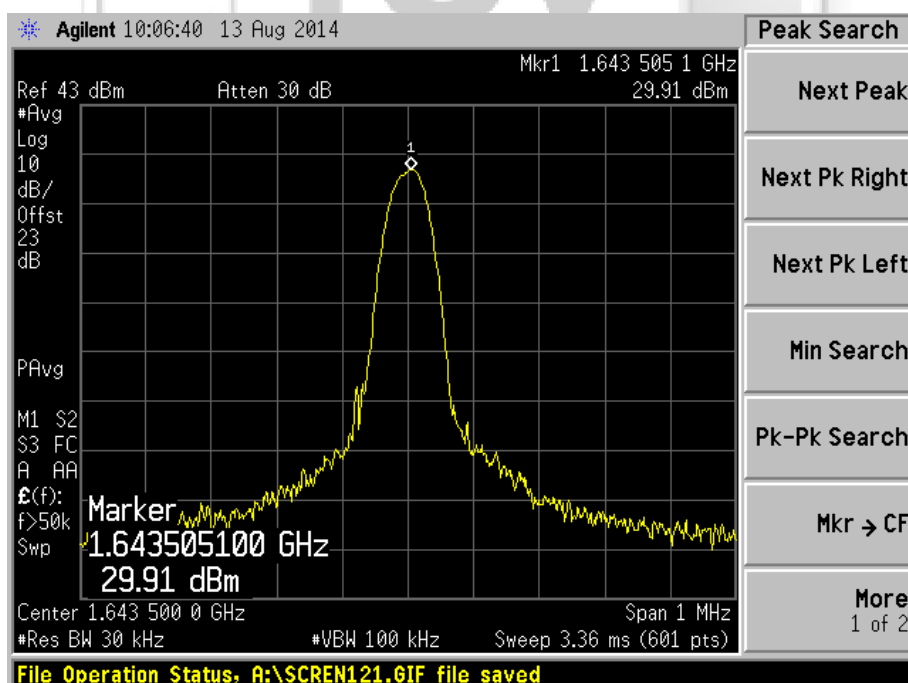
Plot 14 – Lower Channel (Average)

## RF OUTPUT POWER TEST

### Output Power Plots – FACCH



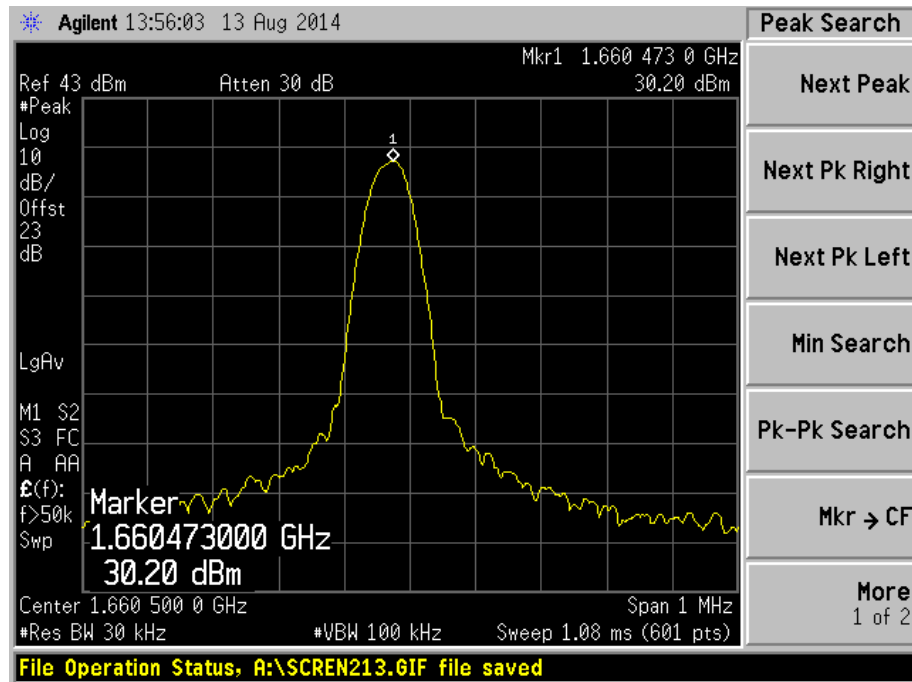
Plot 15 – Middle Channel (Peak)



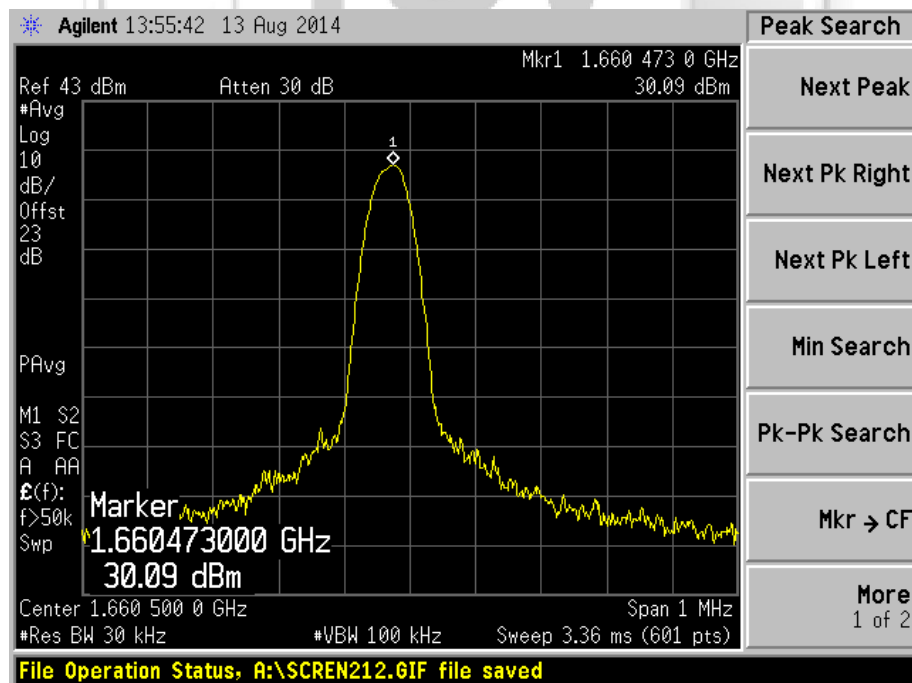
Plot 16 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – FACCH



Plot 17 – Upper Channel (Peak)

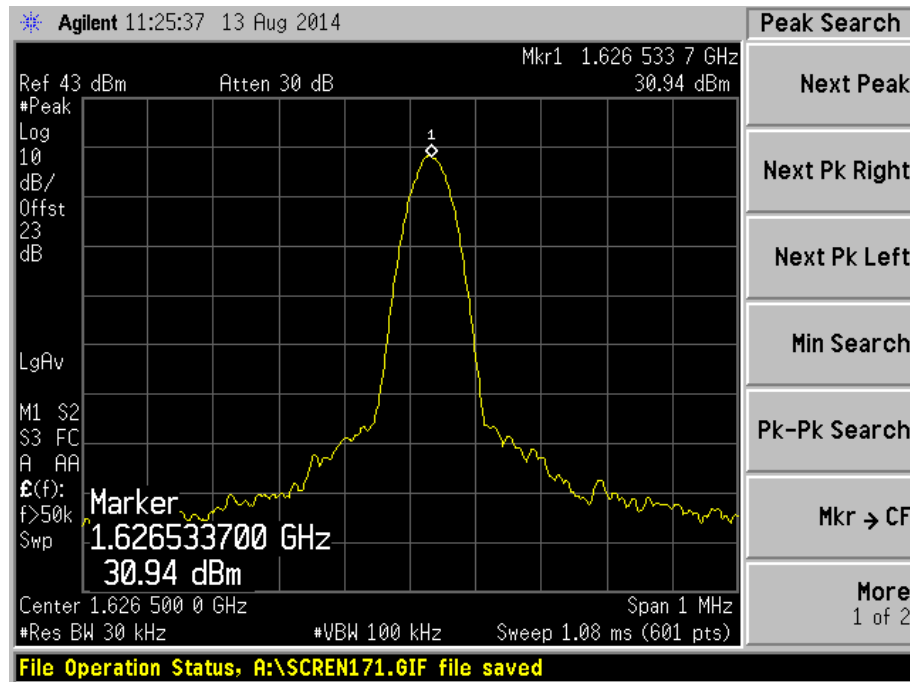


Plot 18 – Upper Channel (Average)

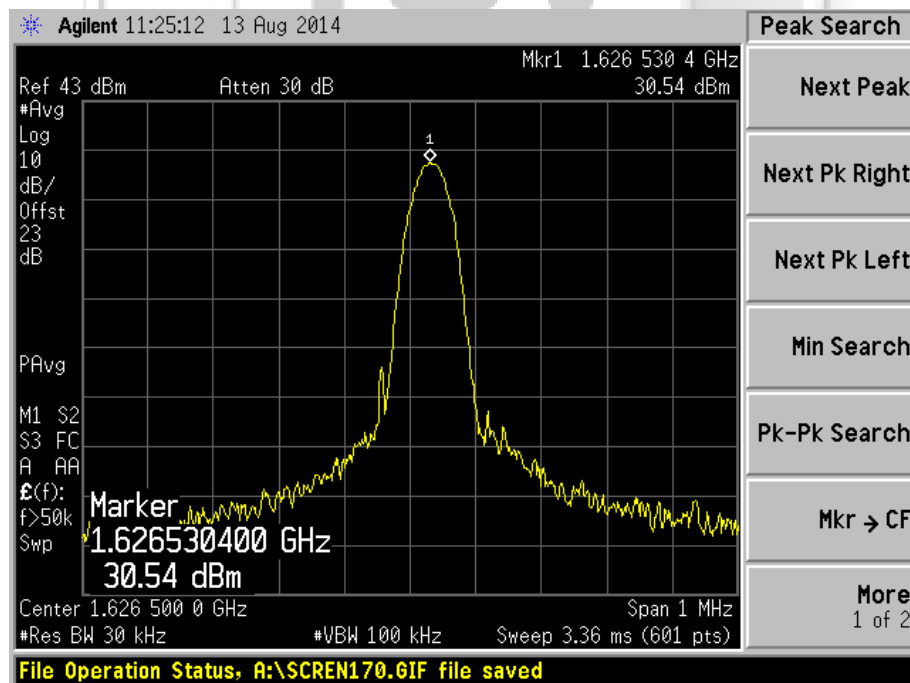


RF OUTPUT POWER TEST

Output Power Plots – TCH3



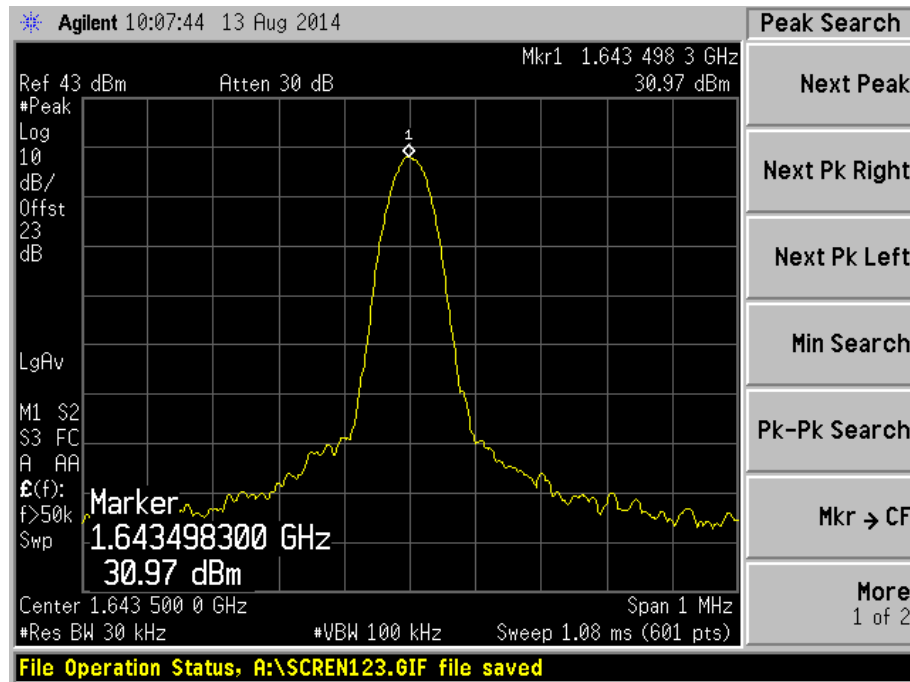
Plot 19 – Lower Channel (Peak)



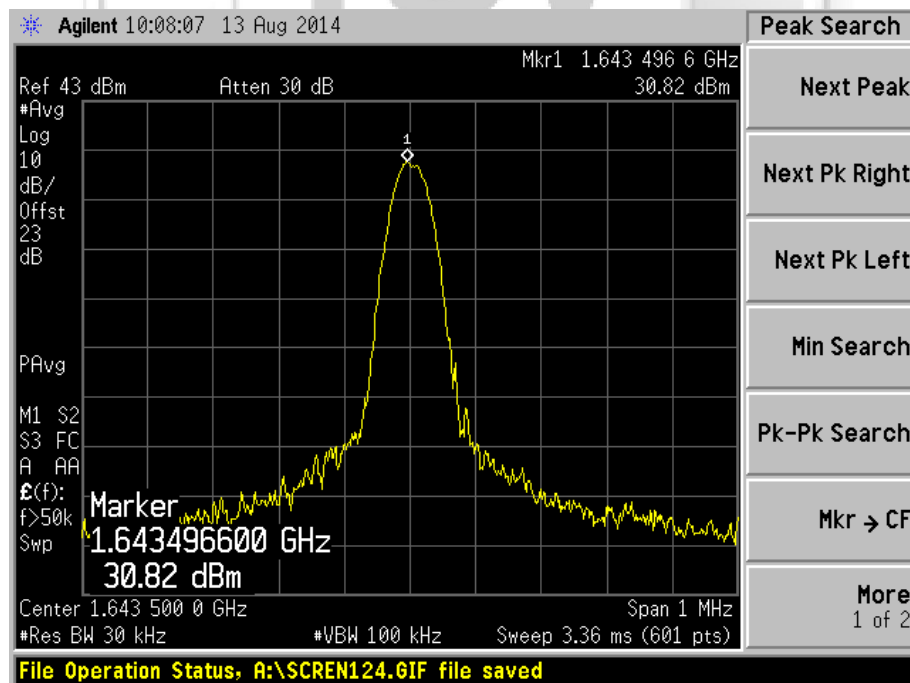
Plot 20 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – TCH3



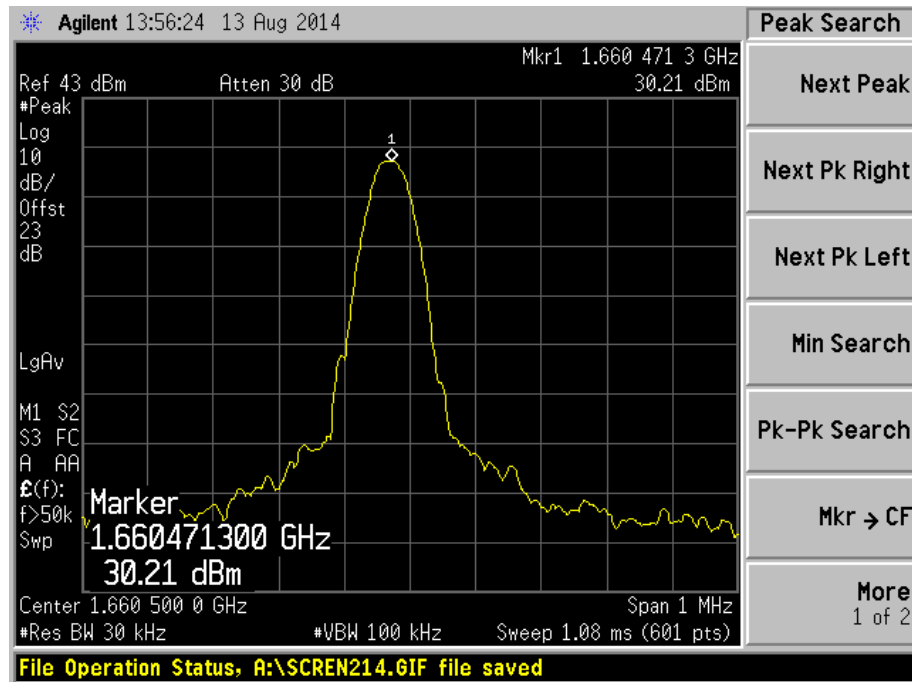
Plot 21 – Middle Channel (Peak)



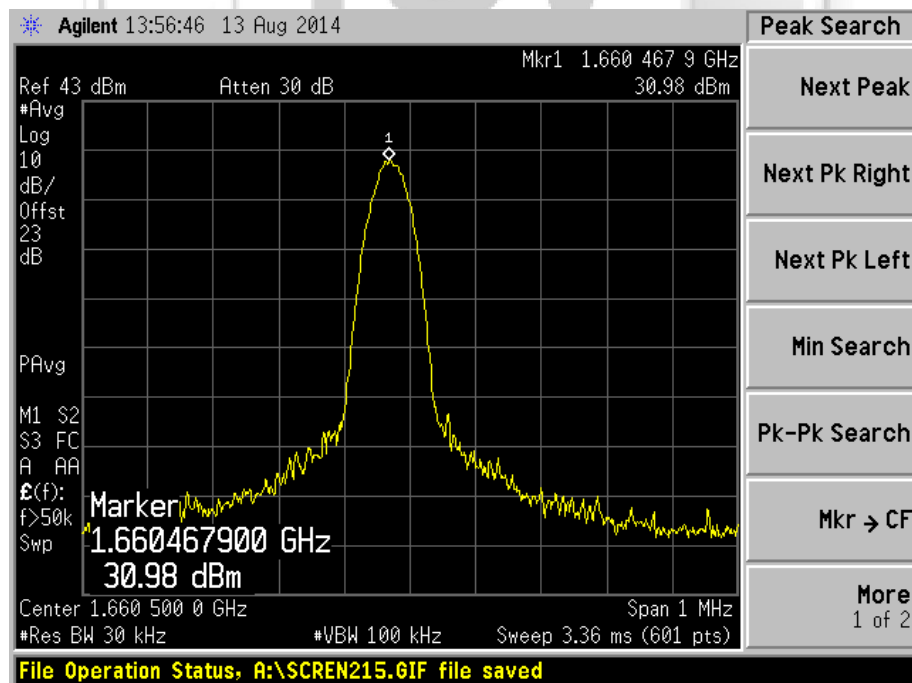
Plot 22 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – TCH3



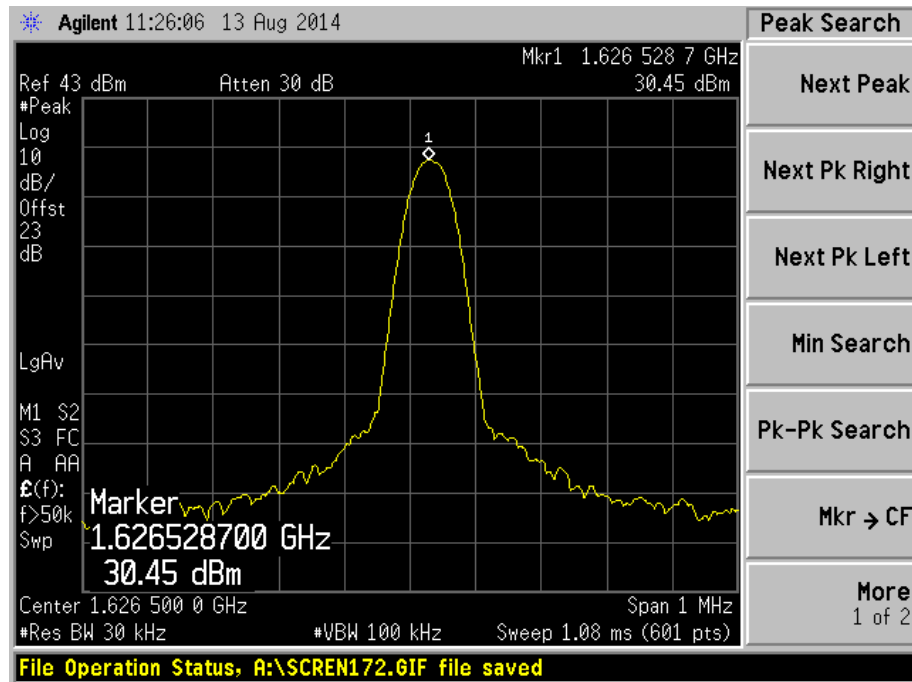
Plot 23 – Upper Channel (Peak)



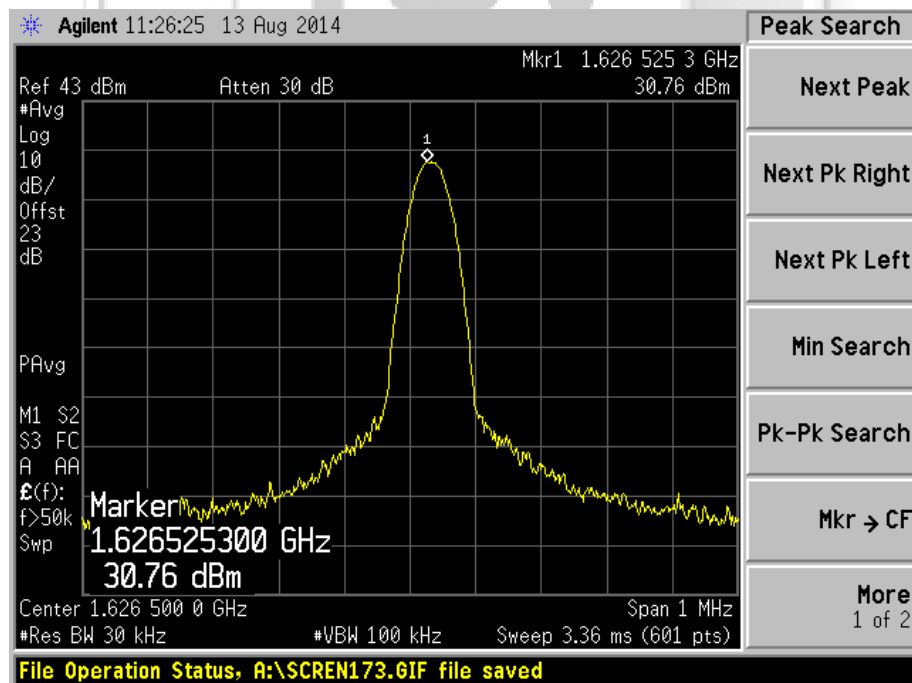
Plot 24 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – FACCH9



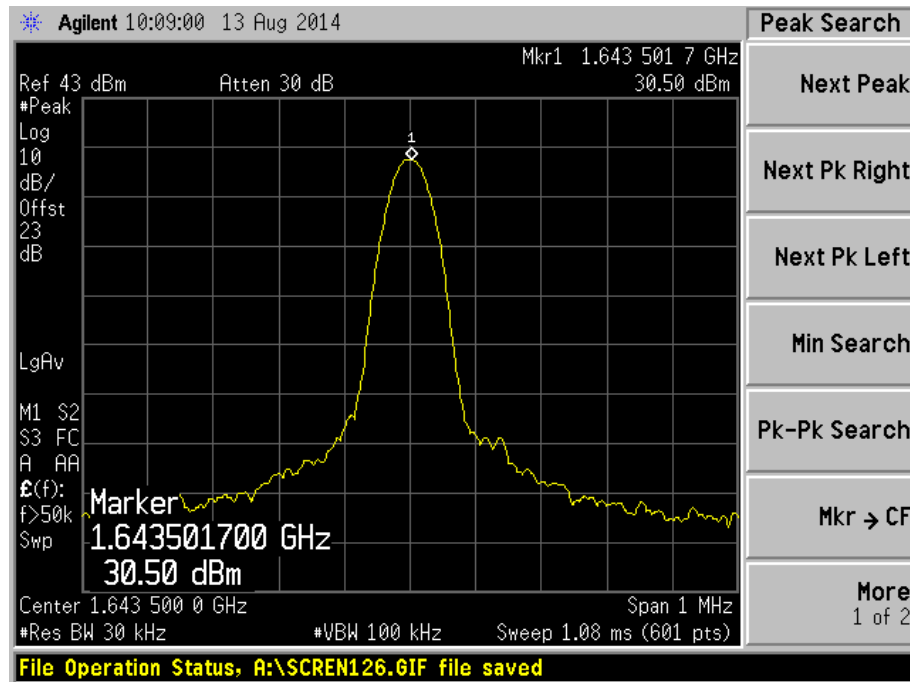
Plot 25 – Lower Channel (Peak)



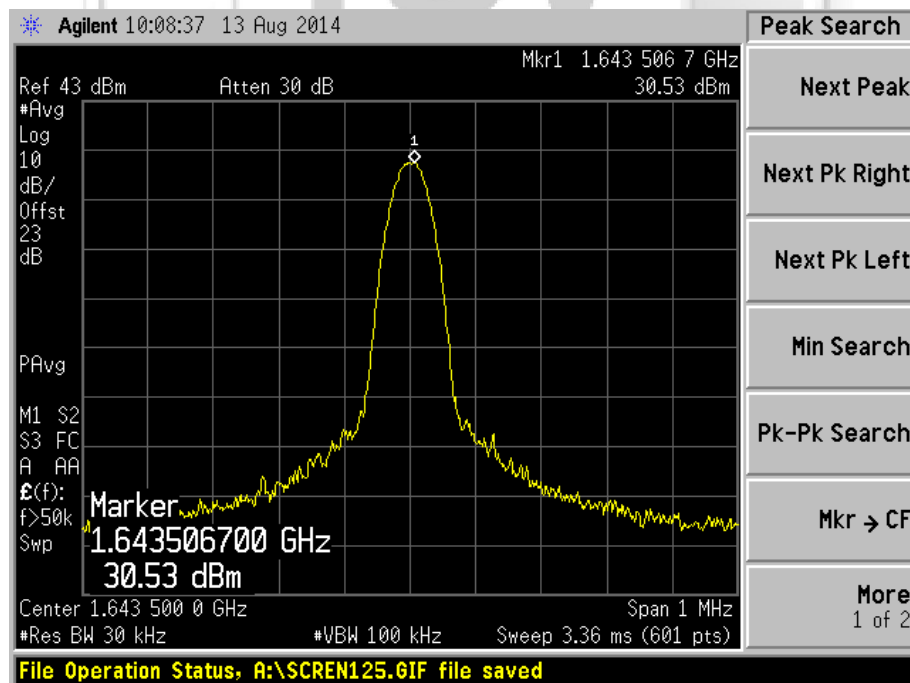
Plot 26 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – FACCH9



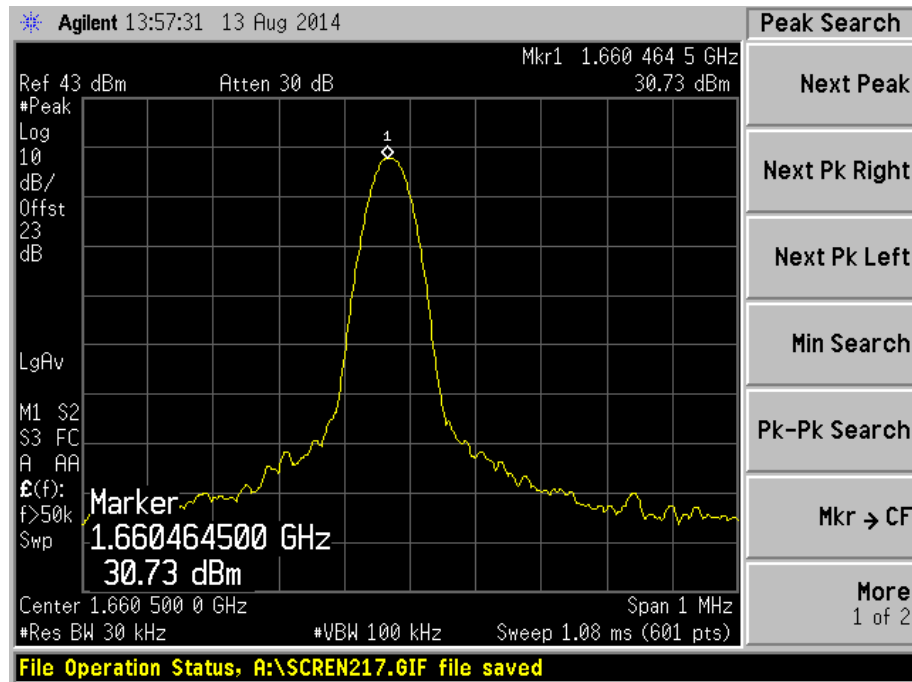
Plot 27 – Middle Channel (Peak)



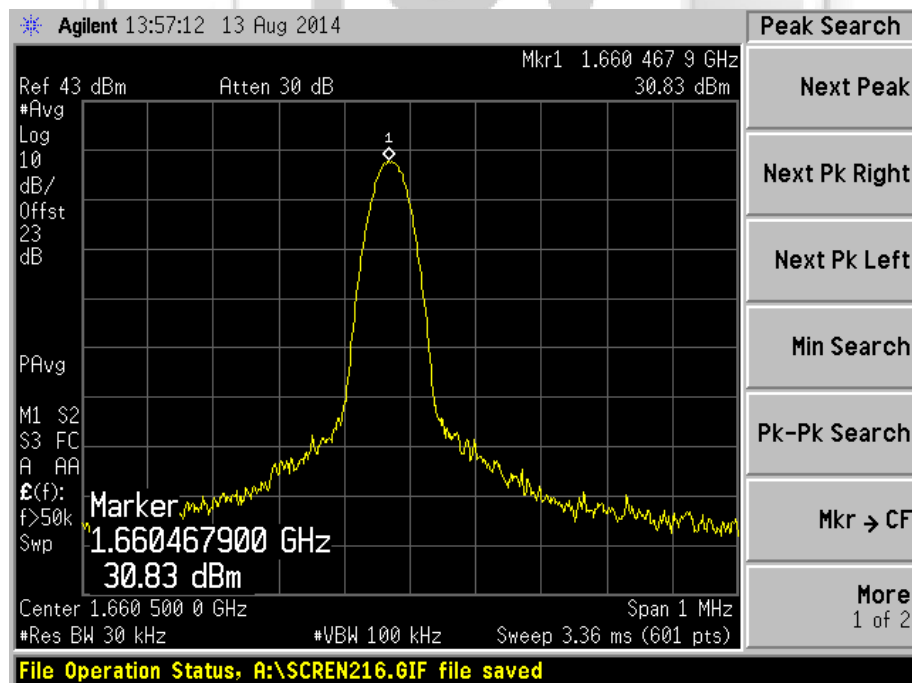
Plot 28 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – FACCH9



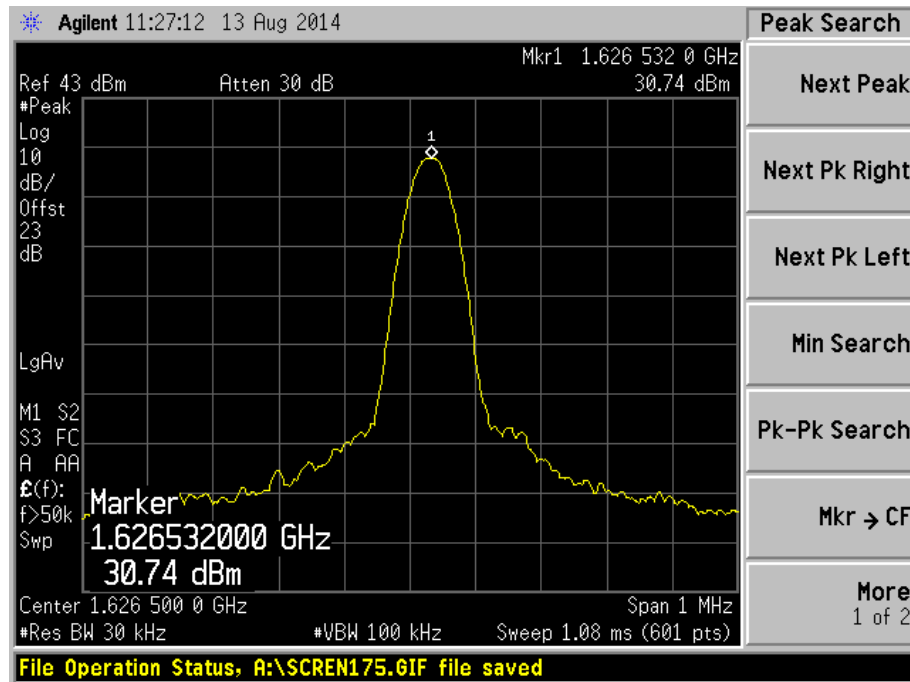
Plot 29 – Upper Channel (Peak)



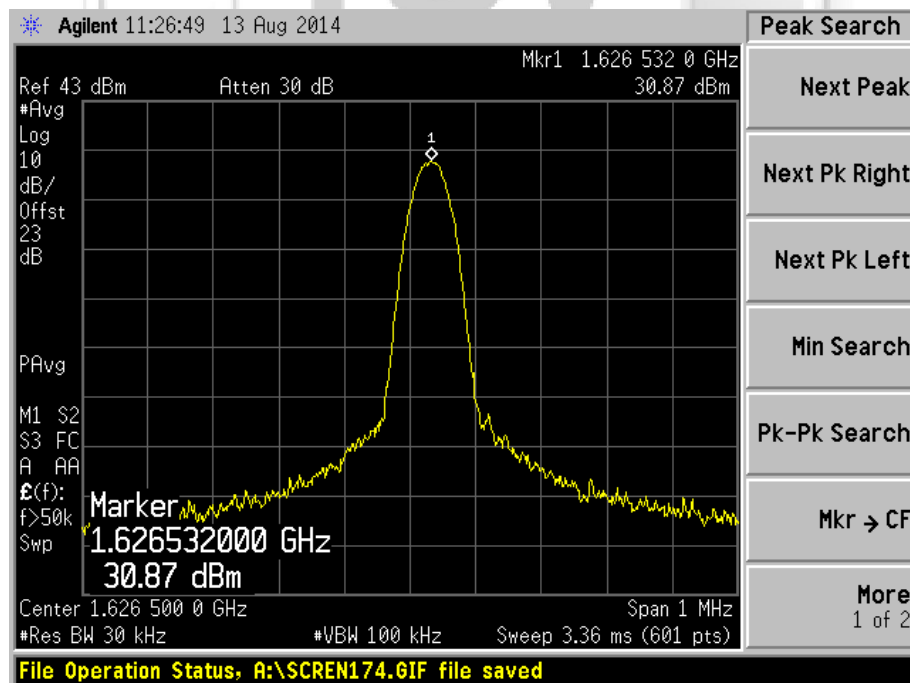
Plot 30 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – TCH9



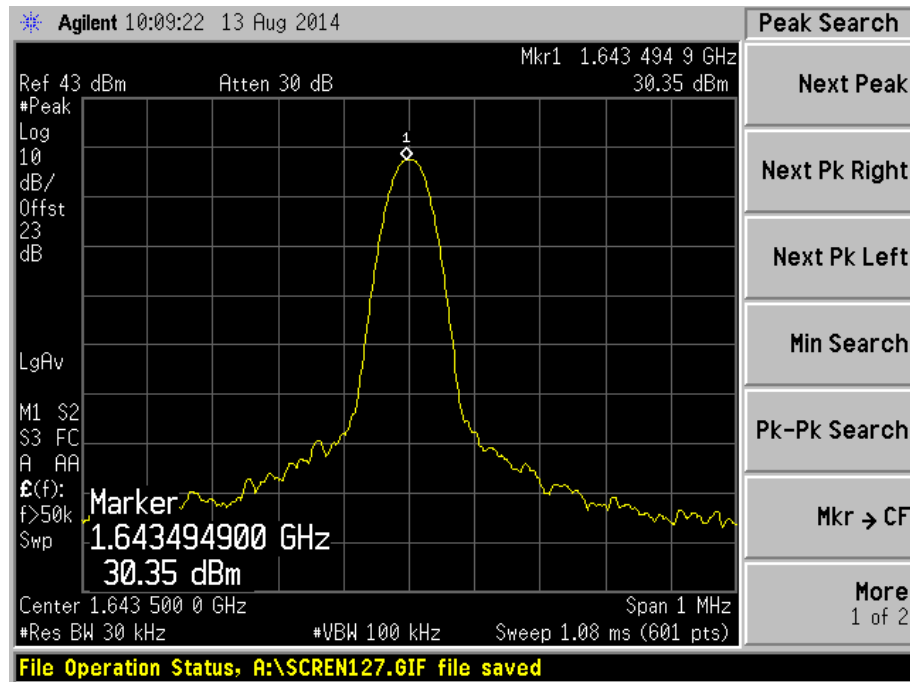
Plot 31 – Lower Channel (Peak)



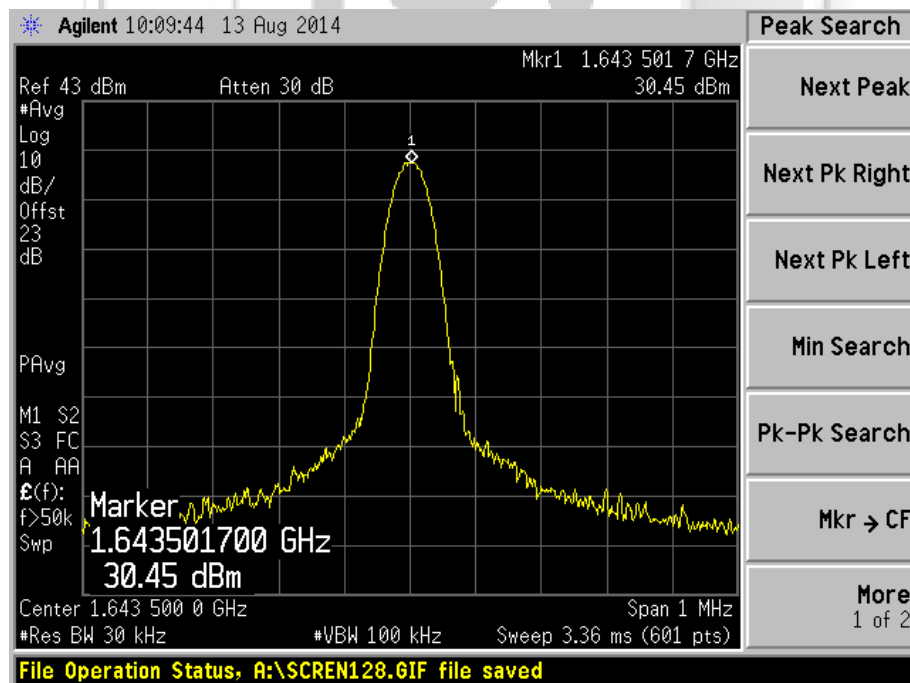
Plot 32 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – TCH9



Plot 33 – Middle Channel (Peak)

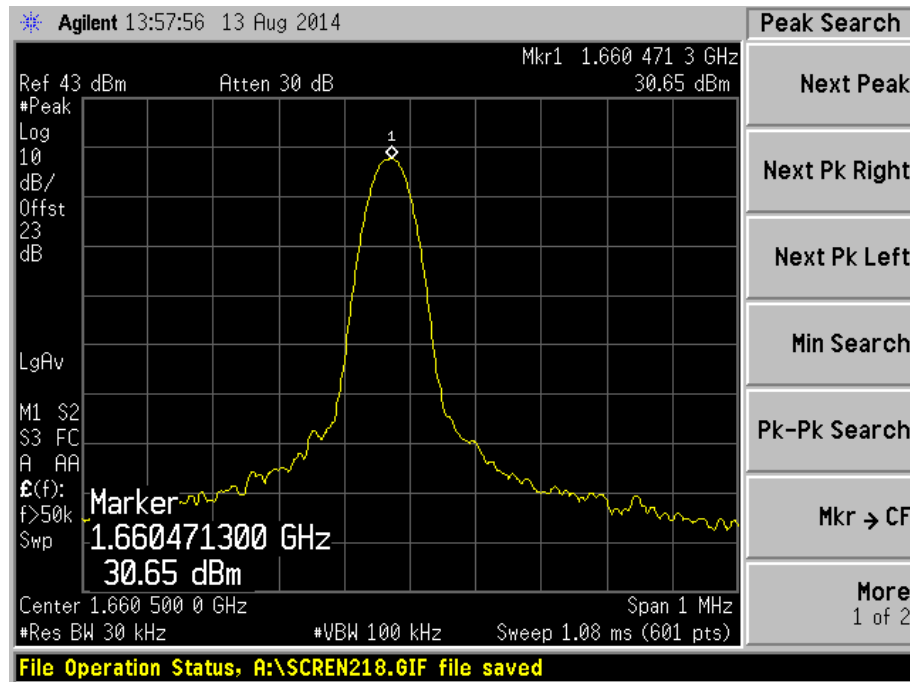


Plot 34 – Middle Channel (Average)

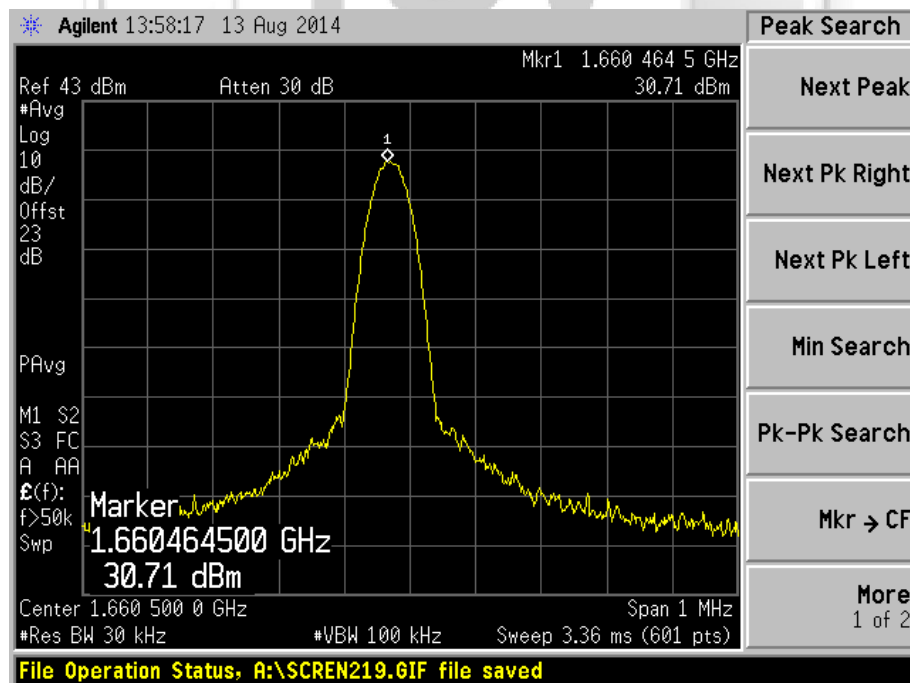


RF OUTPUT POWER TEST

Output Power Plots – TCH9



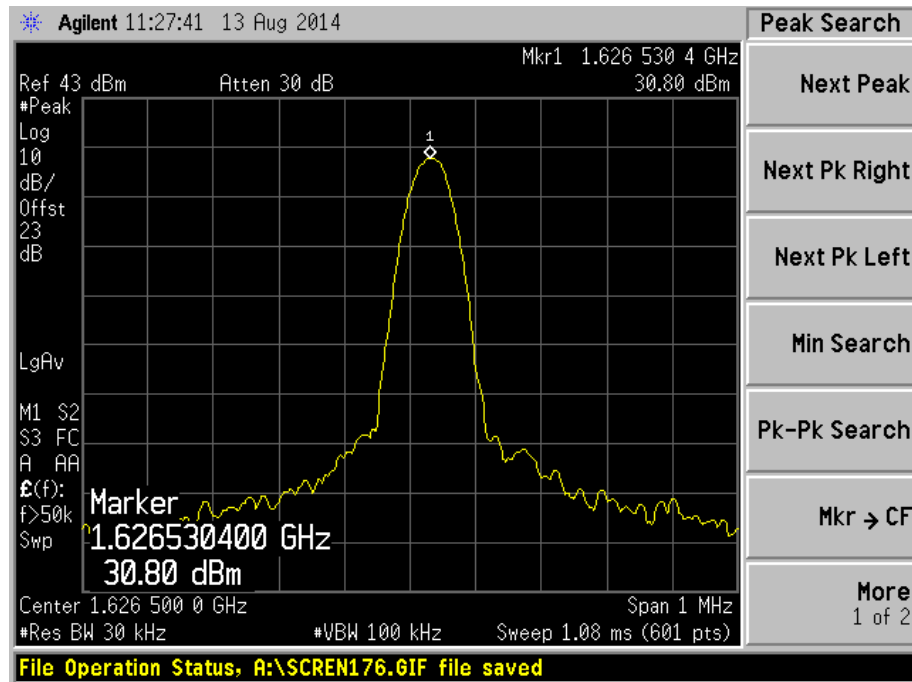
Plot 35 – Upper Channel (Peak)



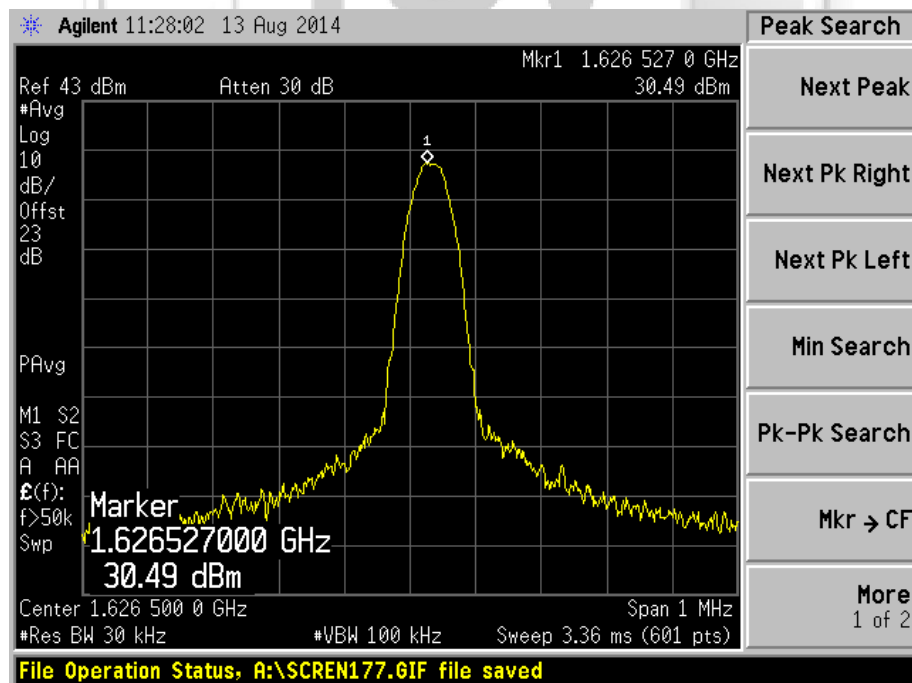
Plot 36 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PAB



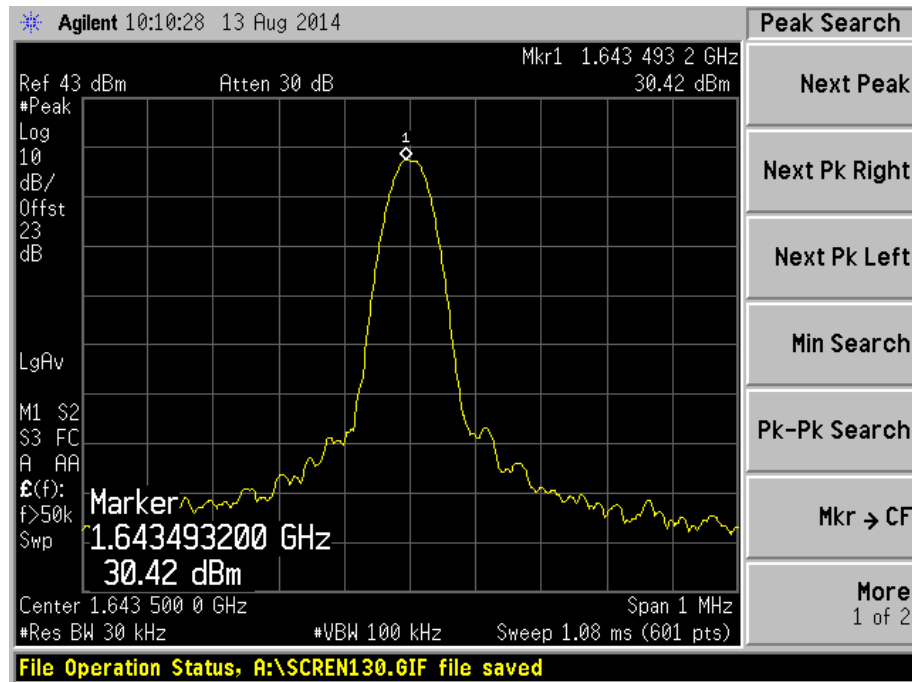
Plot 37 – Lower Channel (Peak)



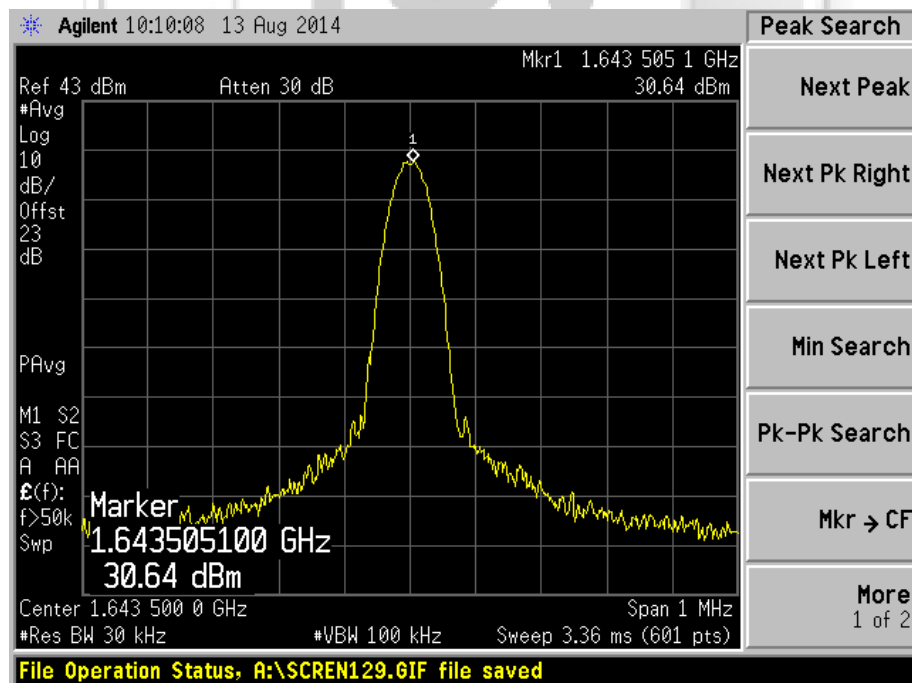
Plot 38 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PAB



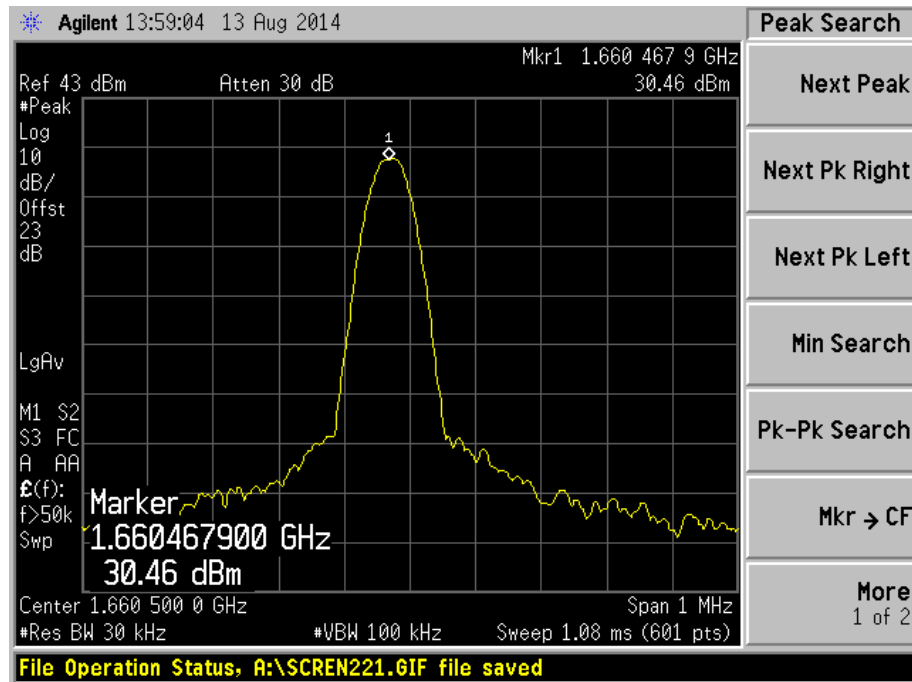
Plot 39 – Middle Channel (Peak)



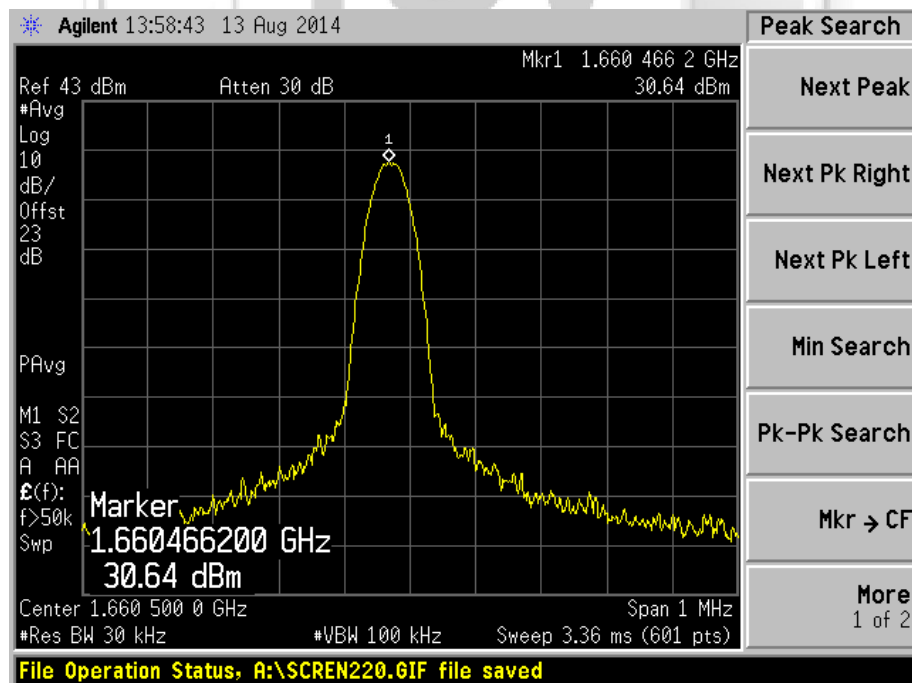
Plot 40 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PAB



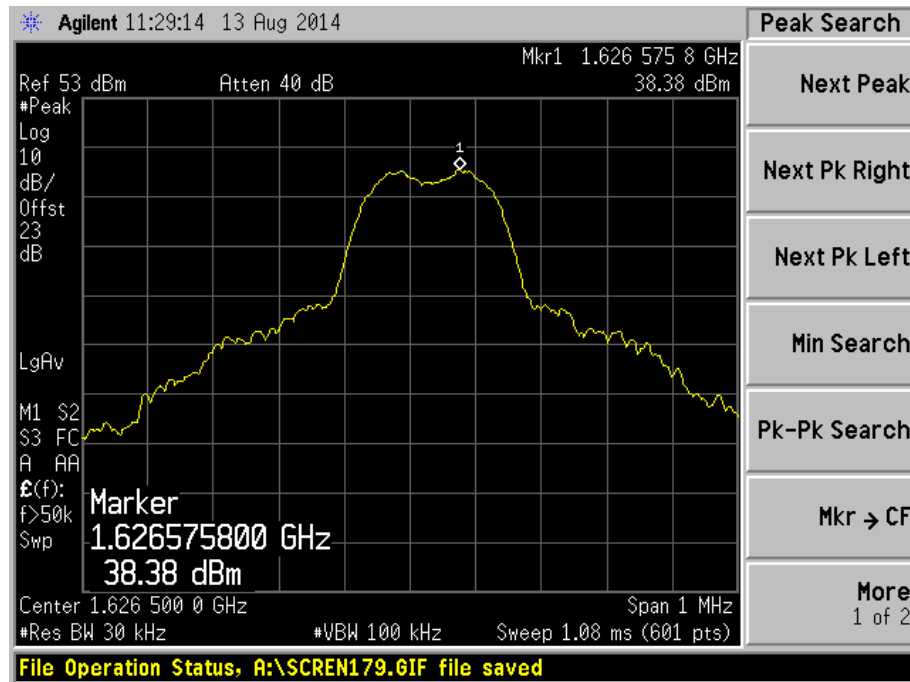
Plot 41 – Upper Channel (Peak)



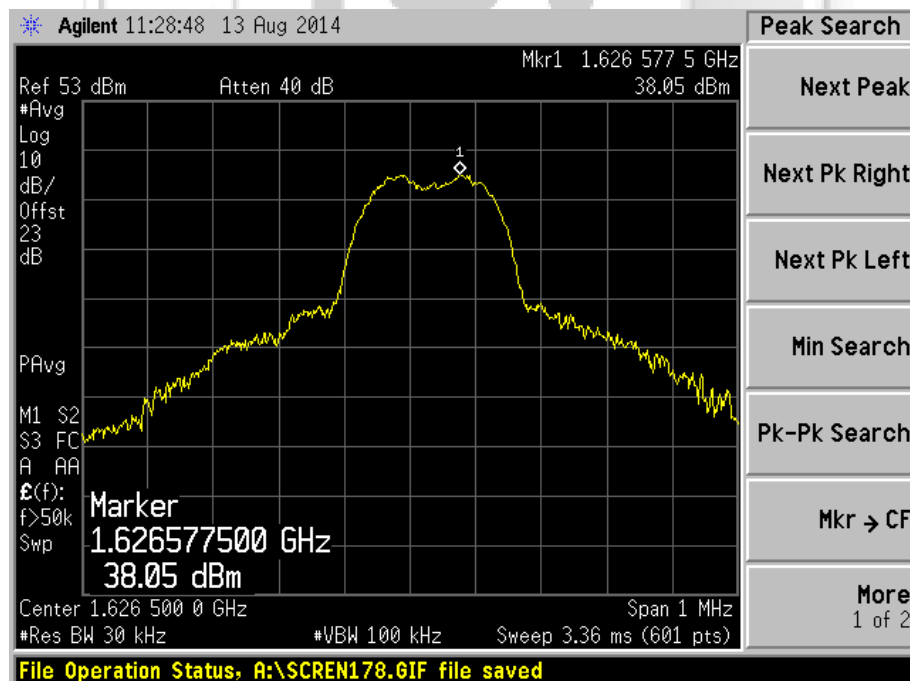
Plot 42 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_12\_QPSK



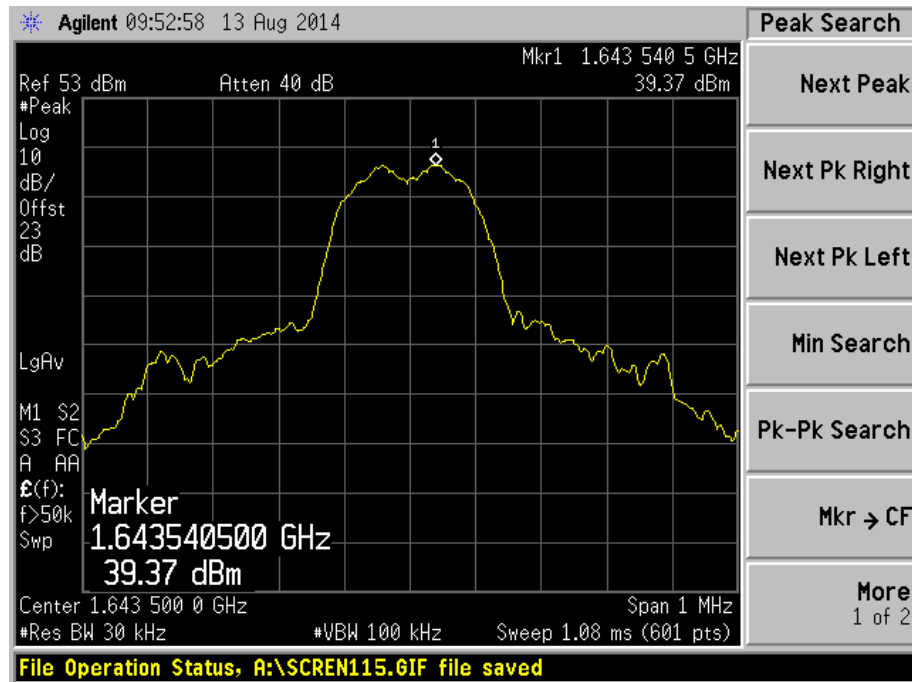
Plot 43 – Lower Channel (Peak)



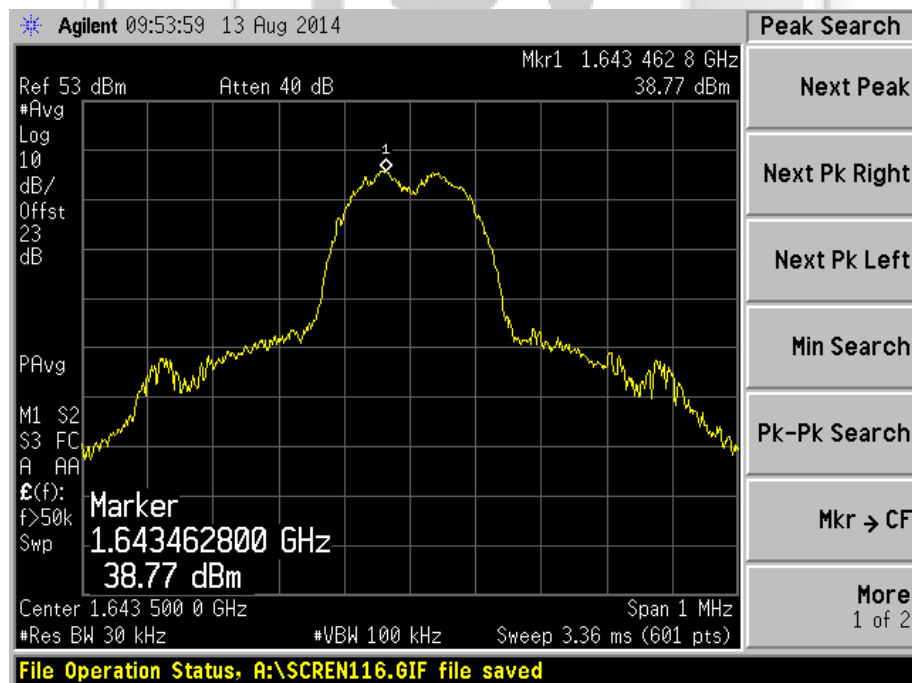
Plot 44 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_12\_QPSK



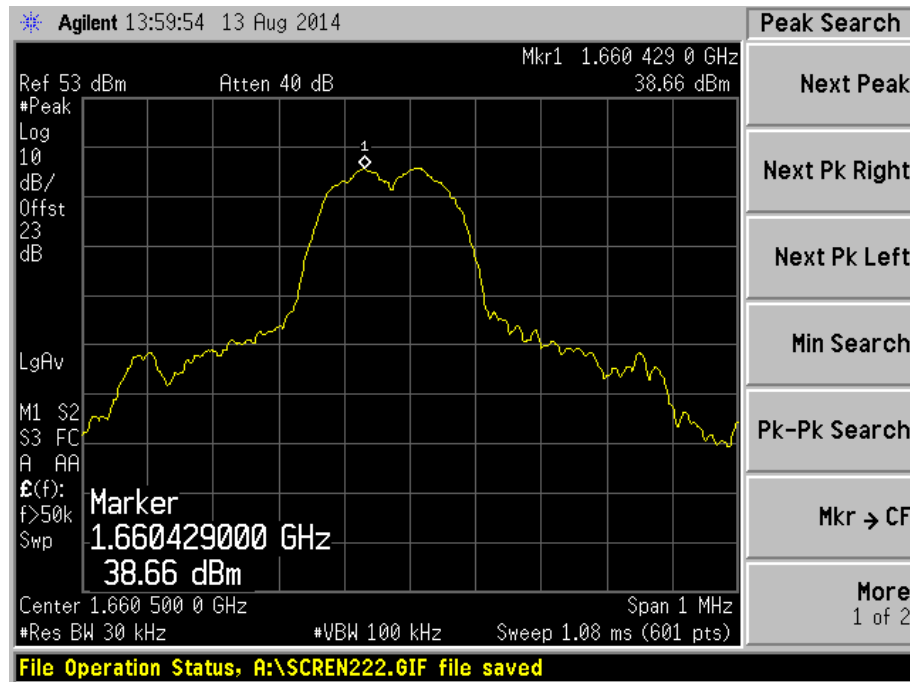
Plot 45 – Middle Channel (Peak)



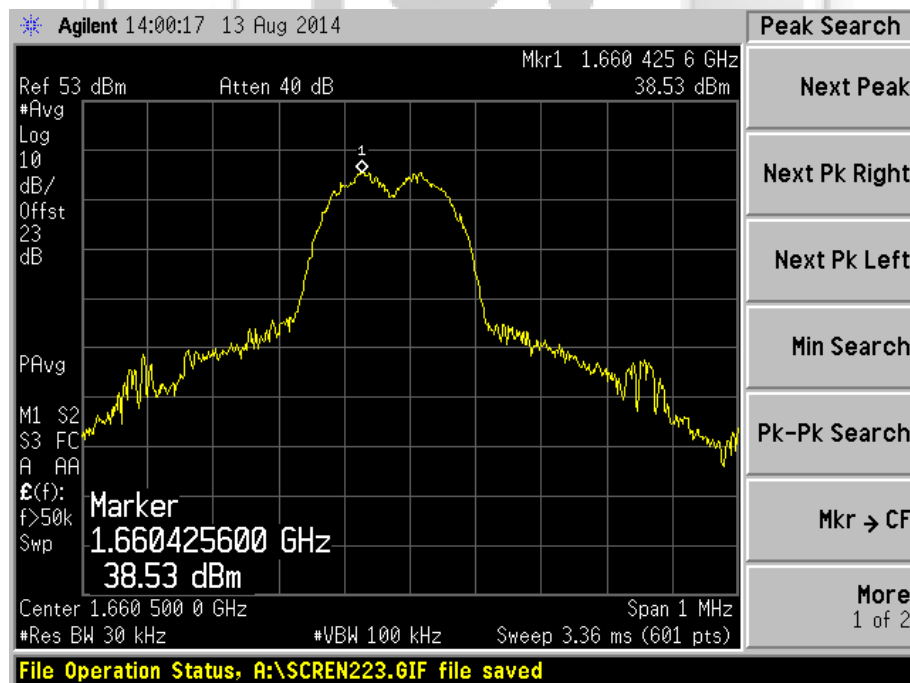
Plot 46 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_12\_QPSK



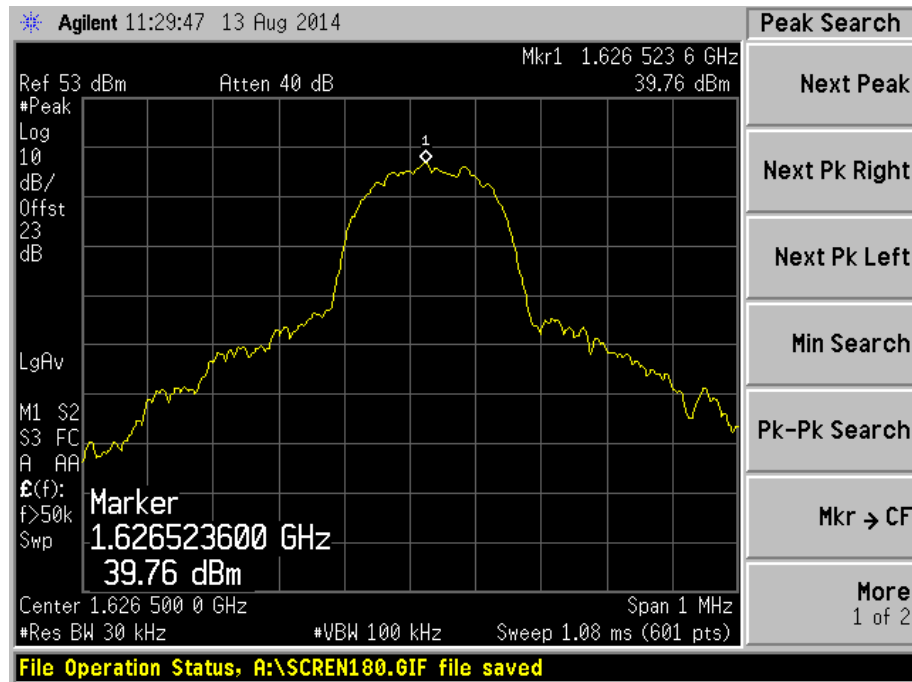
Plot 47 – Upper Channel (Peak)



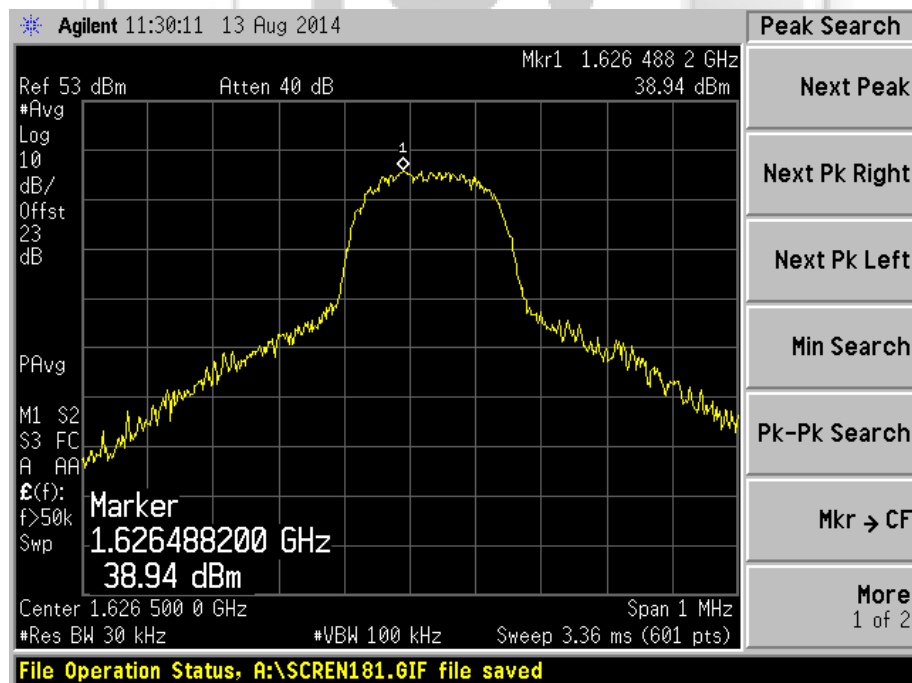
Plot 48 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_23\_16APSK



Plot 49 – Lower Channel (Peak)

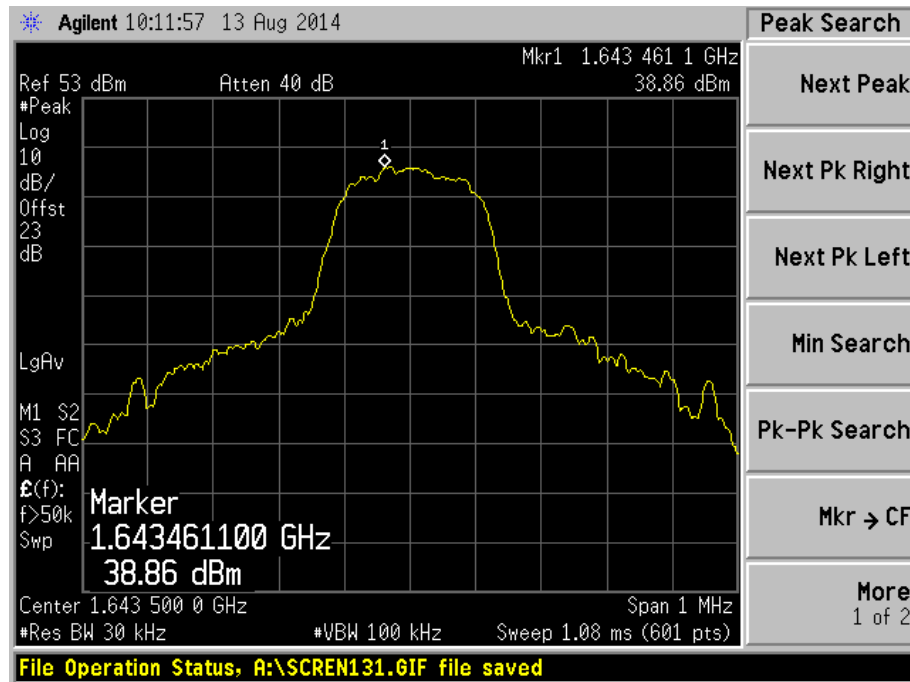


Plot 50 – Lower Channel (Average)

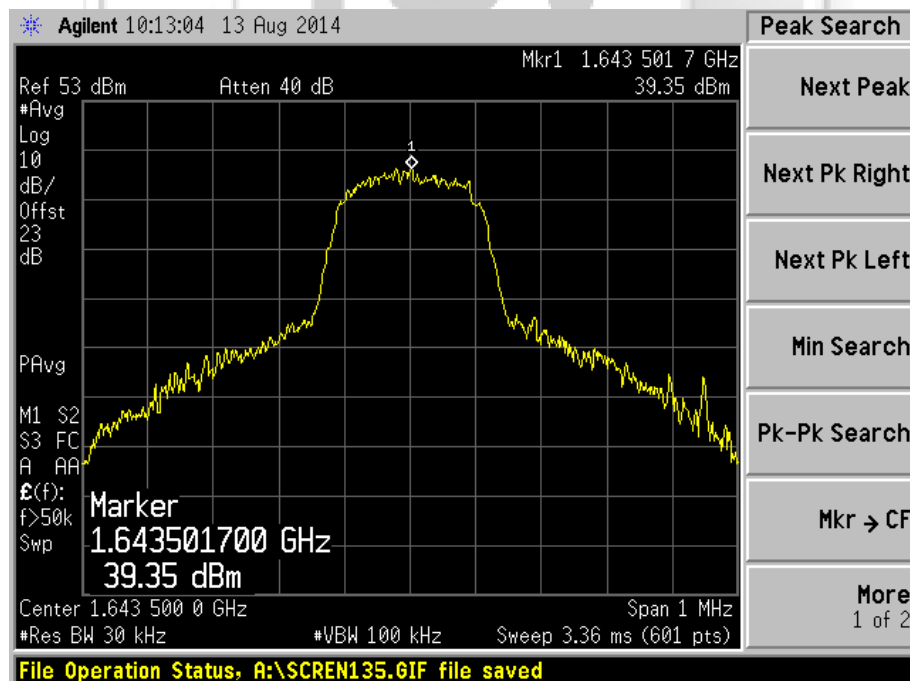


RF OUTPUT POWER TEST

Output Power Plots – PNB512\_23\_16APSK



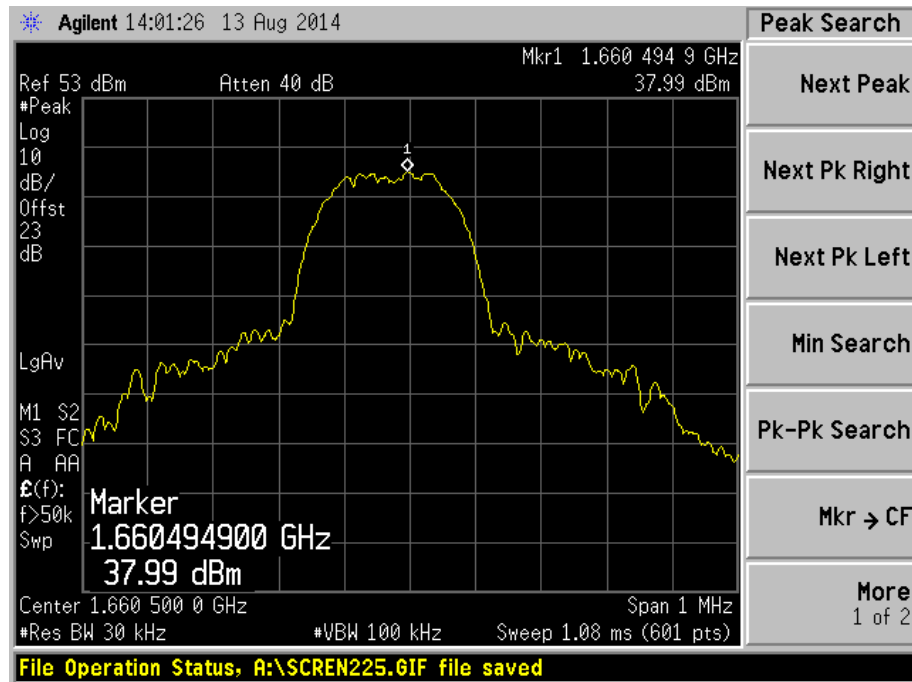
Plot 51 – Middle Channel (Peak)



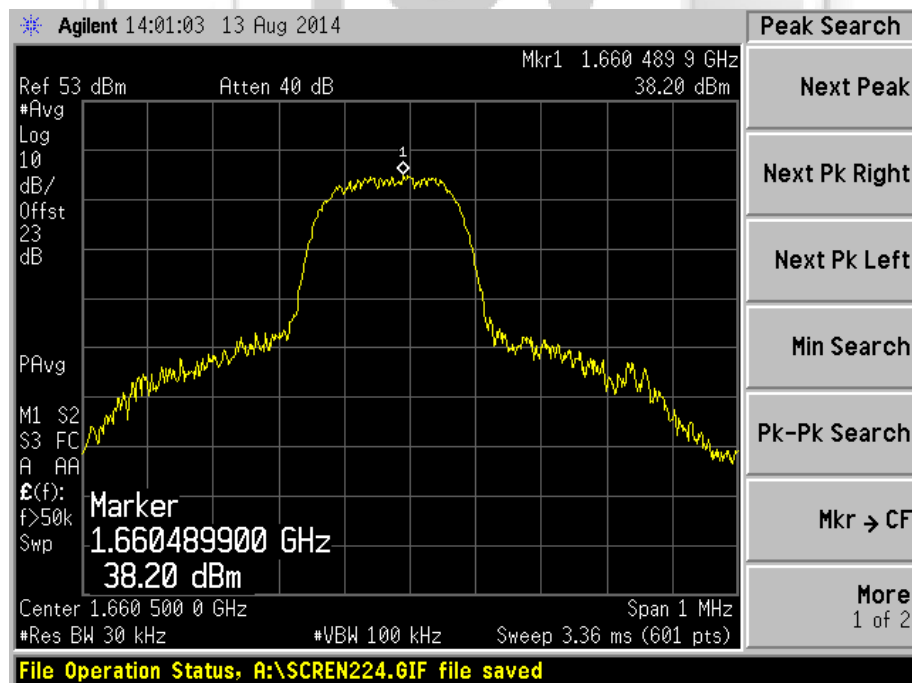
Plot 52 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_23\_16APSK



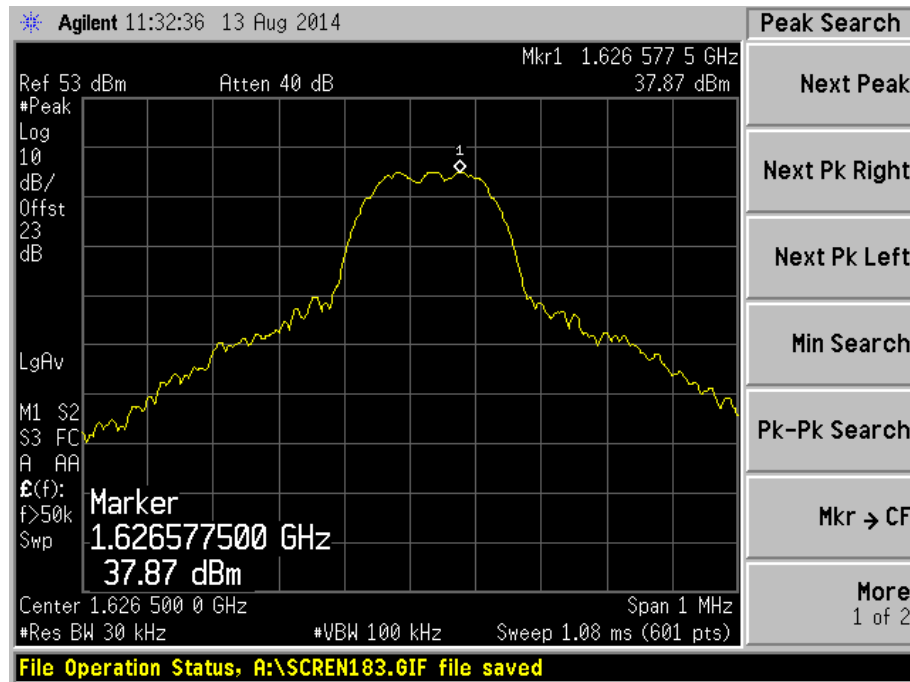
Plot 53 – Upper Channel (Peak)



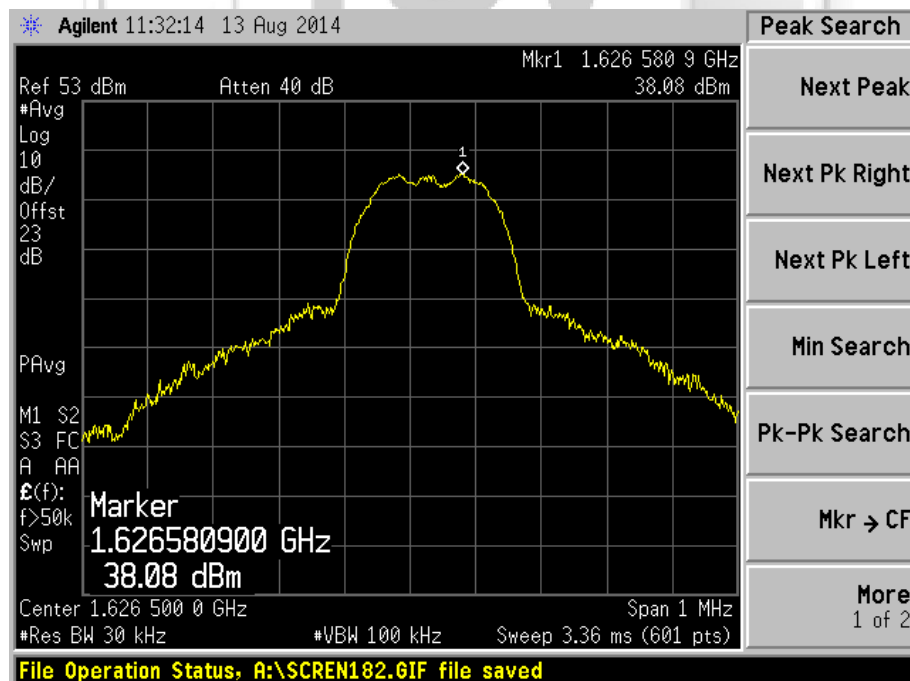
Plot 54 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_23\_QPSK



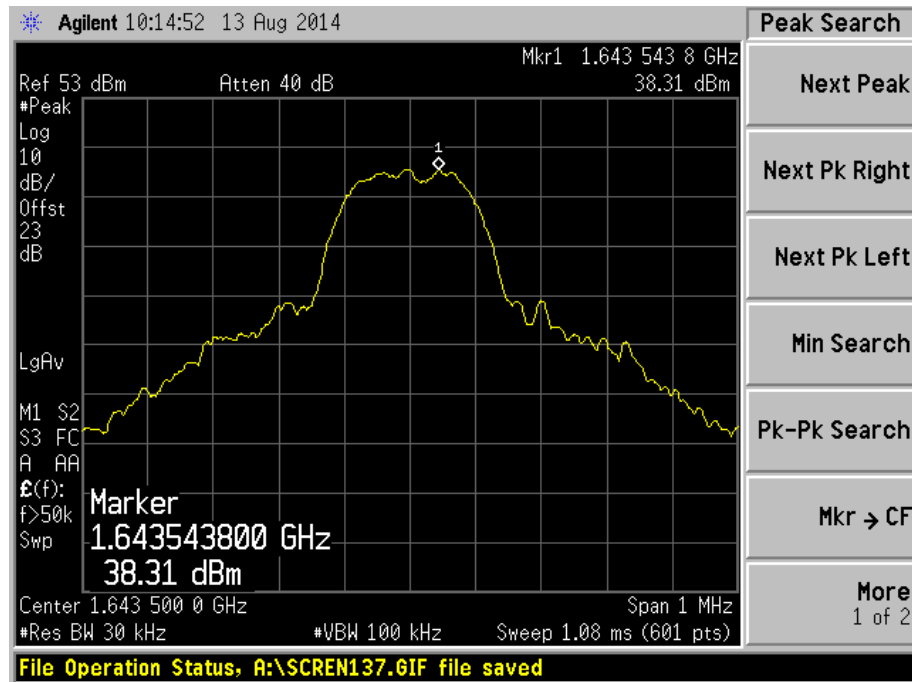
Plot 55 – Lower Channel (Peak)



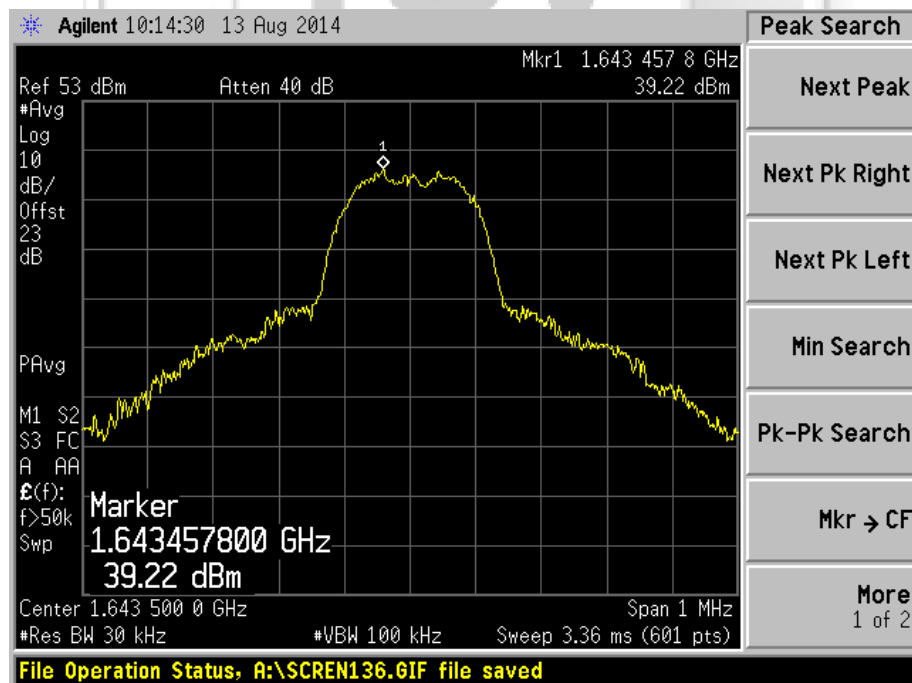
Plot 56 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_23\_QPSK



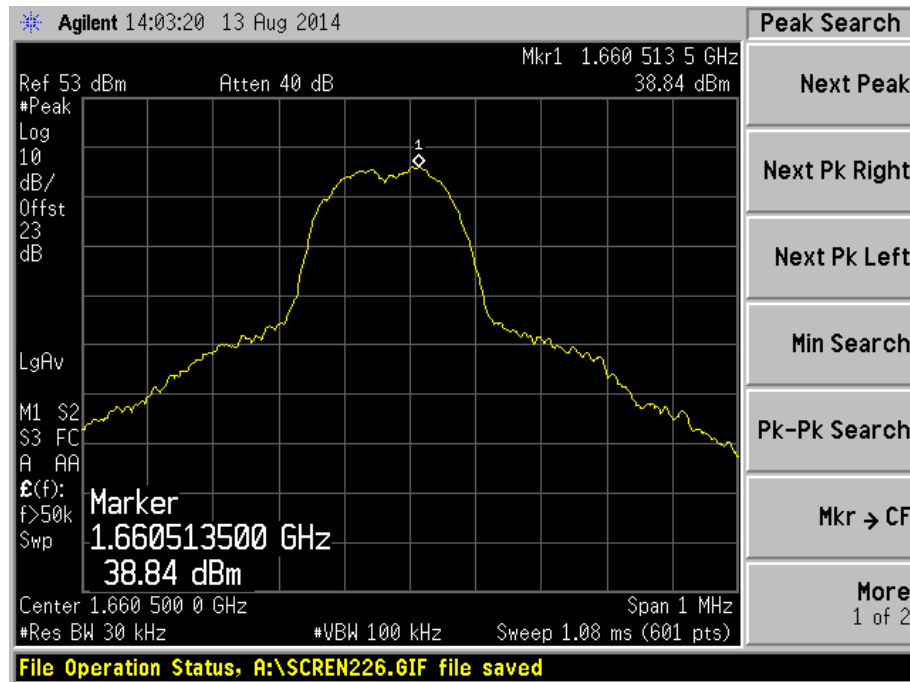
Plot 57 – Middle Channel (Peak)



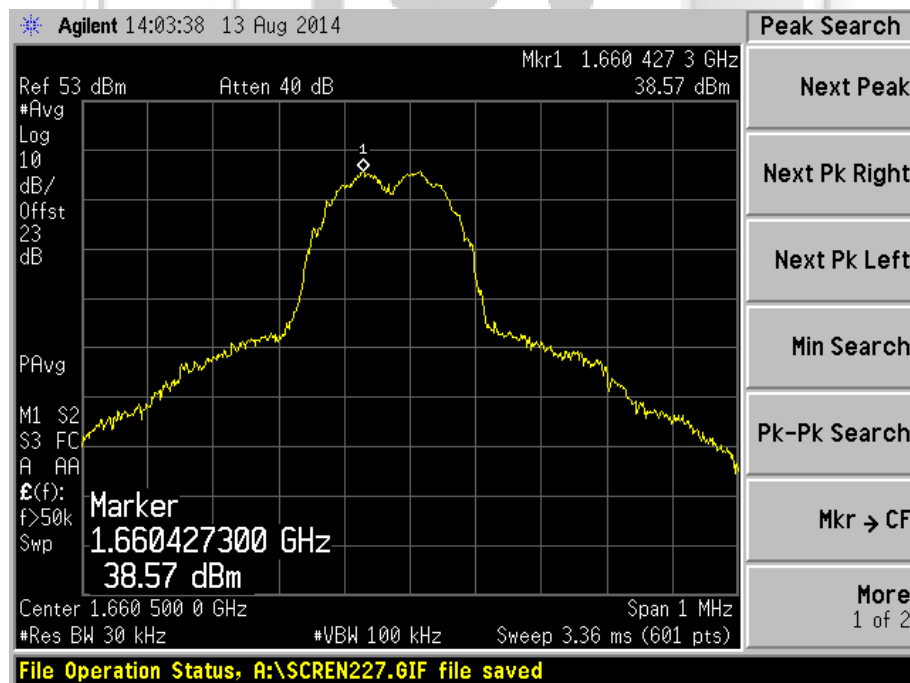
Plot 58 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_23\_QPSK



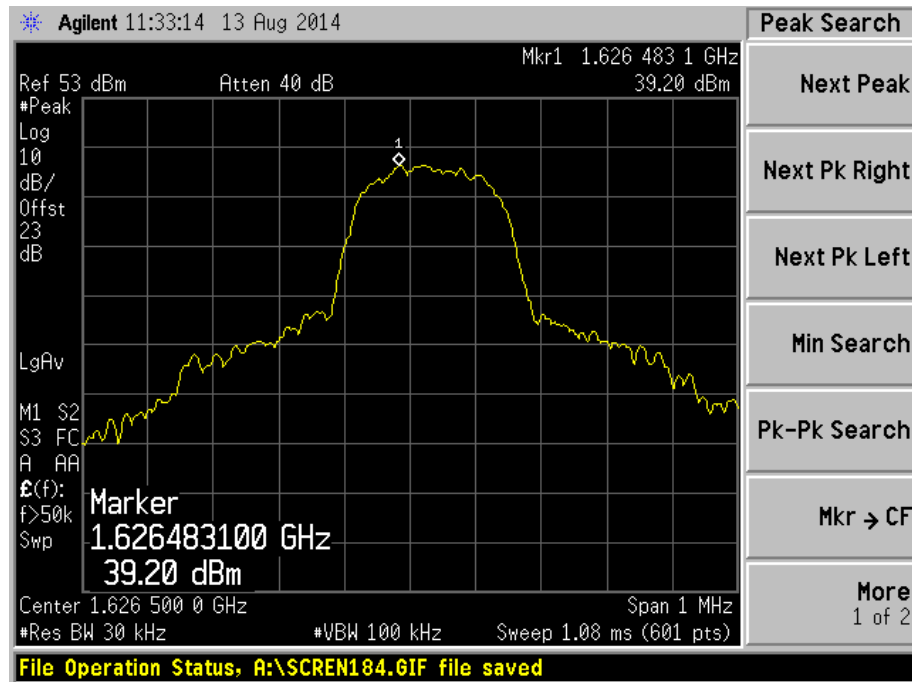
Plot 59 – Upper Channel (Peak)



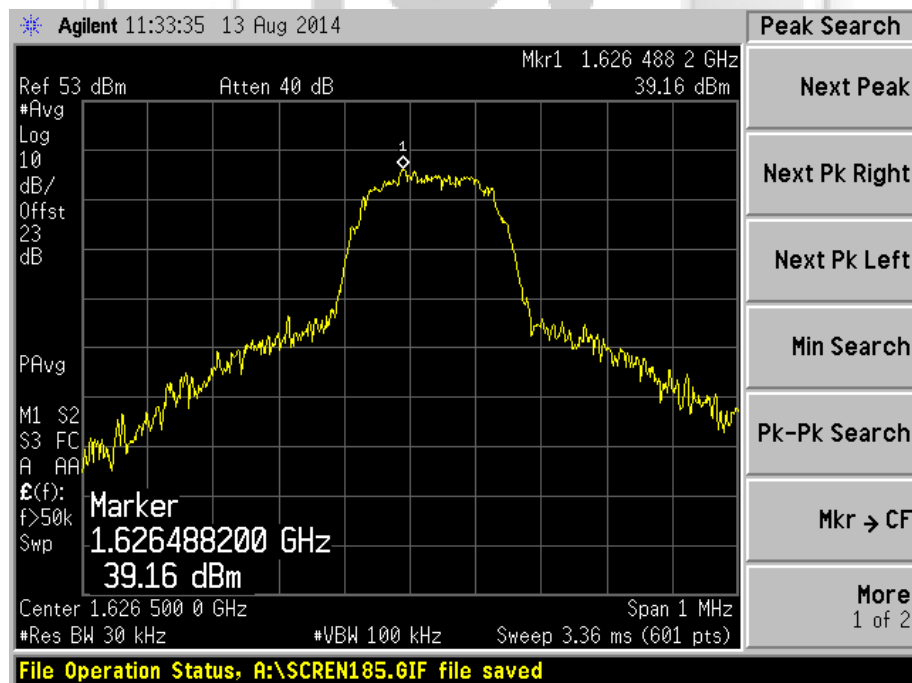
Plot 60 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_45\_16APSK



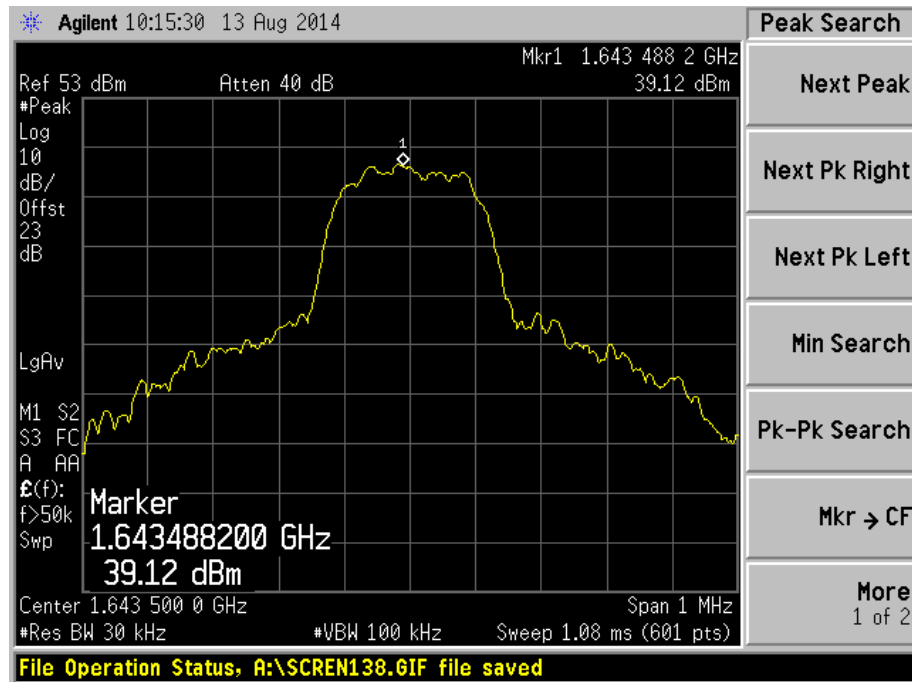
Plot 61 – Lower Channel (Peak)



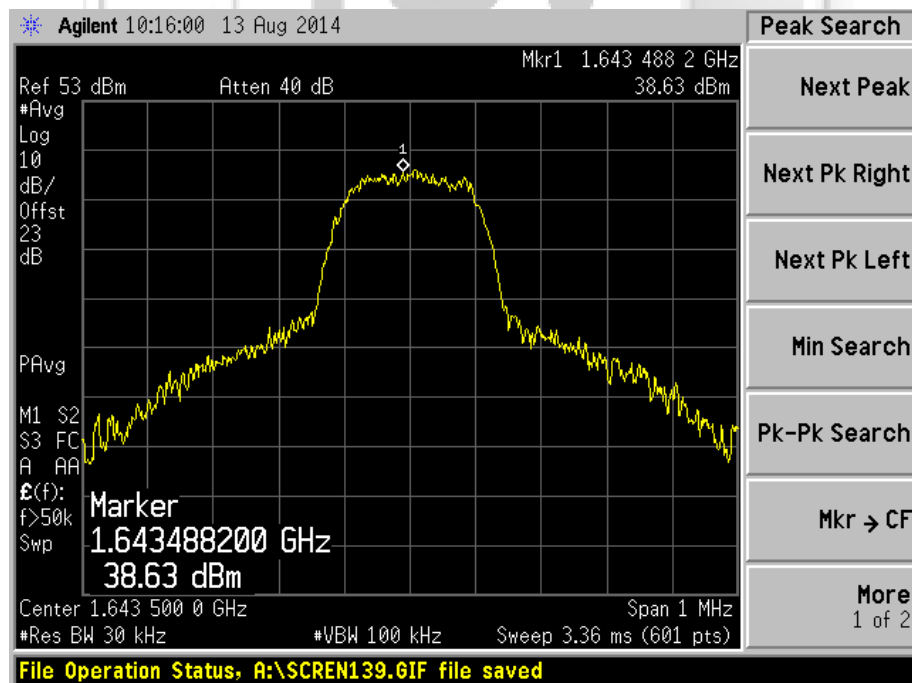
Plot 62 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_45\_16APSK



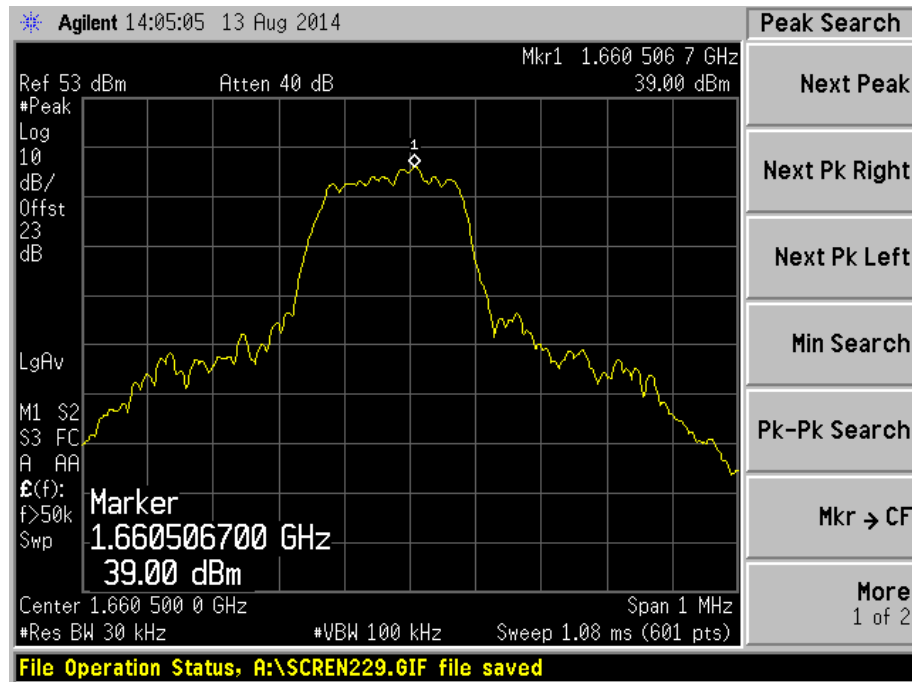
Plot 63 – Middle Channel (Peak)



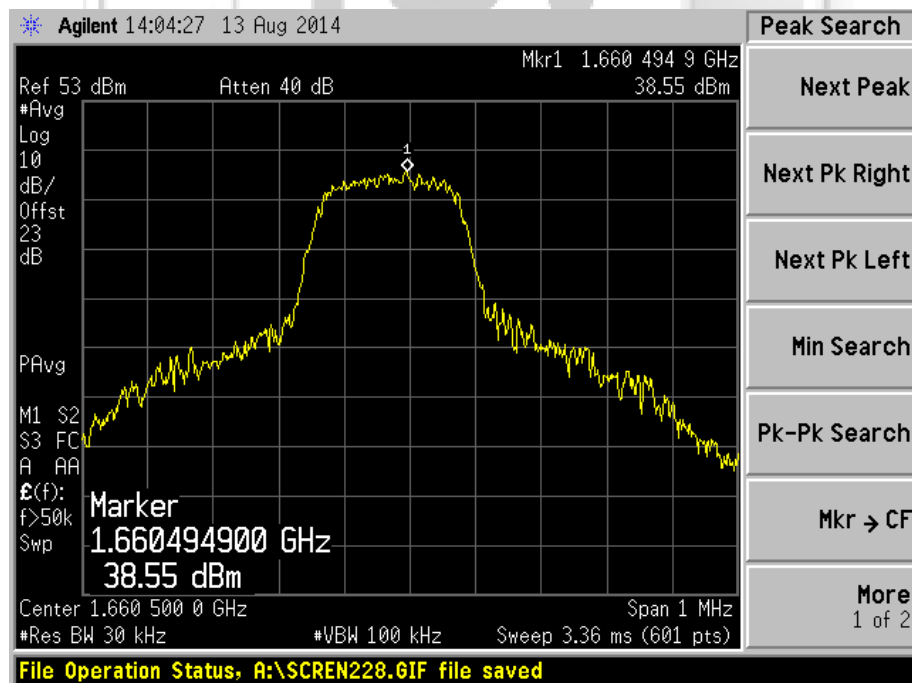
Plot 64 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_45\_16APSK



Plot 65 – Upper Channel (Peak)

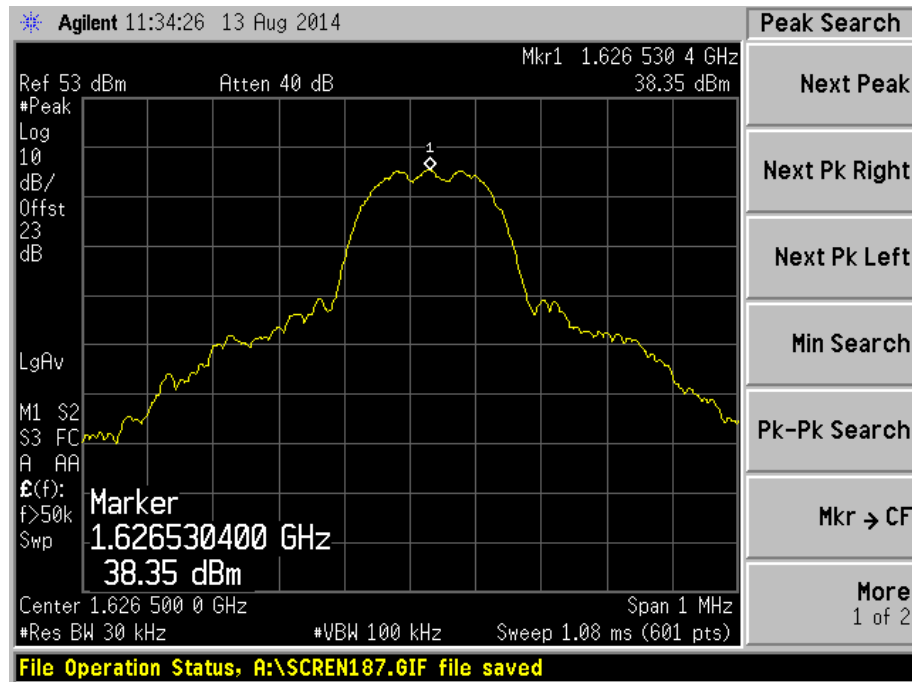


Plot 66 – Upper Channel (Average)

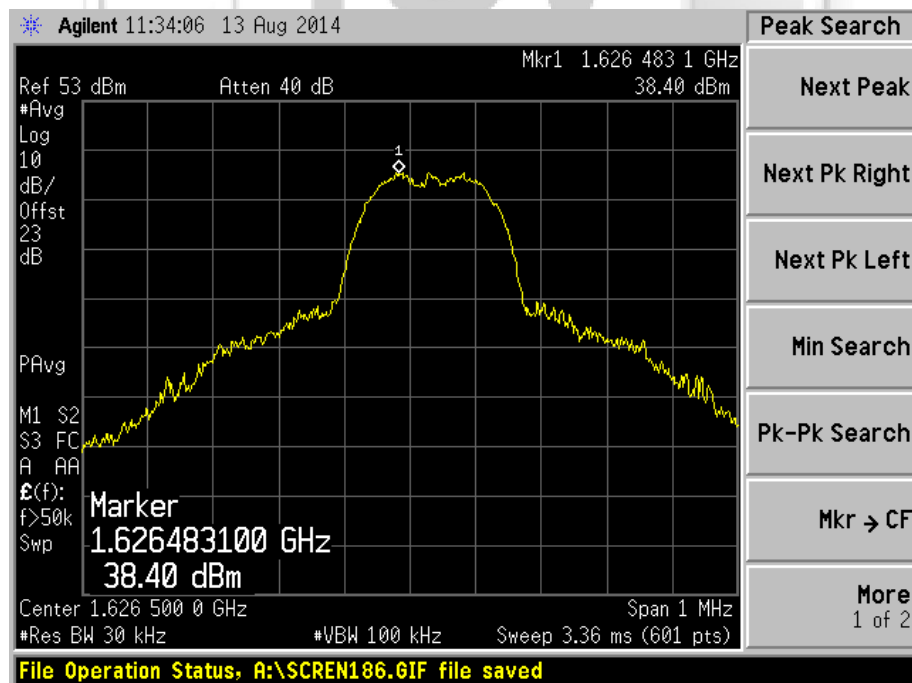


RF OUTPUT POWER TEST

Output Power Plots – PNB512\_45\_QPSK



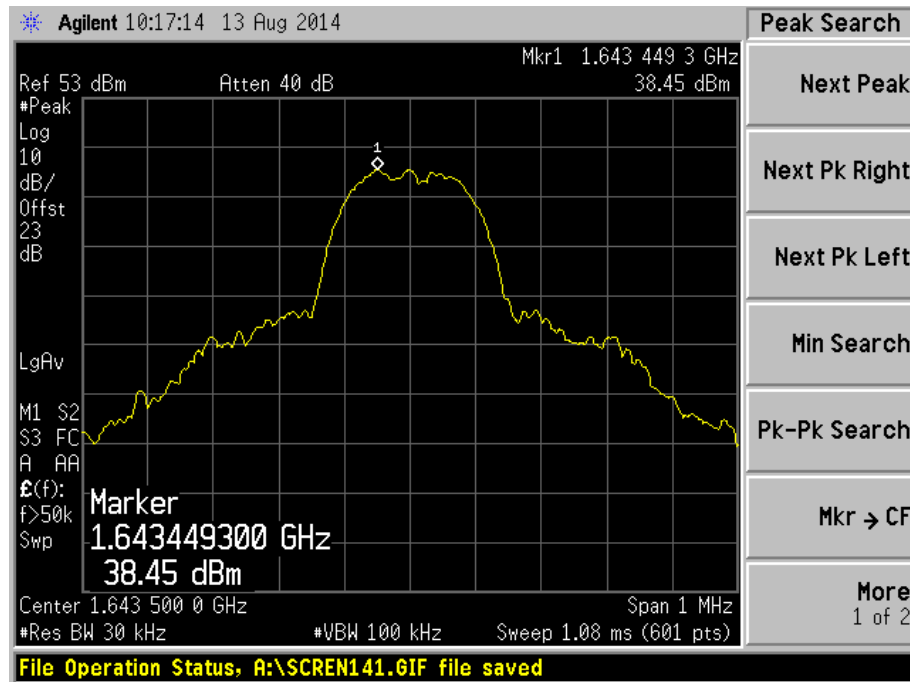
Plot 67 – Lower Channel (Peak)



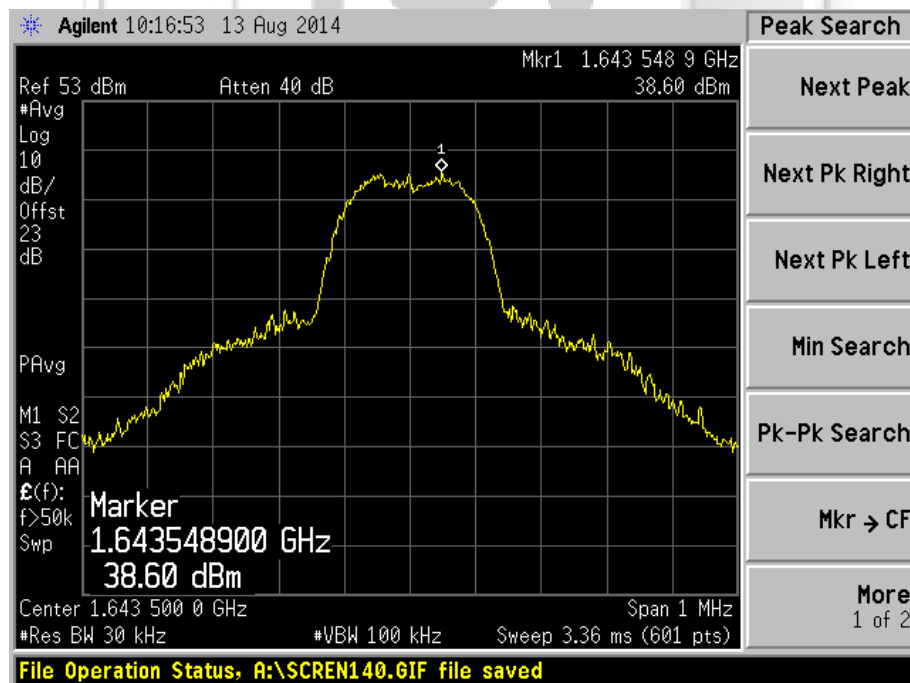
Plot 68 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_45\_QPSK



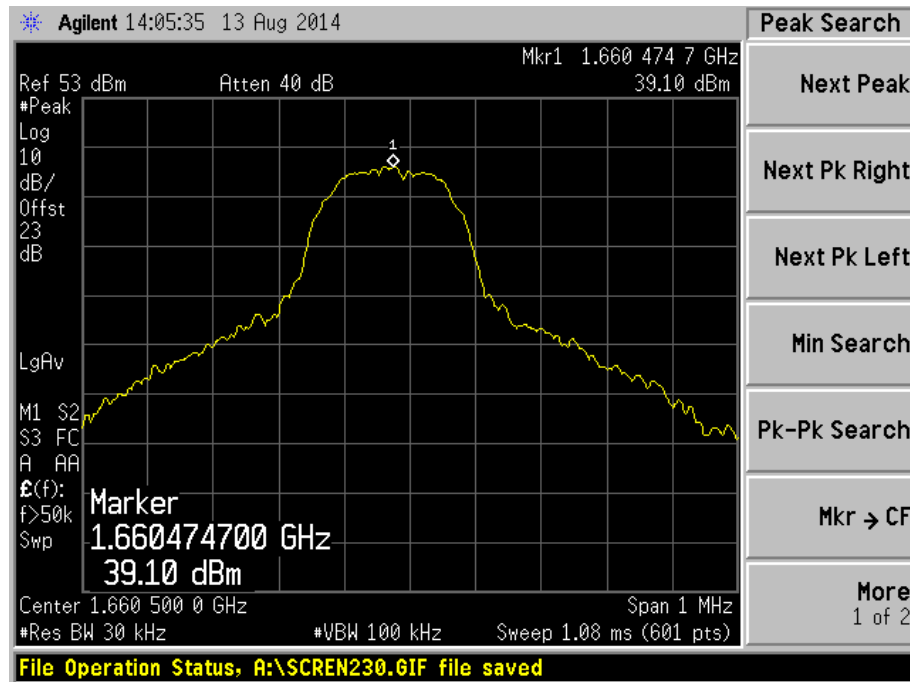
Plot 69 – Middle Channel (Peak)



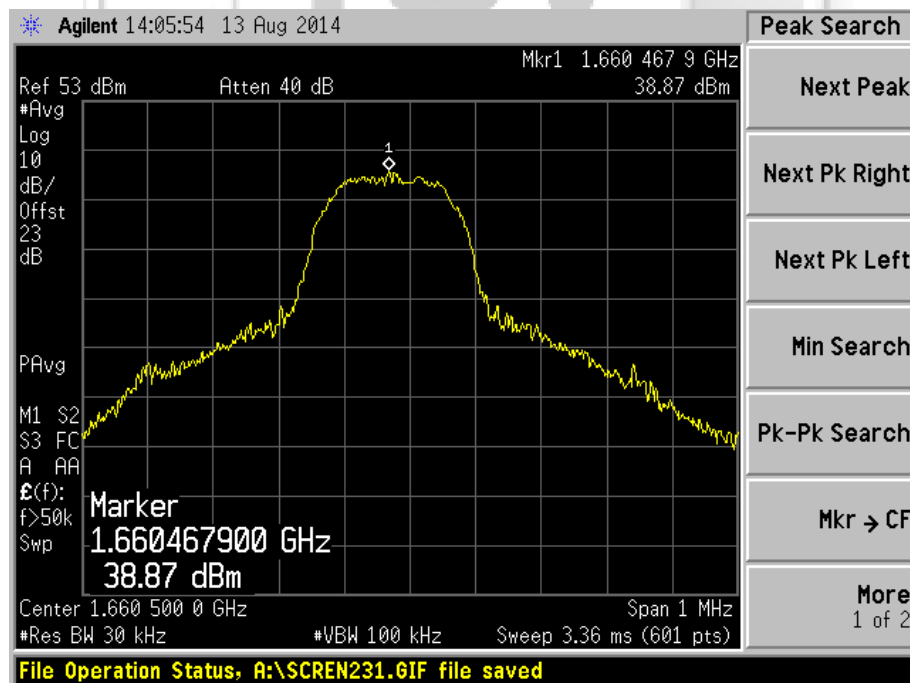
Plot 70 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_45\_QPSK



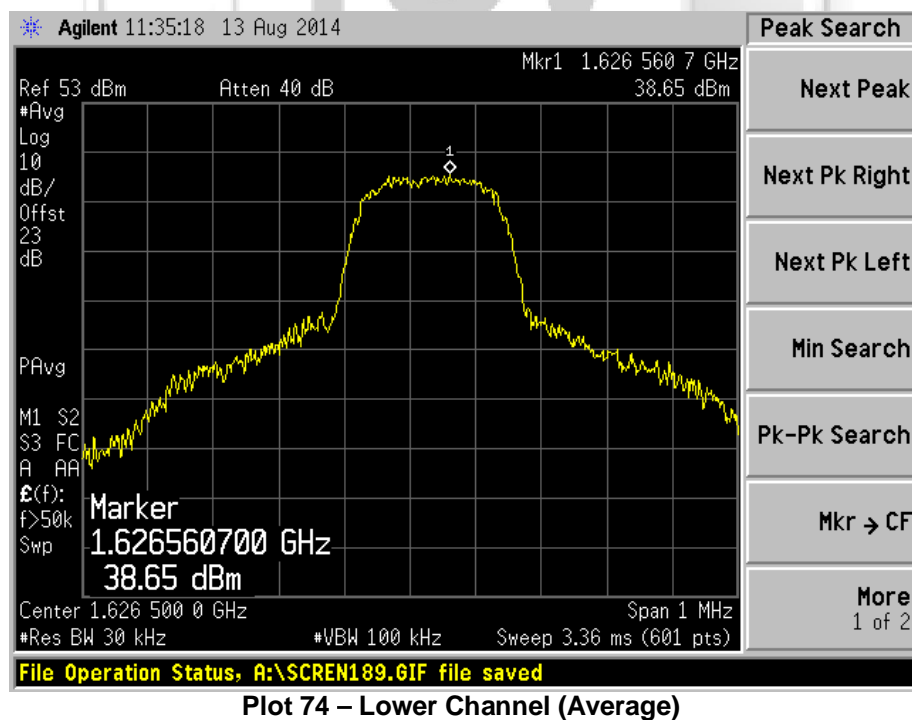
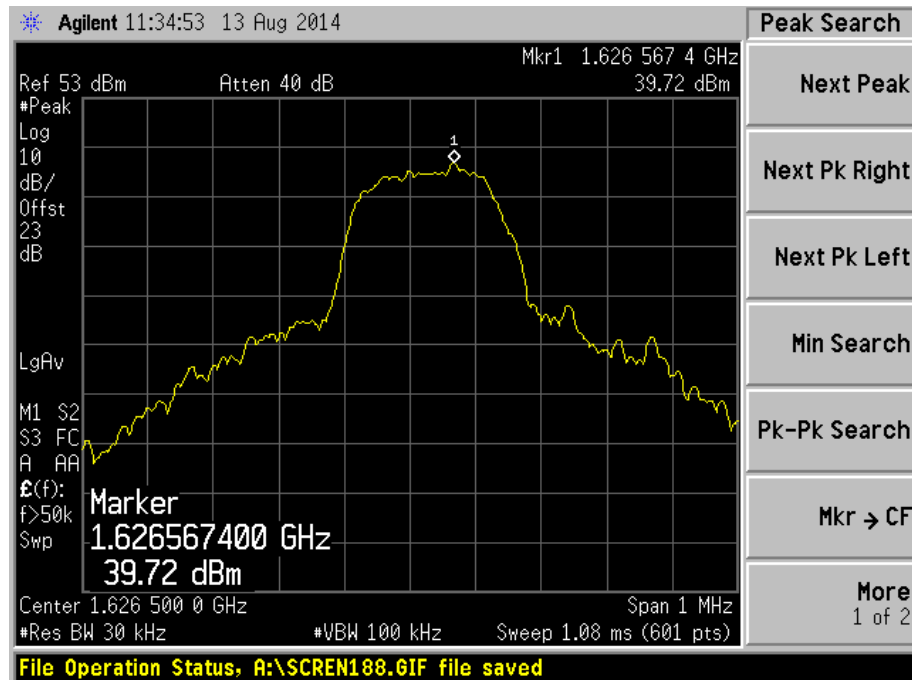
Plot 71 – Upper Channel (Peak)



Plot 72 – Upper Channel (Average)

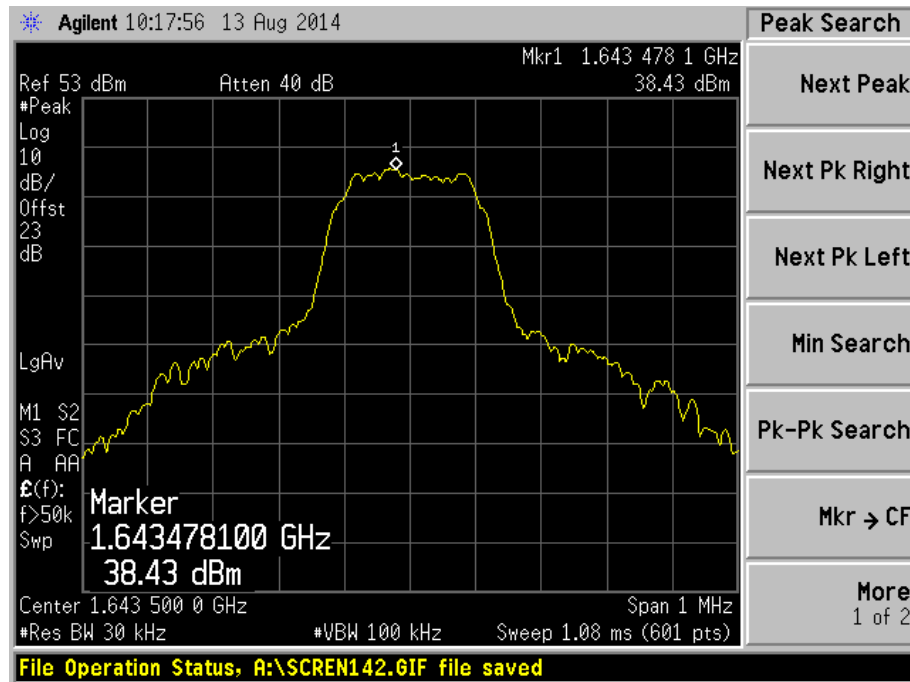
RF OUTPUT POWER TEST

Output Power Plots – PNB512\_910\_16APSK

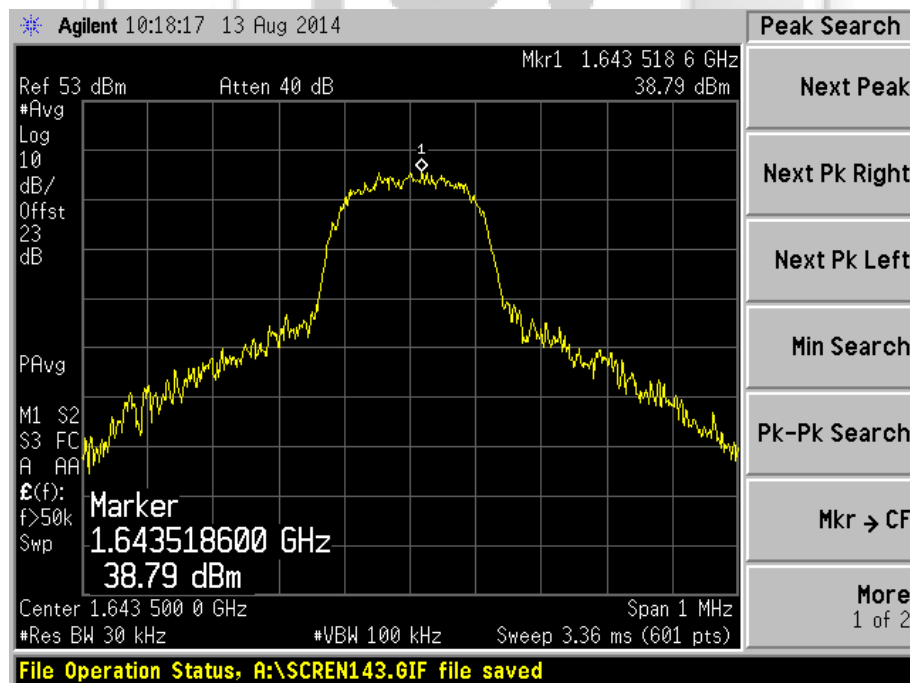


RF OUTPUT POWER TEST

Output Power Plots – PNB512\_910\_16APSK



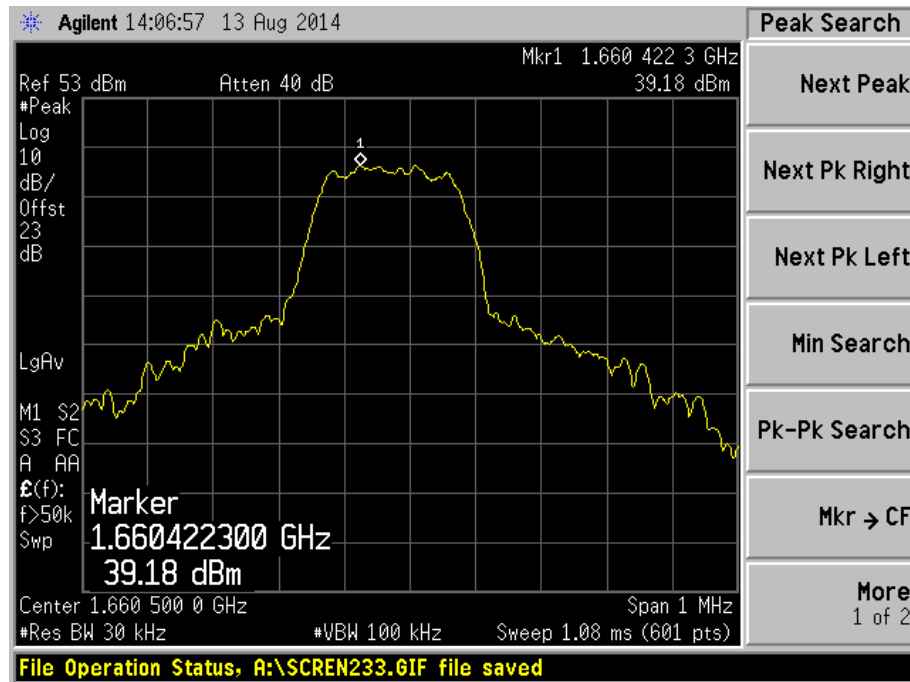
Plot 75 – Middle Channel (Peak)



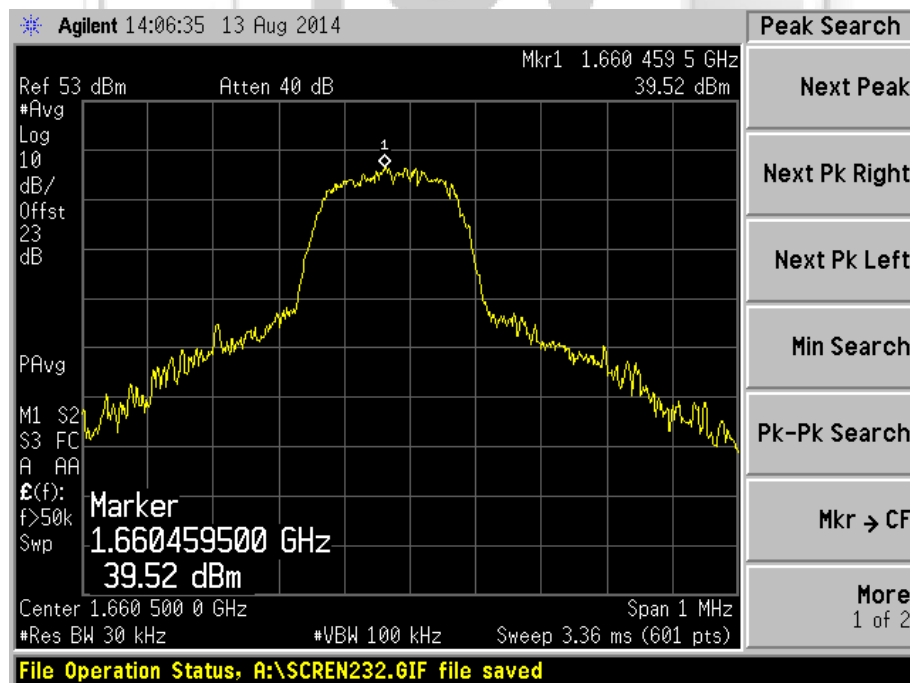
Plot 76 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_910\_16APSK



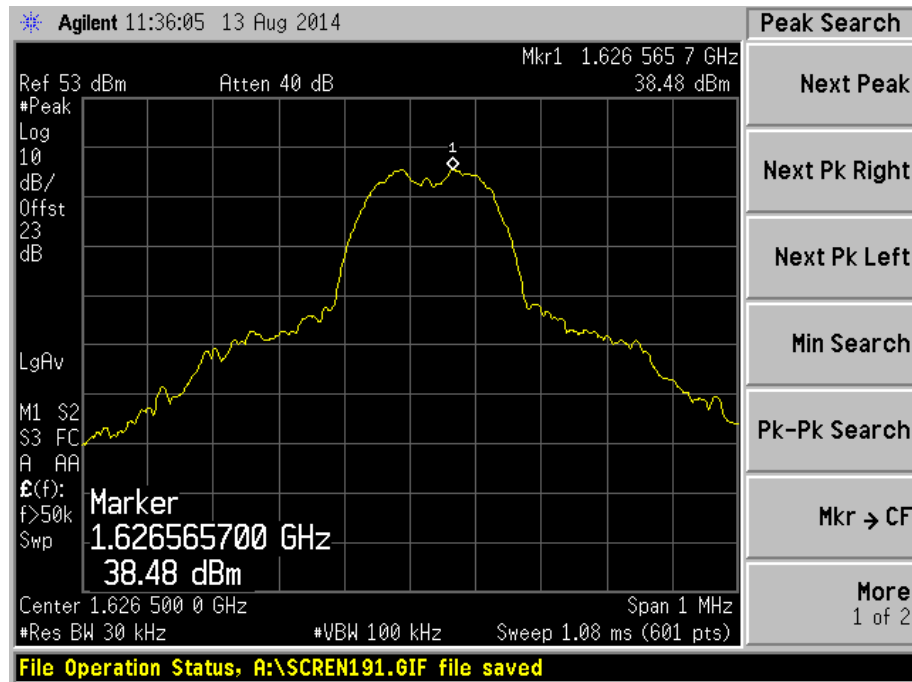
Plot 77 – Upper Channel (Peak)



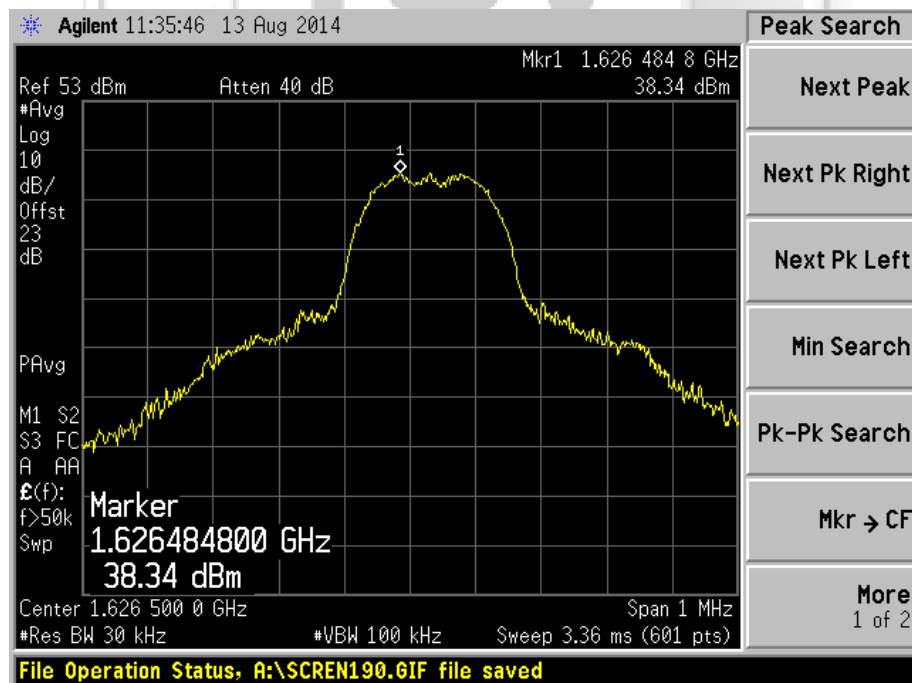
Plot 78 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_910\_QPSK



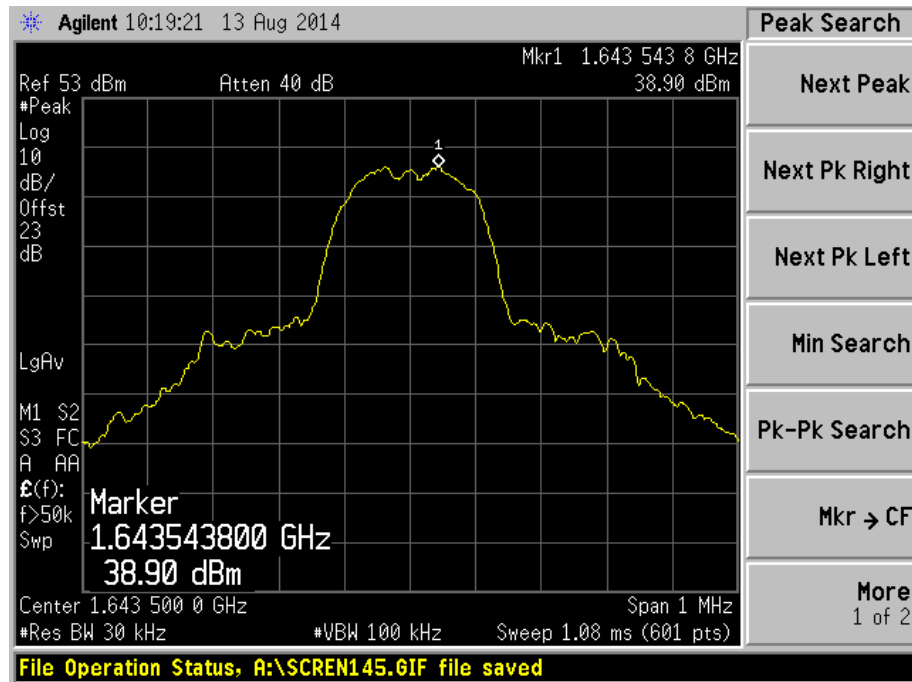
Plot 79 – Lower Channel (Peak)



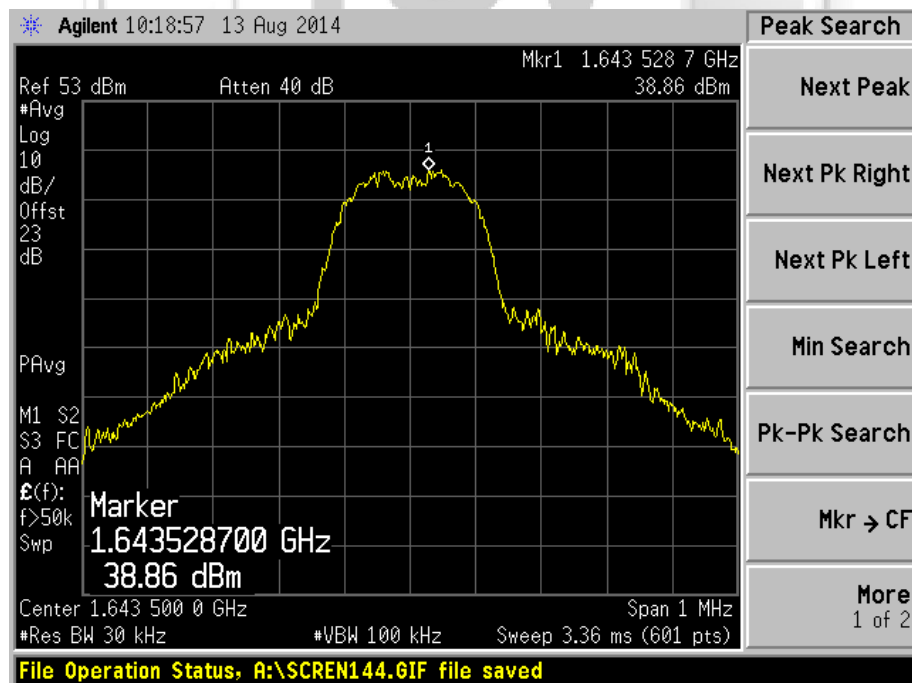
Plot 80 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB512\_910\_QPSK



Plot 81 – Middle Channel (Peak)

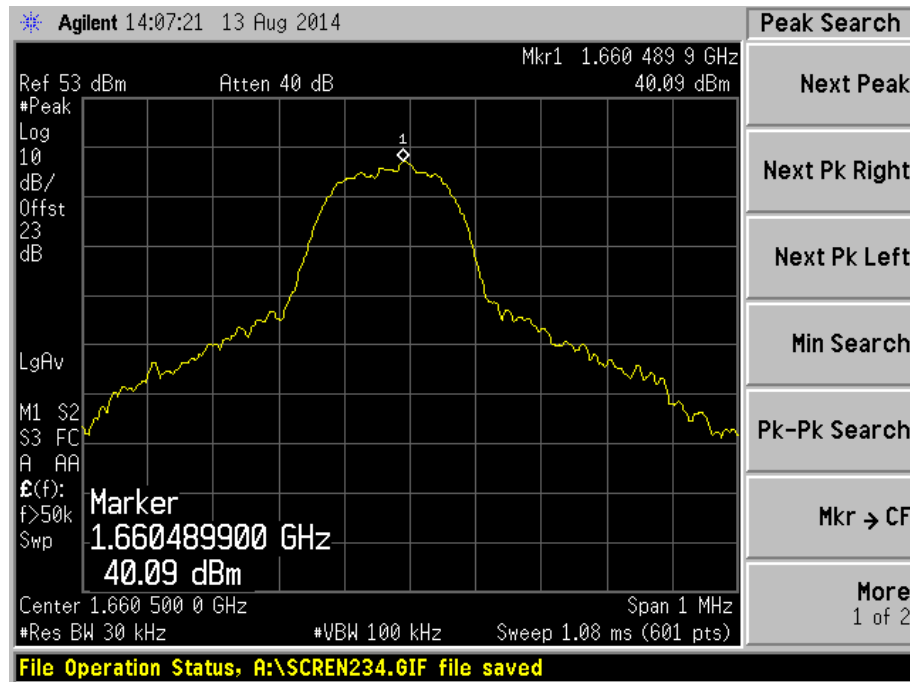


Plot 82 – Middle Channel (Average)

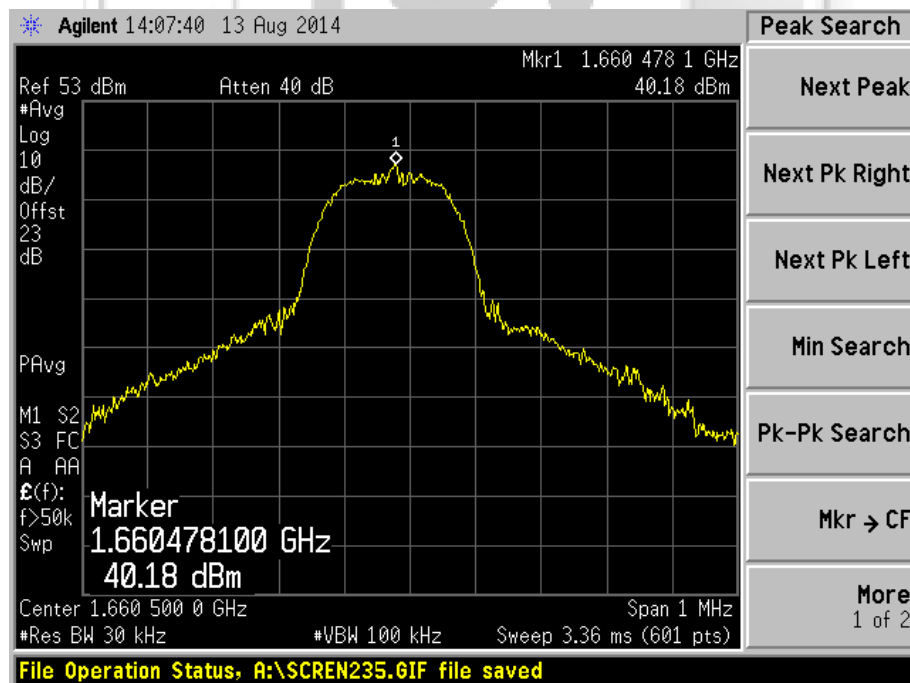


RF OUTPUT POWER TEST

Output Power Plots – PNB512\_910\_QPSK



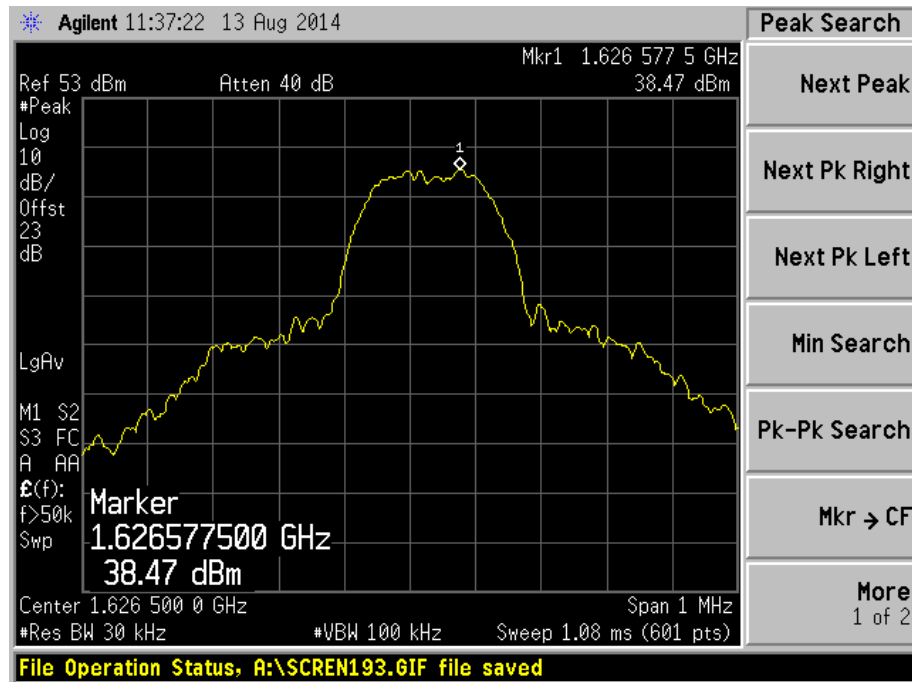
Plot 83 – Upper Channel (Peak)



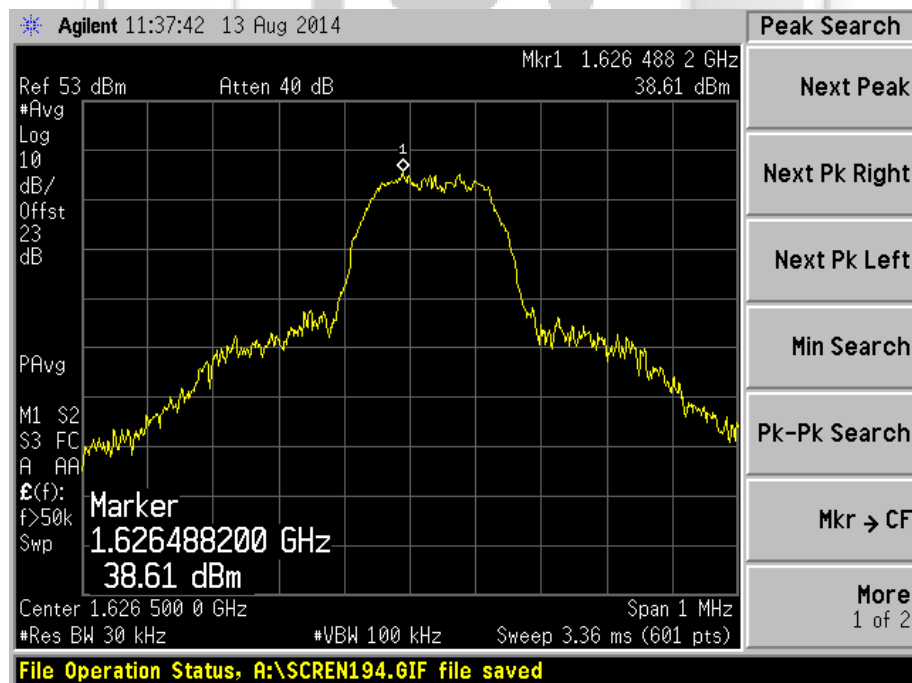
Plot 84 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_12\_QPSK



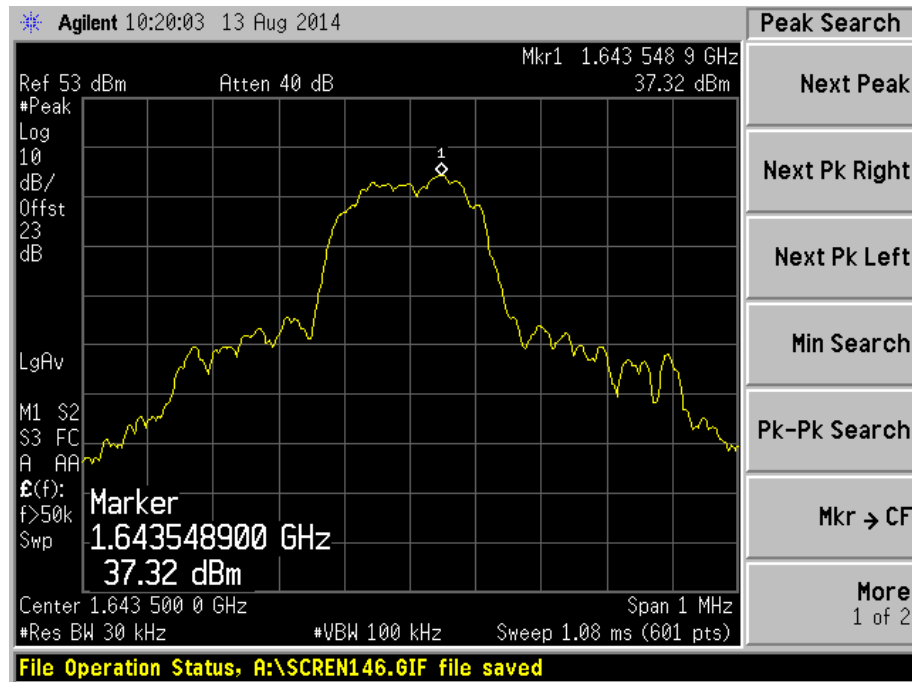
Plot 85 – Lower Channel (Peak)



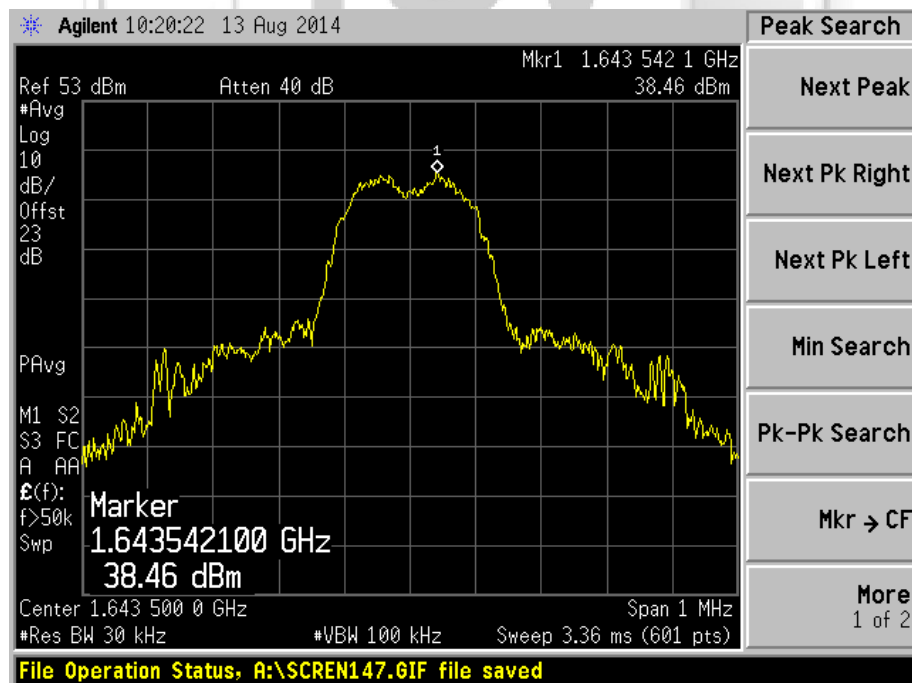
Plot 86 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_12\_QPSK



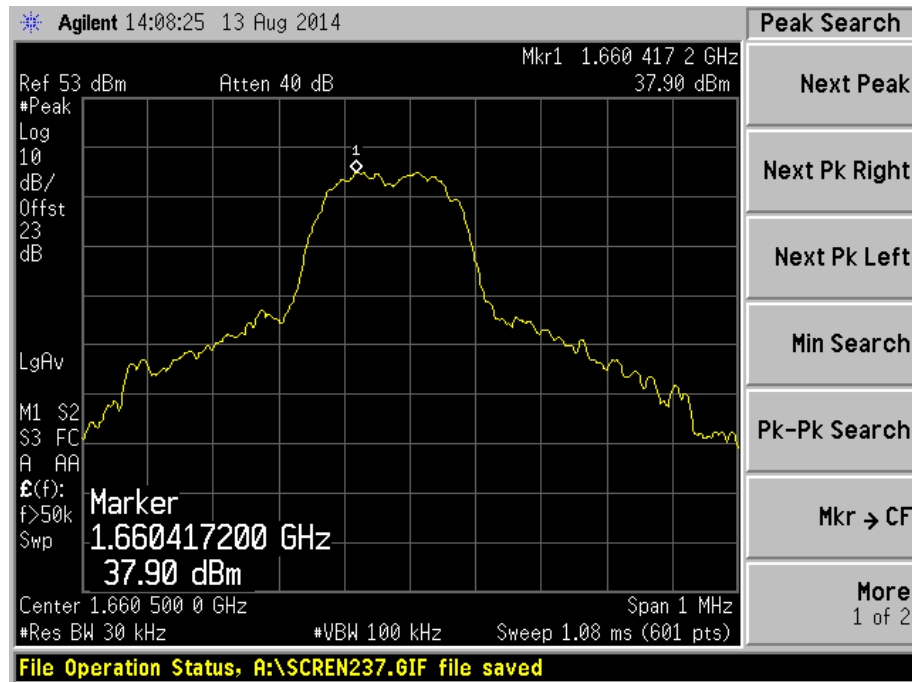
Plot 87 – Middle Channel (Peak)



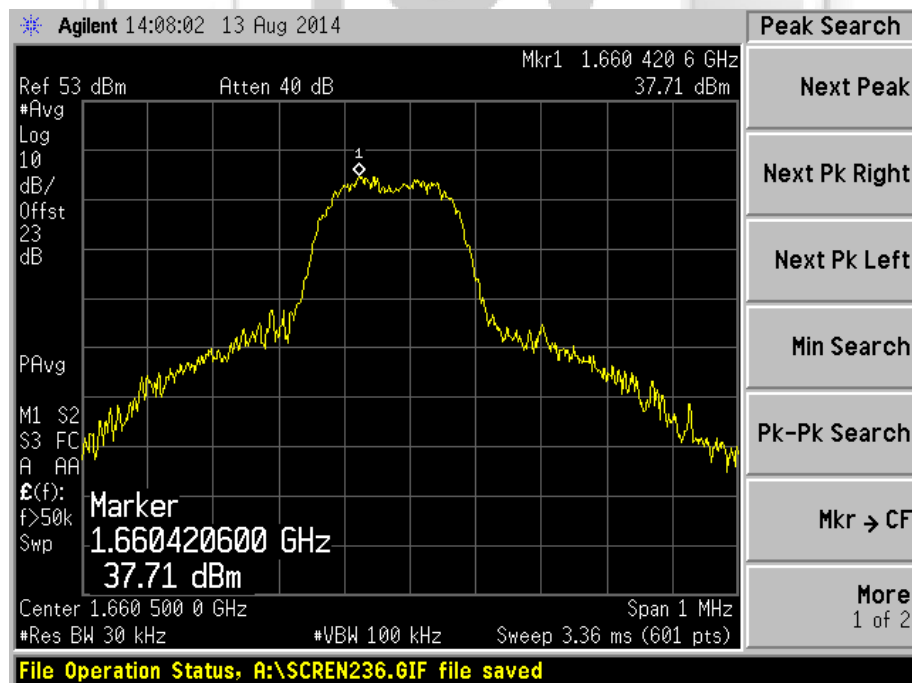
Plot 88 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_12\_QPSK



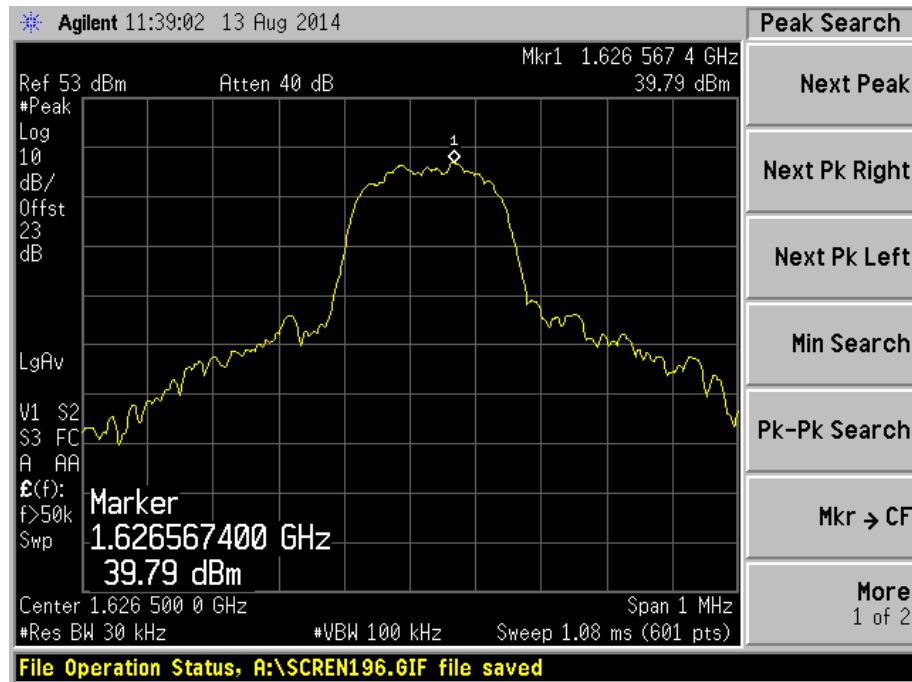
Plot 89 – Upper Channel (Peak)



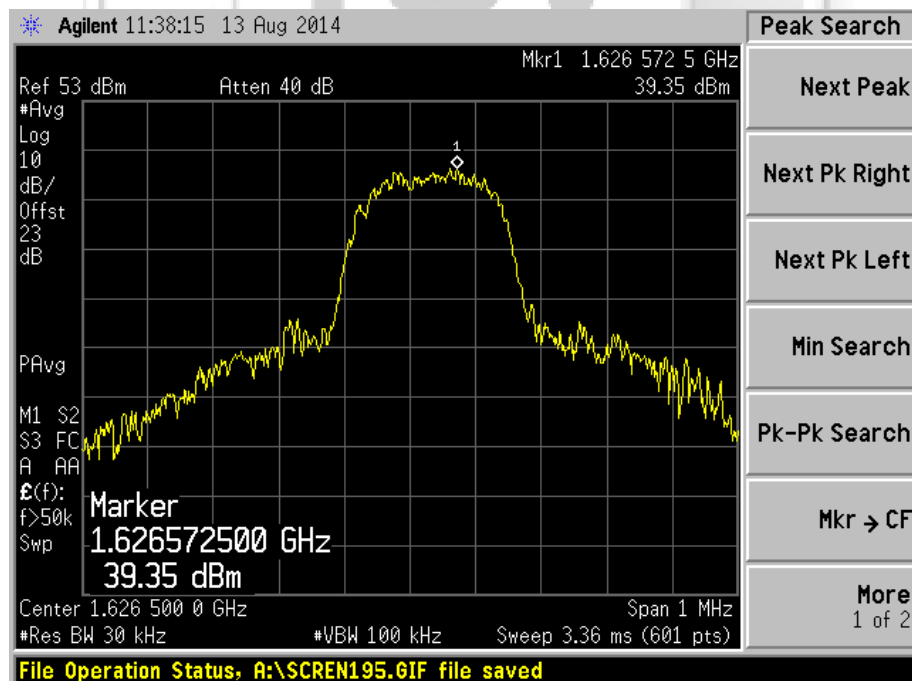
Plot 90 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_23\_16APSK



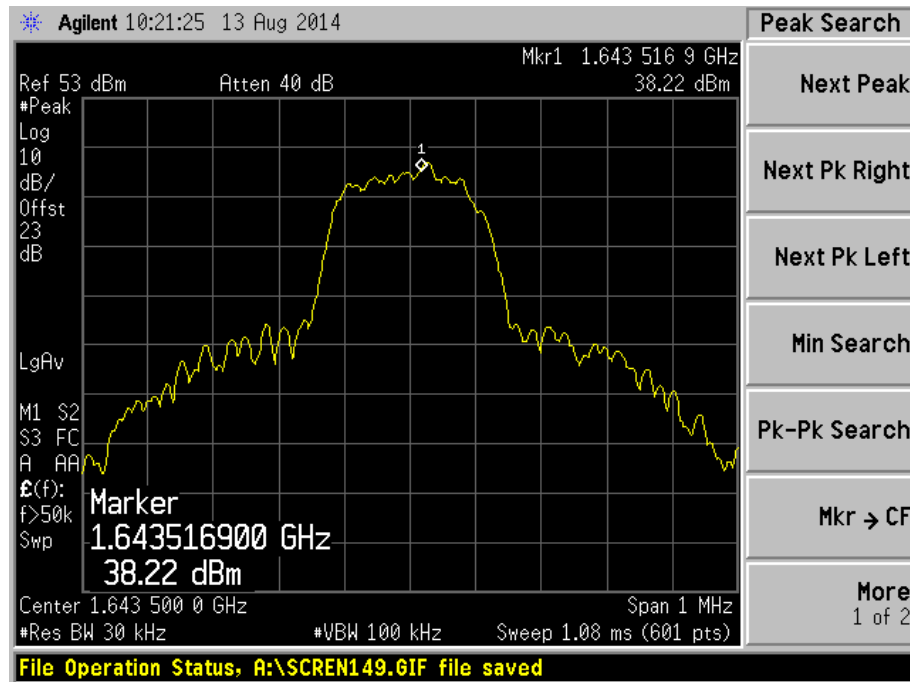
Plot 91 – Lower Channel (Peak)



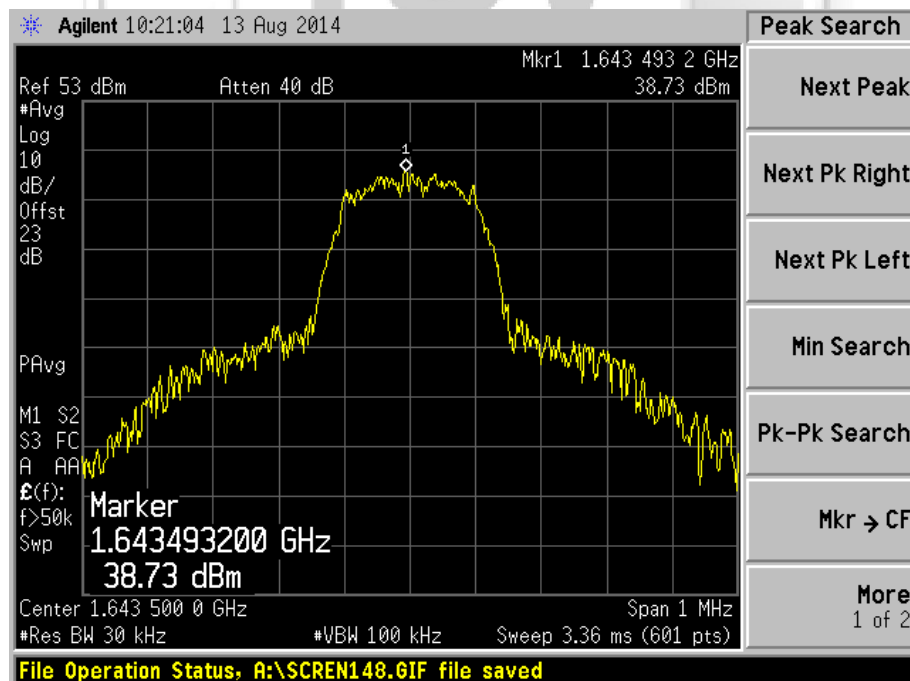
Plot 92 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_23\_16APSK



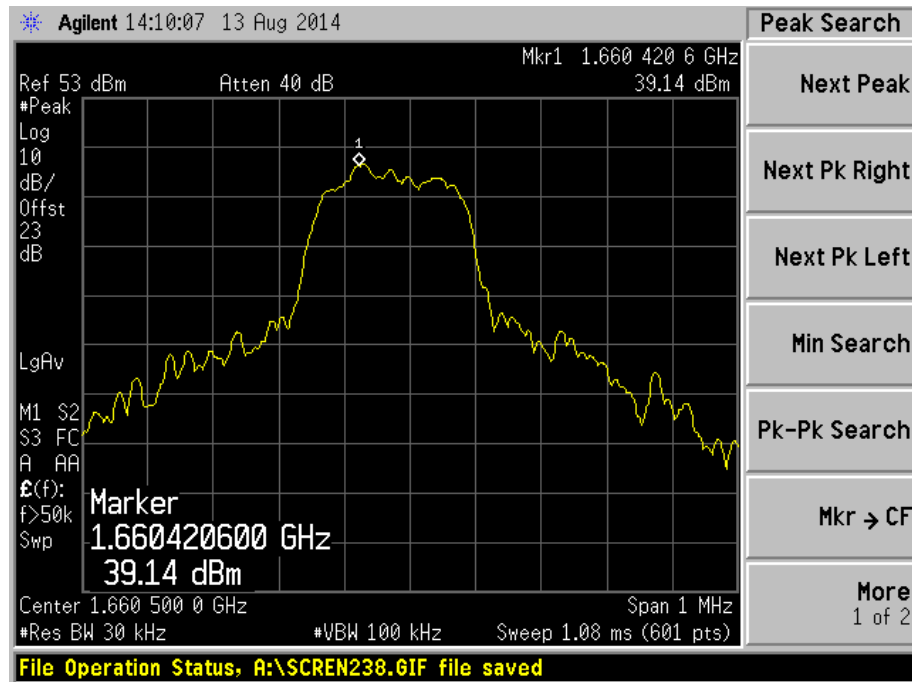
Plot 93 – Middle Channel (Peak)



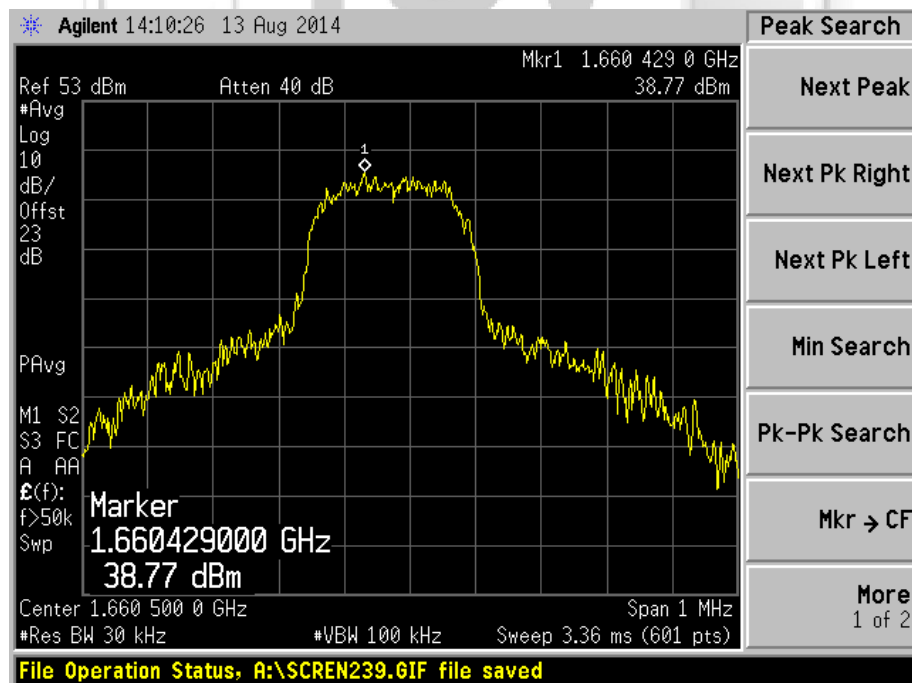
Plot 94 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_23\_16APSK



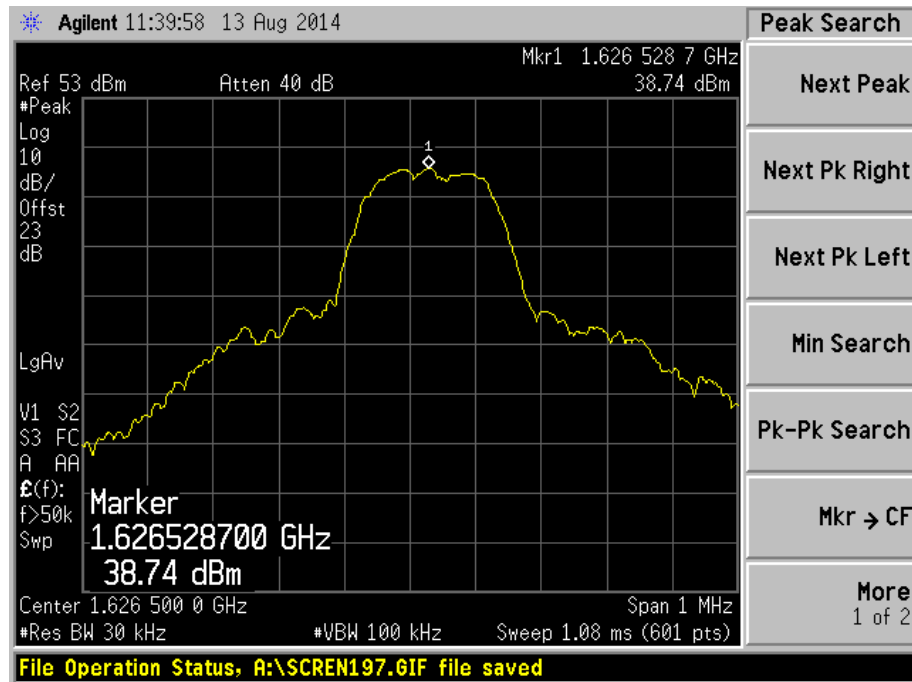
Plot 95 – Upper Channel (Peak)



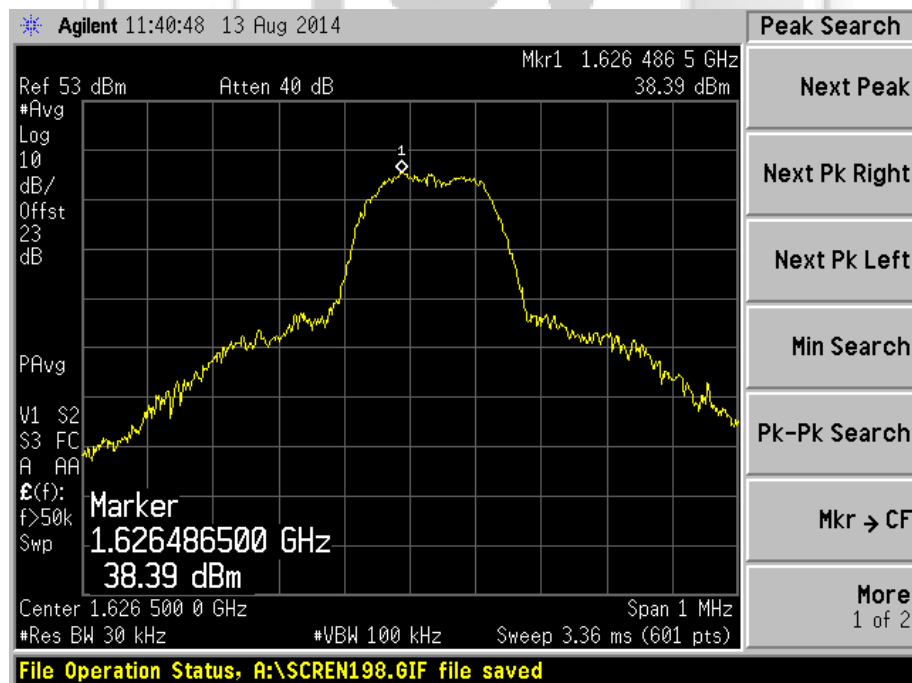
Plot 96 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_23\_QPSK



Plot 97 – Lower Channel (Peak)

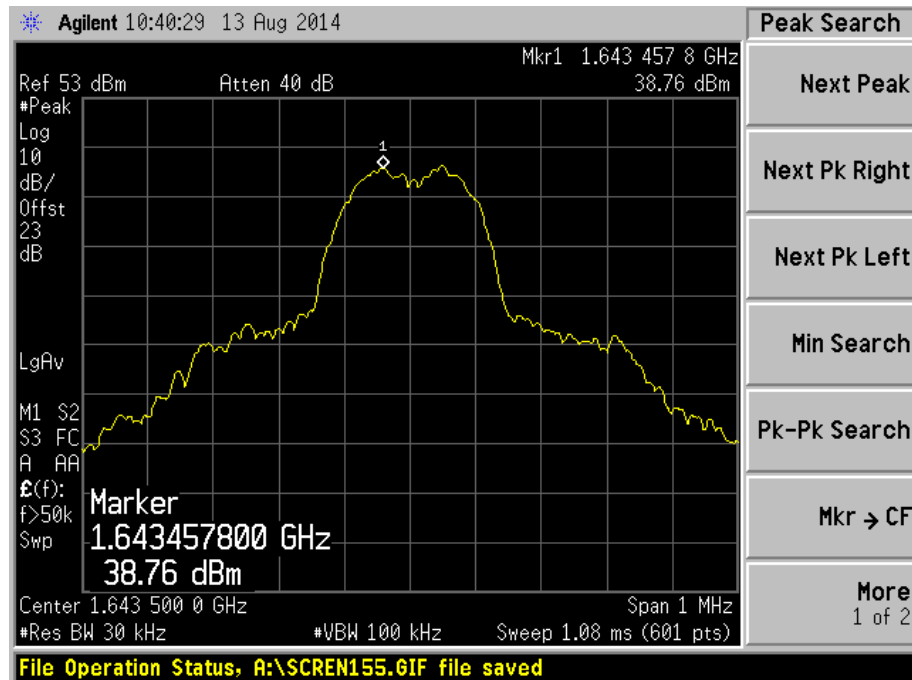


Plot 98 – Lower Channel (Average)

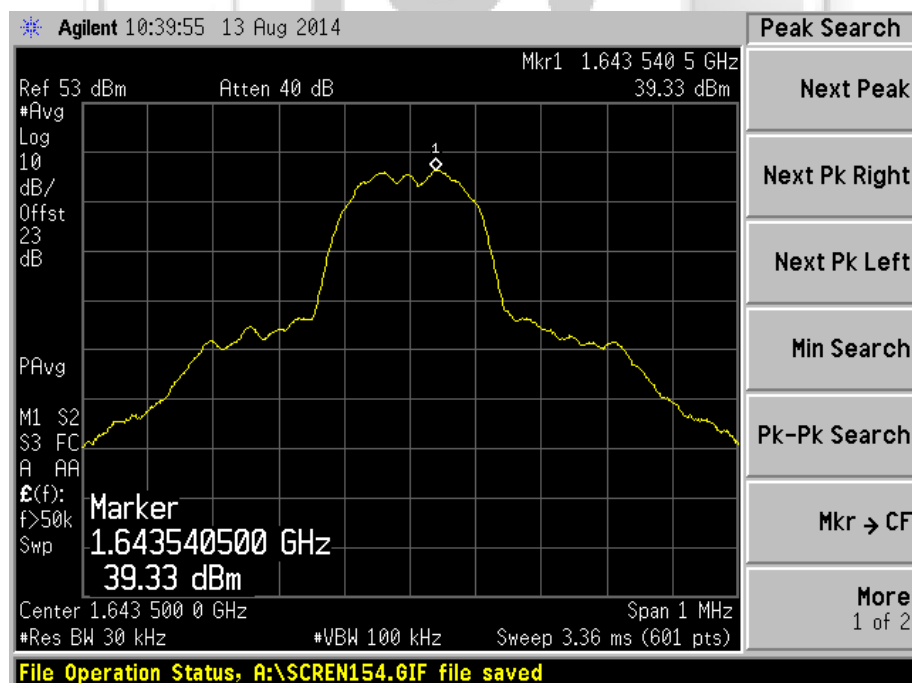


RF OUTPUT POWER TEST

Output Power Plots – PNB53\_23\_QPSK



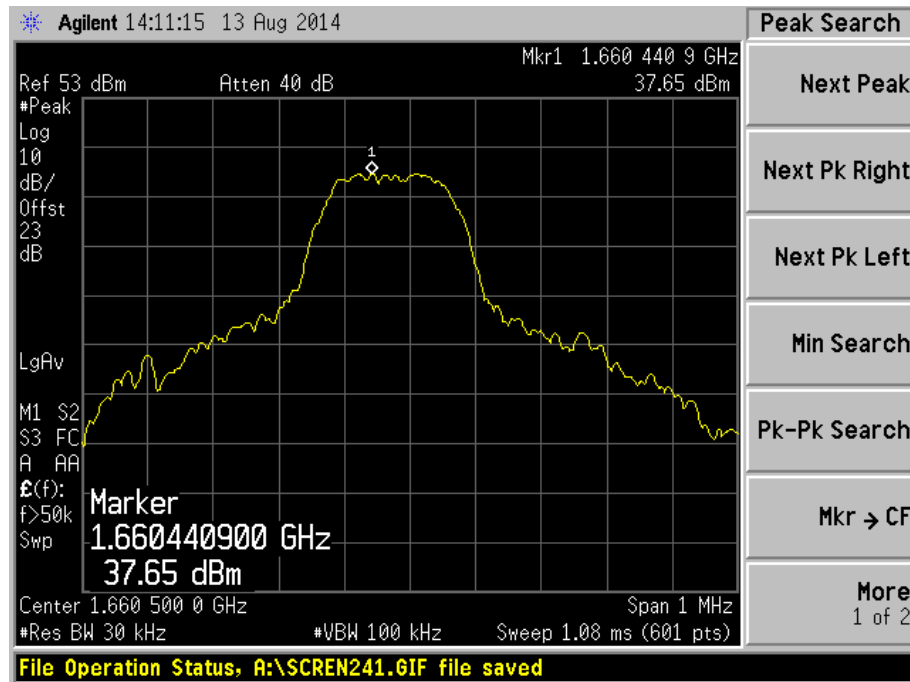
Plot 99 – Middle Channel (Peak)



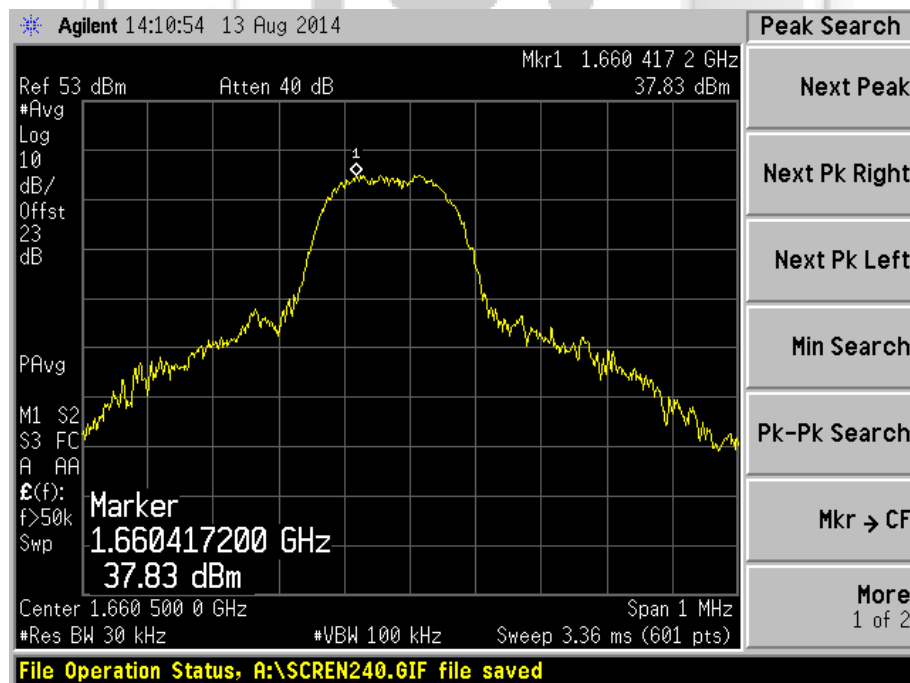
Plot 100 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_23\_QPSK



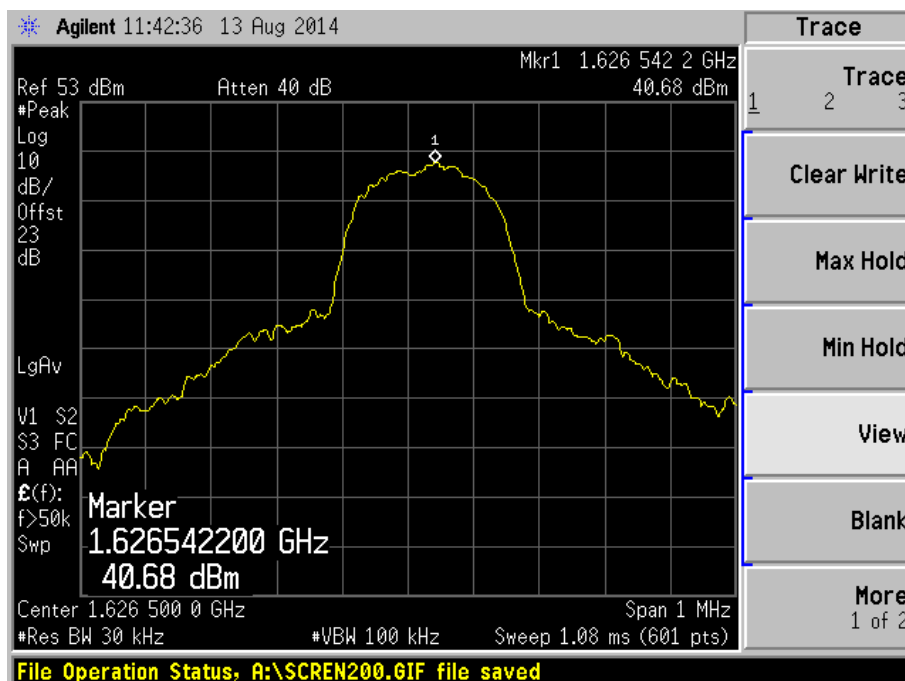
Plot 101 – Upper Channel (Peak)



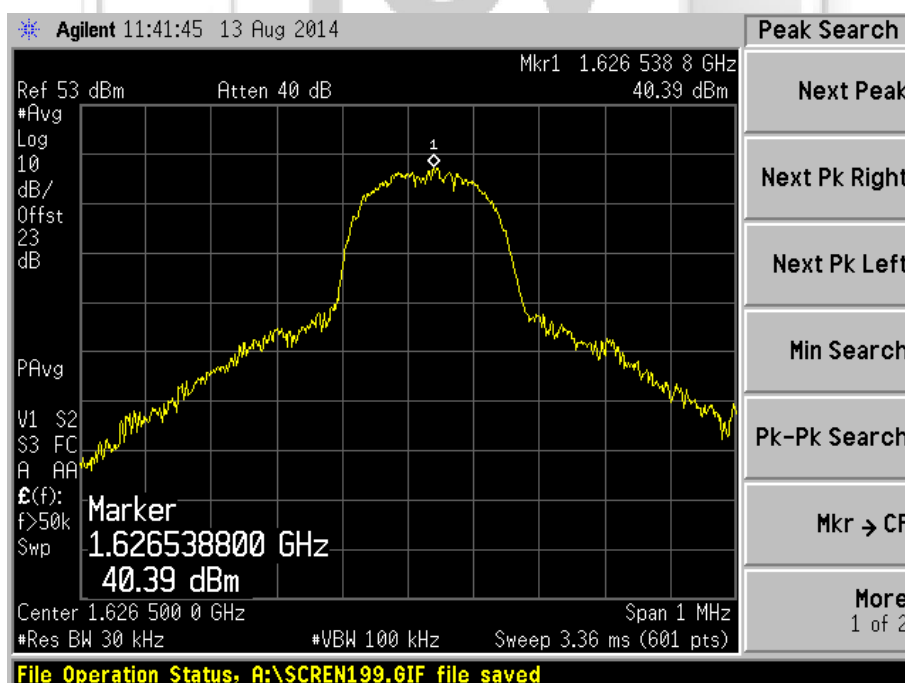
Plot 102 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_45\_16APSK



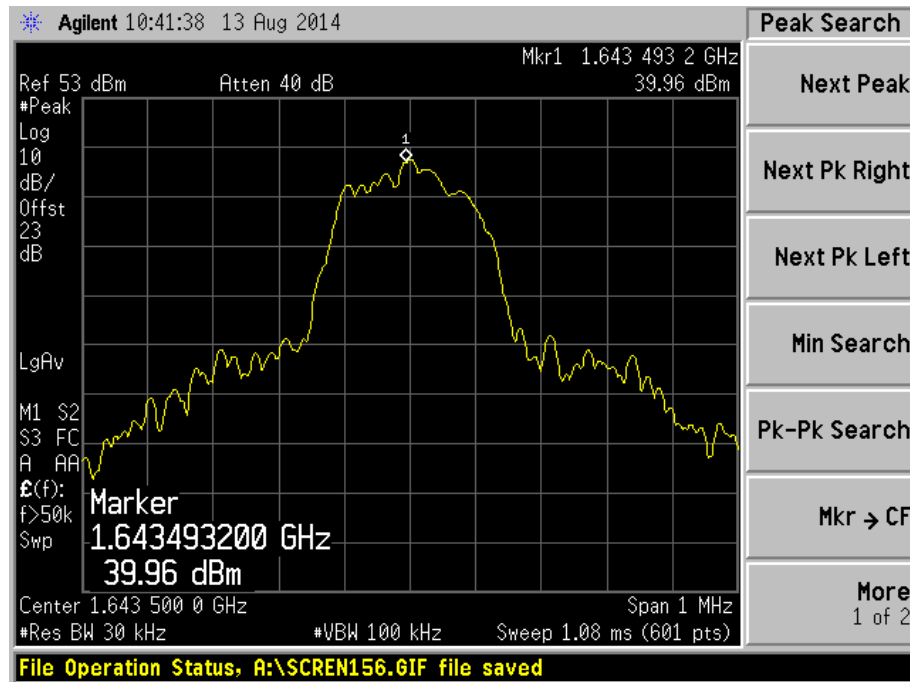
Plot 103 – Lower Channel (Peak)



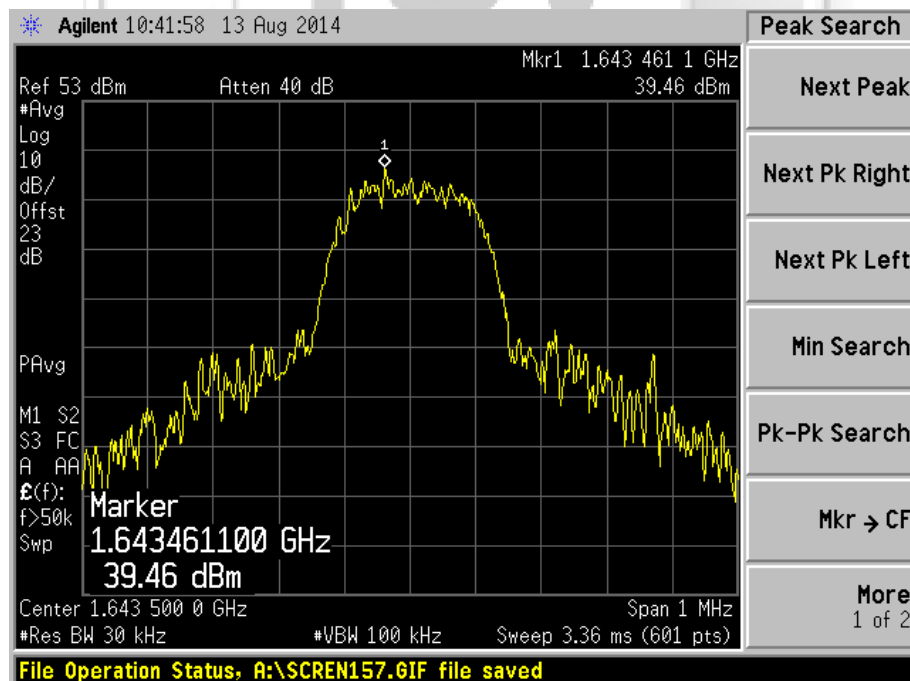
Plot 104 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_45\_16APSK



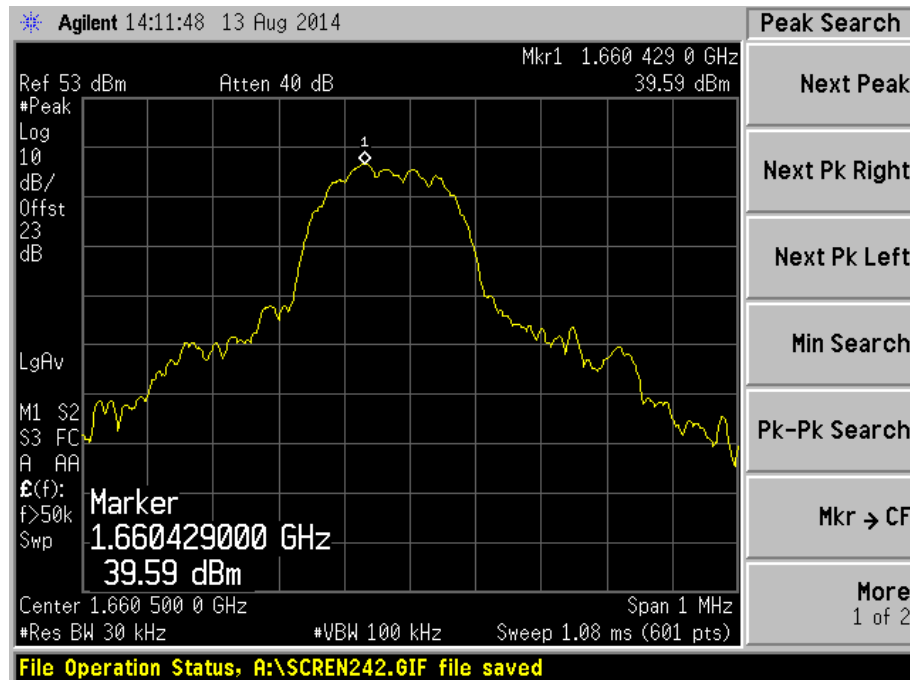
Plot 105 – Middle Channel (Peak)



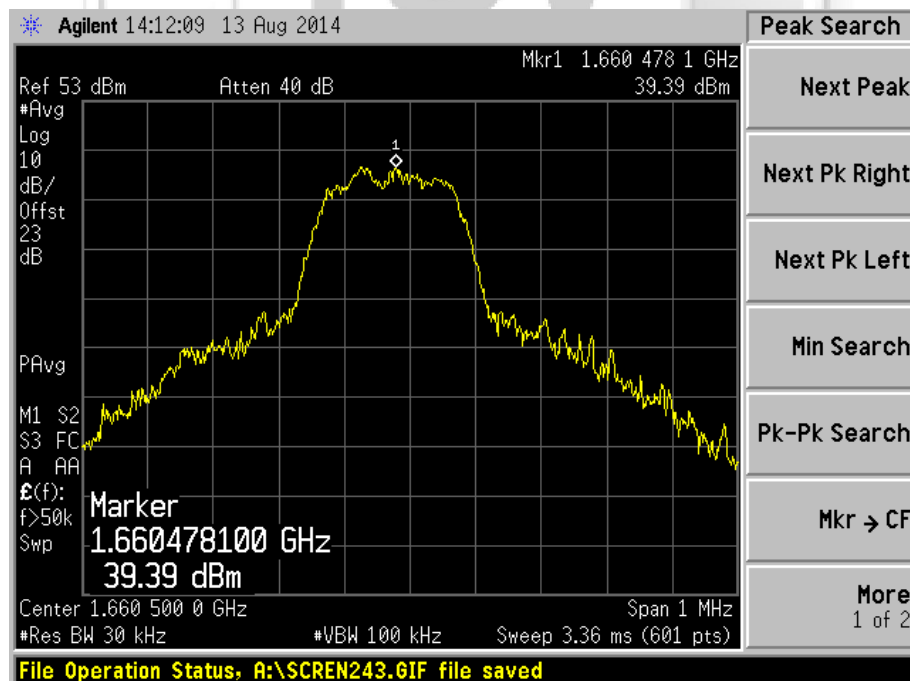
Plot 106 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_45\_16APSK



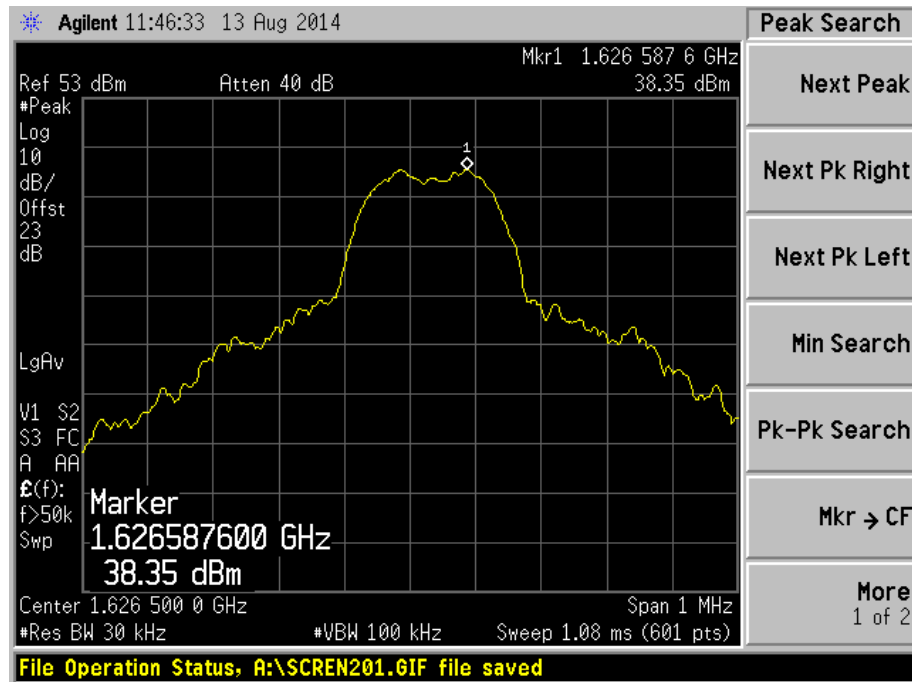
Plot 107 – Upper Channel (Peak)



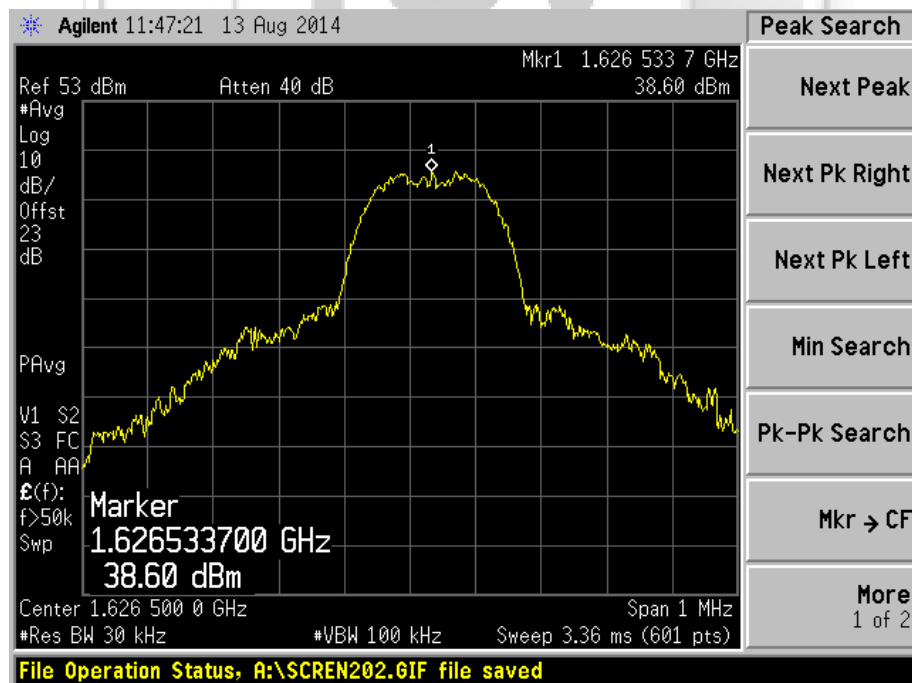
Plot 108 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_45\_QPSK



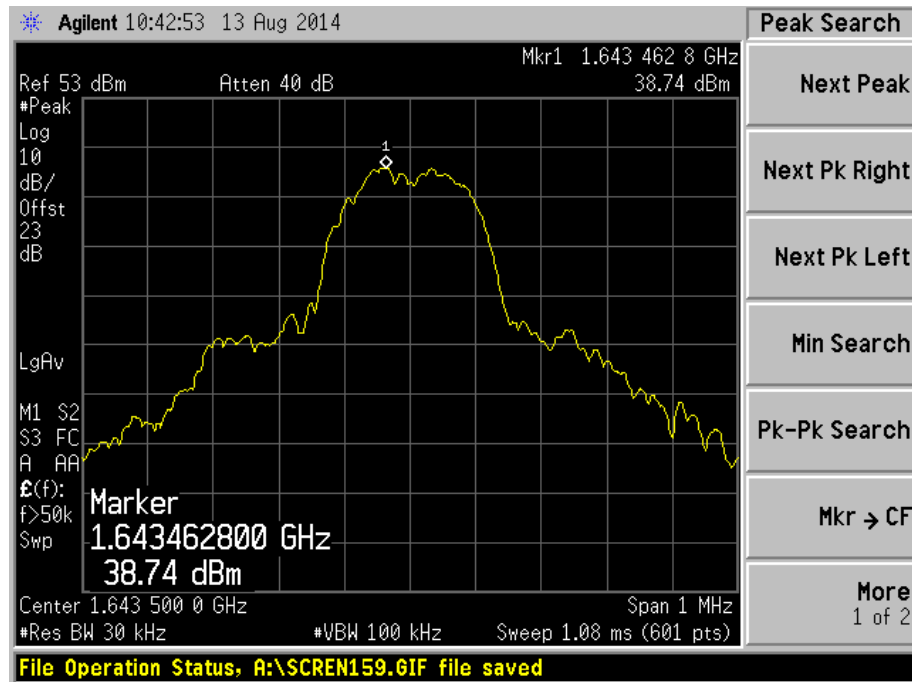
Plot 109 – Lower Channel (Peak)



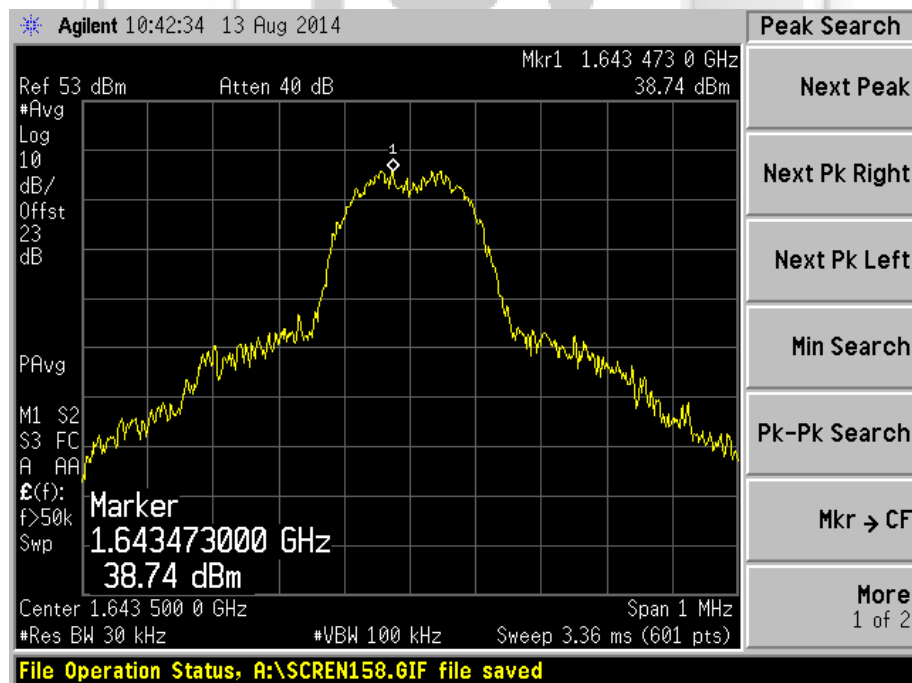
Plot 110 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_45\_QPSK



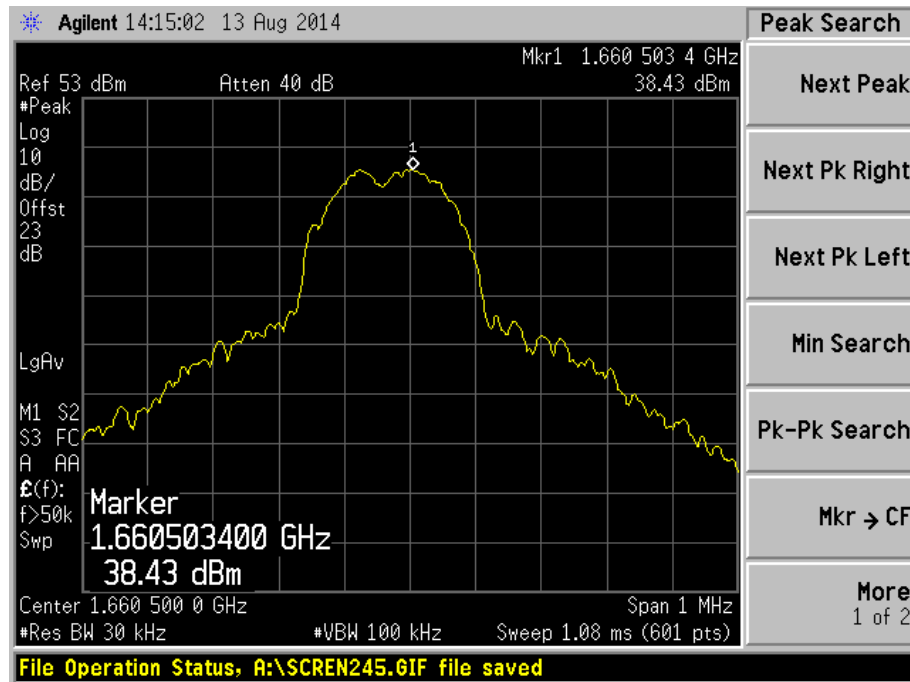
Plot 111 – Middle Channel (Peak)



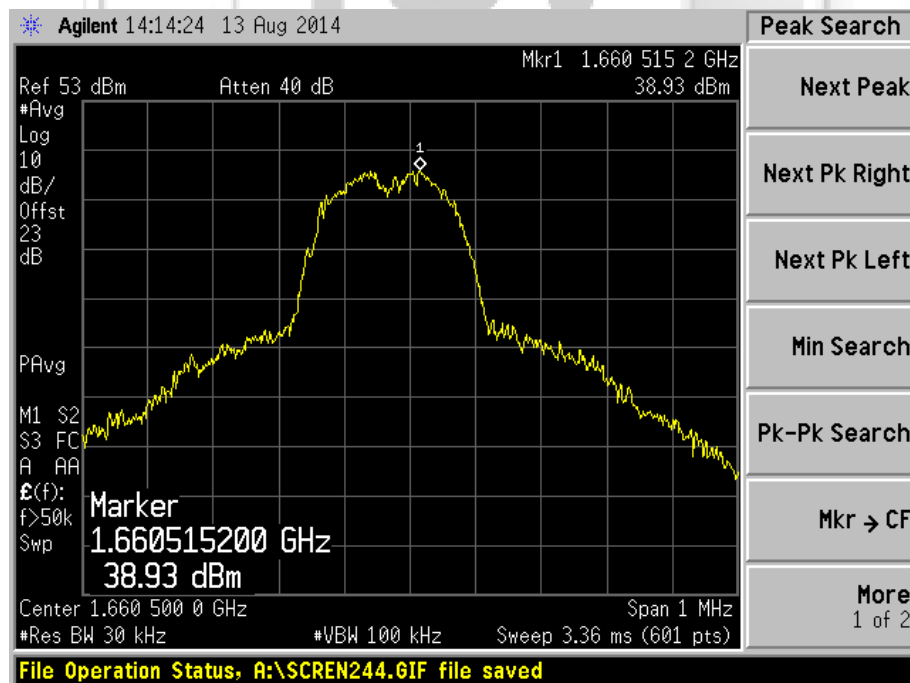
Plot 112 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_45\_QPSK



Plot 113 – Upper Channel (Peak)

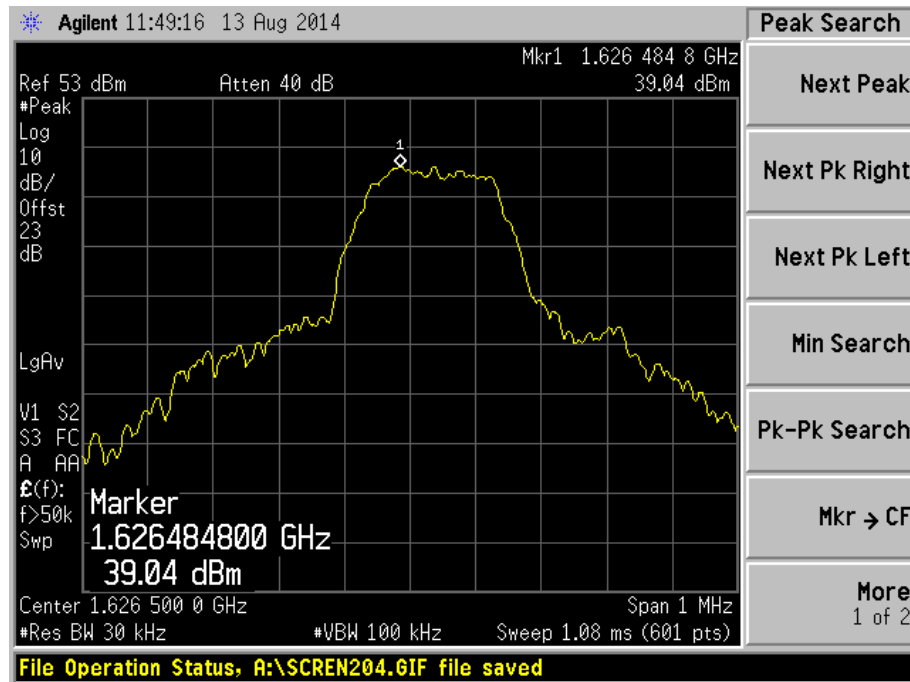


Plot 114 – Upper Channel (Average)

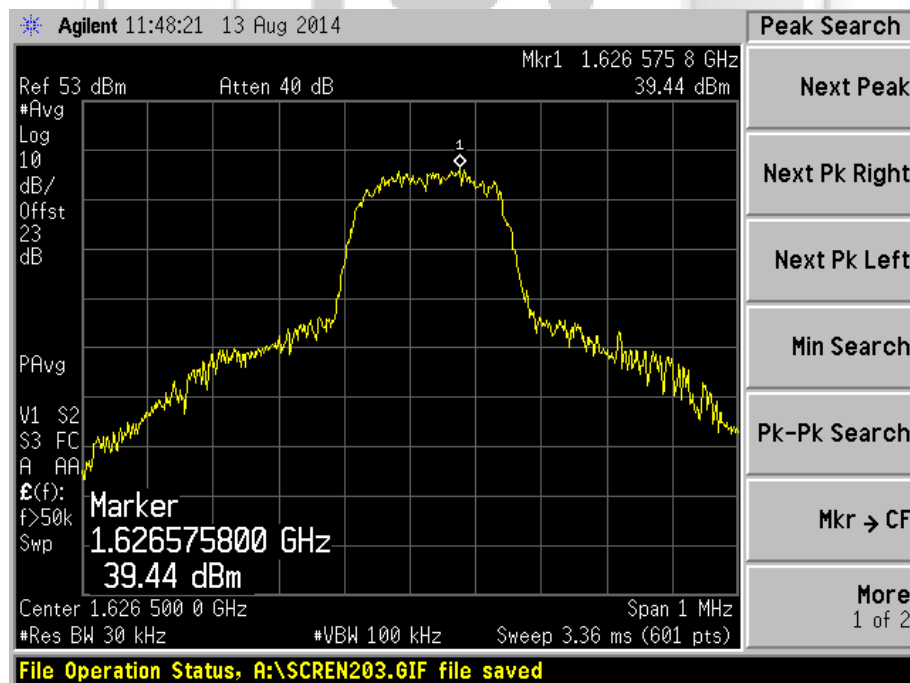


RF OUTPUT POWER TEST

Output Power Plots – PNB53\_910\_16APSK



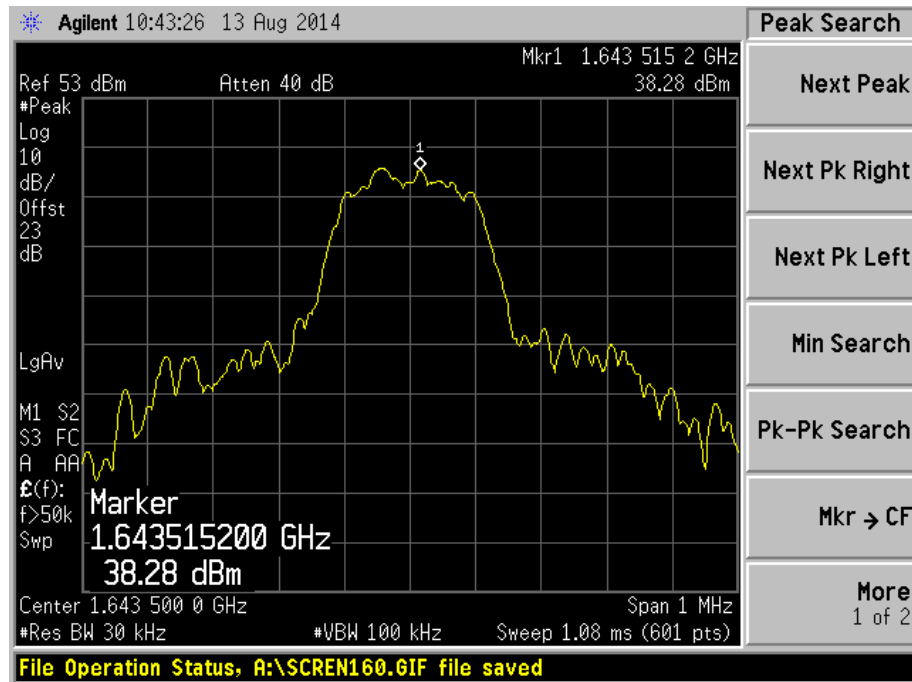
Plot 115 – Lower Channel (Peak)



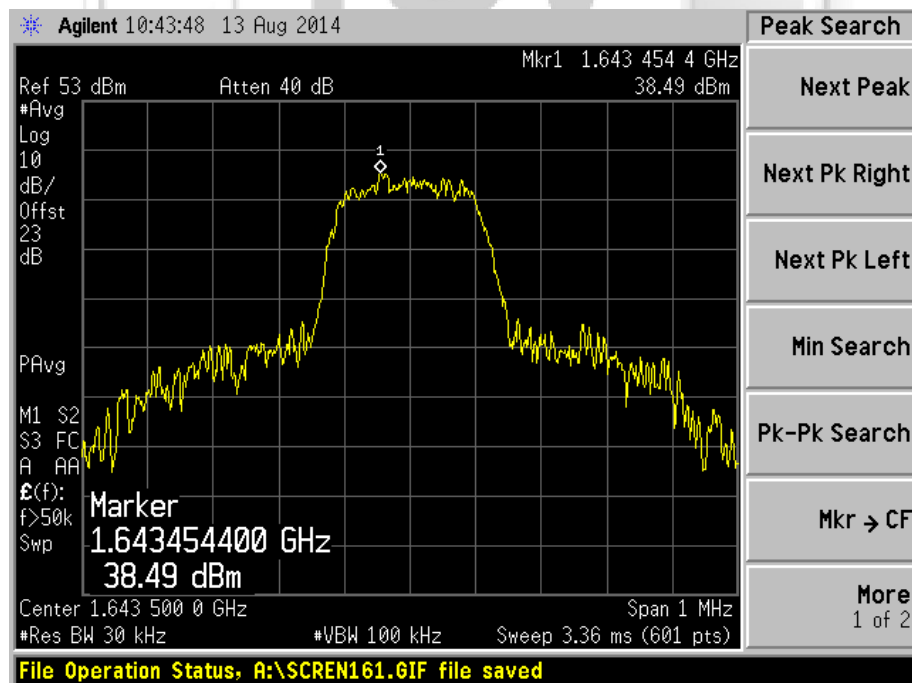
Plot 116 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_910\_16APSK



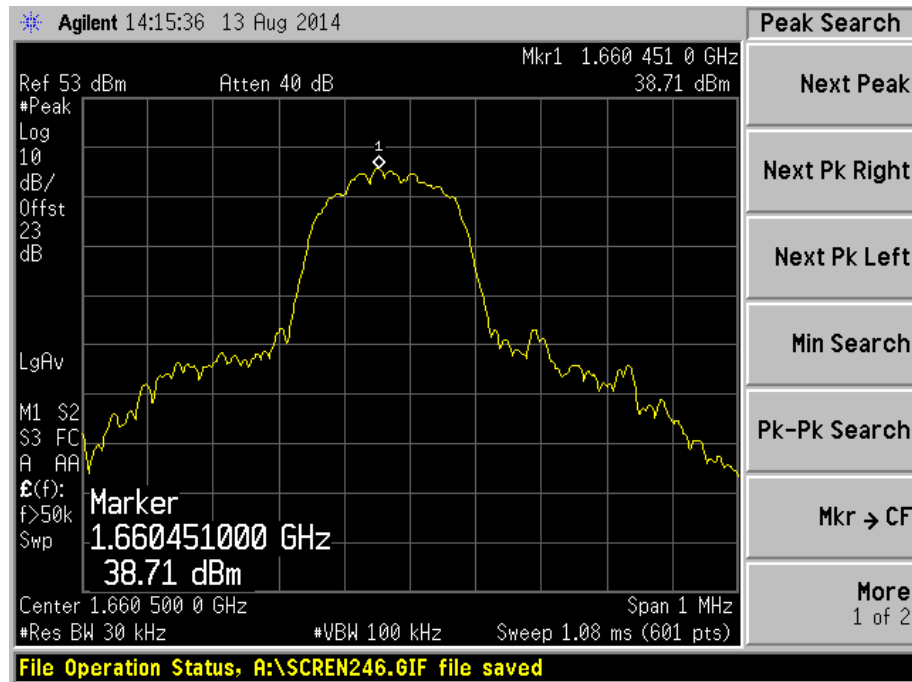
Plot 117 – Middle Channel (Peak)



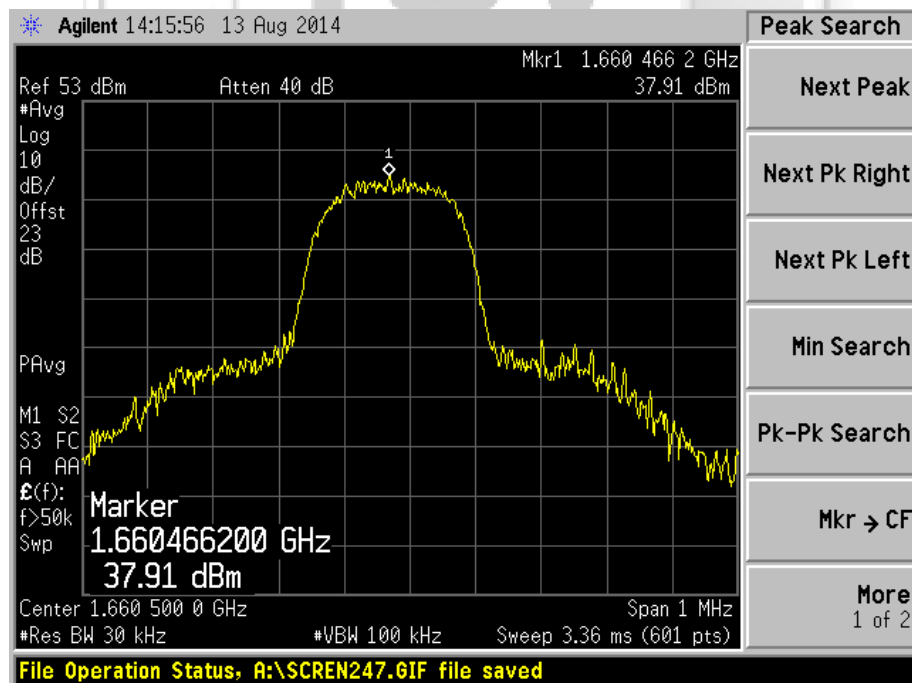
Plot 118 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_910\_16APSK



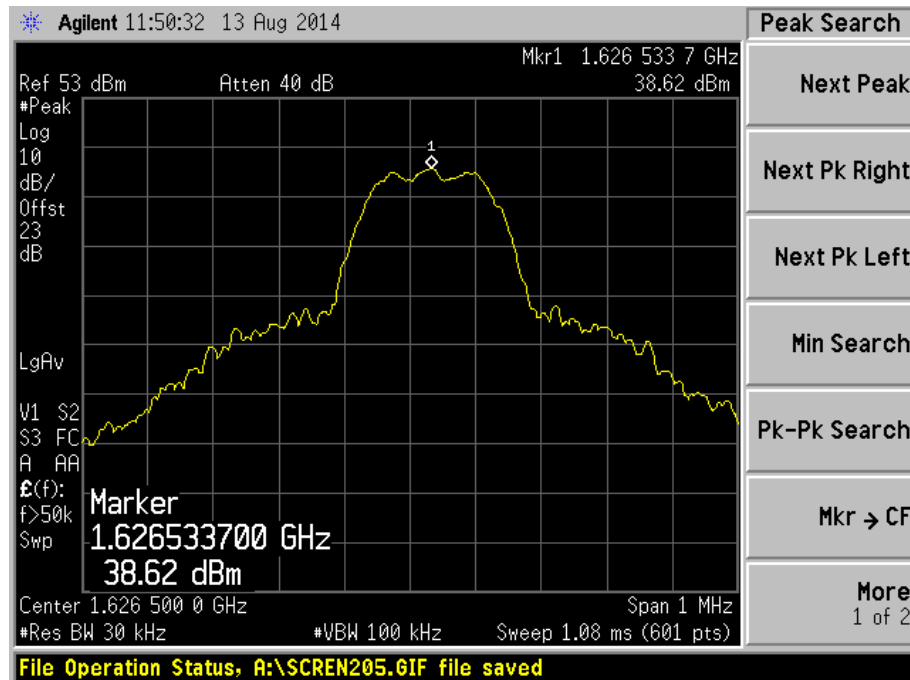
Plot 119 – Upper Channel (Peak)



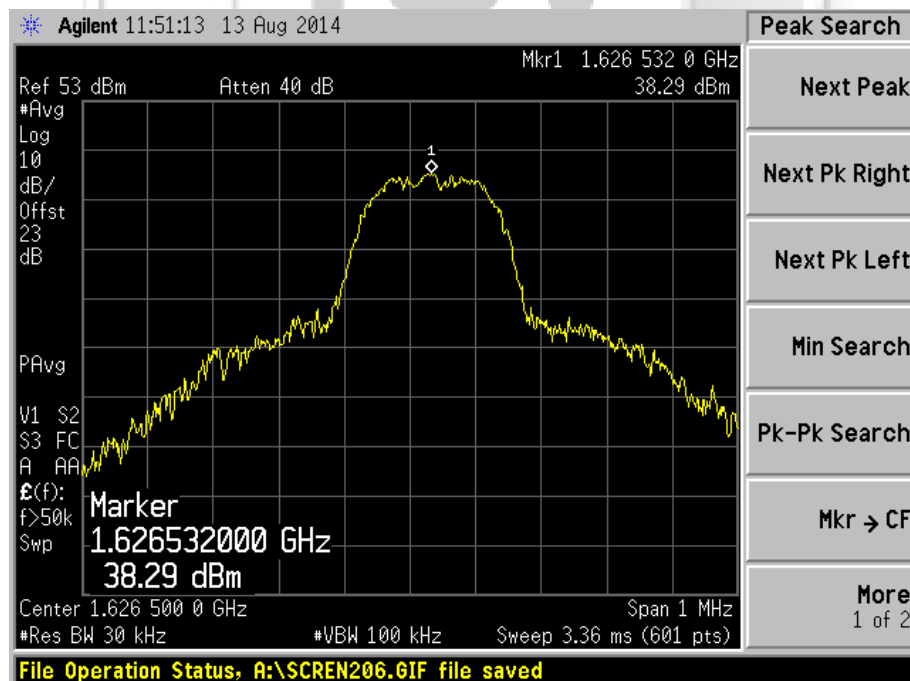
Plot 120 – Upper Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_910\_QPSK



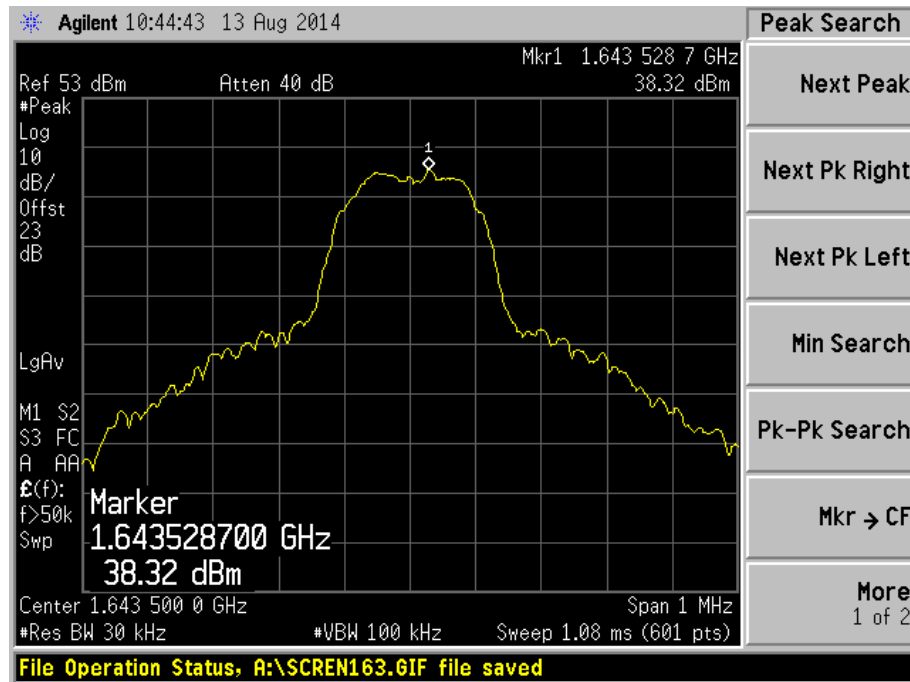
Plot 121 – Lower Channel (Peak)



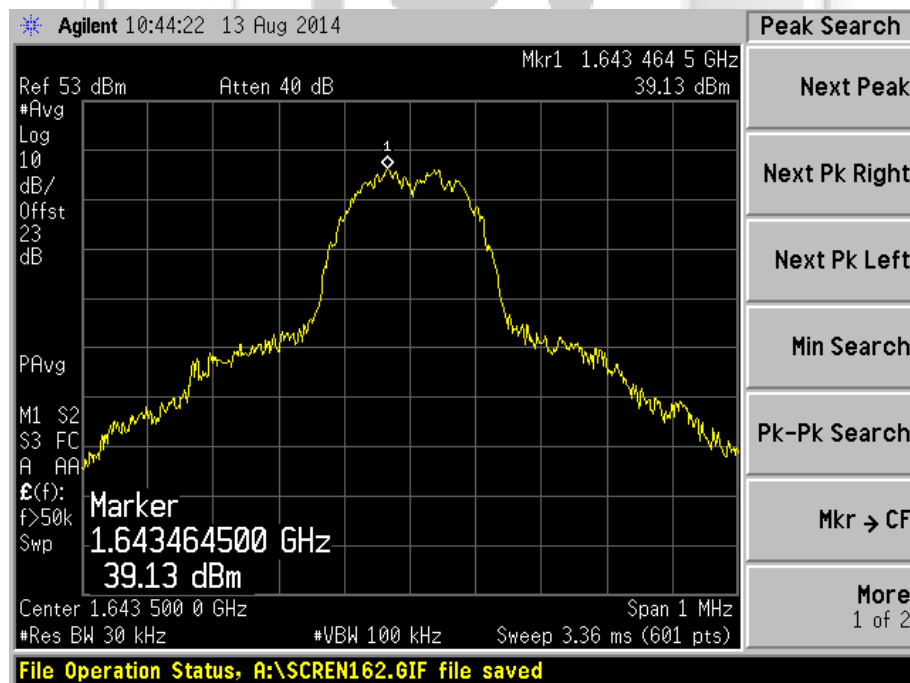
Plot 122 – Lower Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_910\_QPSK



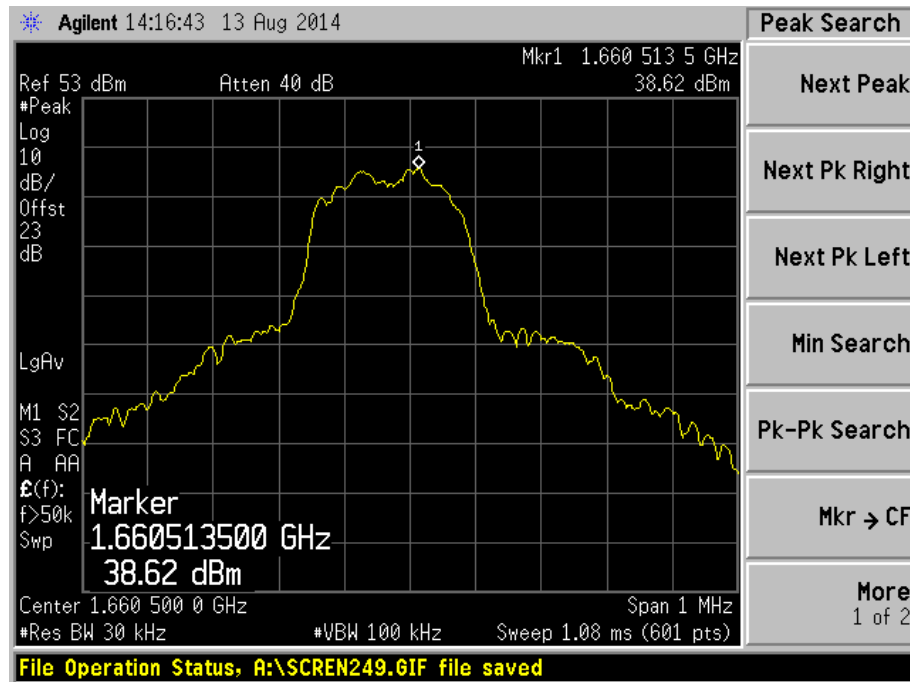
Plot 123 – Middle Channel (Peak)



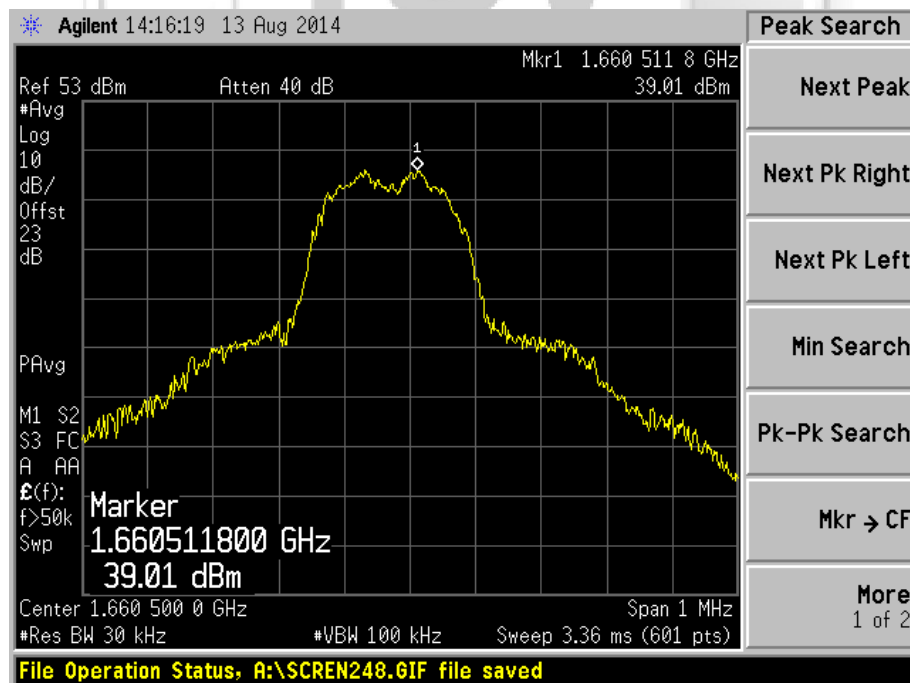
Plot 124 – Middle Channel (Average)

RF OUTPUT POWER TEST

Output Power Plots – PNB53\_910\_QPSK



Plot 125 – Upper Channel (Peak)



Plot 126 – Upper Channel (Average)

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### FCC Parts 2.1051 and 25.202(f) Unwanted Emissions at Antenna Terminal Test Limits

1. 25.202 Emissions Limitations
  - (f) The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:
    - (1) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 50% up to and including 100% of the authorized bandwidth: 25 decibels;
    - (2) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 100% up to and including 250% of the authorized bandwidth: 35 decibels;
    - (3) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 250% of the authorized bandwidth: an amount equal to 43 decibels plus 10 times logarithm (to the base 10) of the transmitter power in watts.
2. 2.1051 Measurements Required: Spurious Emissions at Antenna Terminals  
The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20dB below the permissible value needed not be specified.

### FCC Parts 2.1051 and 25.202(f) Unwanted Emissions at Antenna Terminal Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	14 Nov 2014
Bird 20dB 25W RF Attenuator	25-A-MFN-20	Nil	Output Monitor
Instock Divider / Combiner	PD7120	Nil	Output Monitor

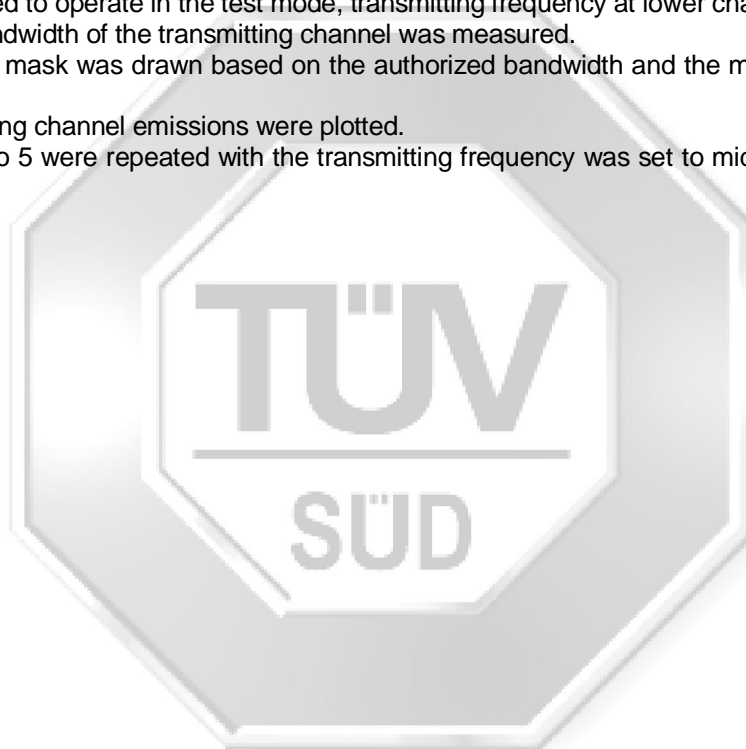
## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 47 CFR FCC Parts 2.1051 and 25.202(f) Unwanted Emissions at Antenna Terminal Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a RF attenuator and a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

### 47 CFR FCC Parts 2.1051 and 25.202(f) Unwanted Emissions at Antenna Terminal Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, transmitting frequency at lower channel.
2. The 26dB bandwidth of the transmitting channel was measured.
3. The emission mask was drawn based on the authorized bandwidth and the measured average output power.
4. The transmitting channel emissions were plotted.
5. The steps 2 to 5 were repeated with the transmitting frequency was set to middle and upper channels respectively.





## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 47 CFR FCC Parts 25.254(d)(6) and 2.1049 Occupied Bandwidth Results

Operating Mode	Continuous Satellite Transmit	Temperature	24°C
Test Input Power	12Vdc	Relative Humidity	60%
Antenna Gain	10.0dBi	Atmospheric Pressure	1030mbar
Attached Plots	127 – 189 (26dB Bandwidth) 190 – 252 (In Band Emissions) 253 – 441 (Out of Band Spurious)	Tested By	Li Chelmin, Liao LeeYin, Lim Poh Huat

All emissions are within the emission mask. Please refer to the attached plots.

#### Notes

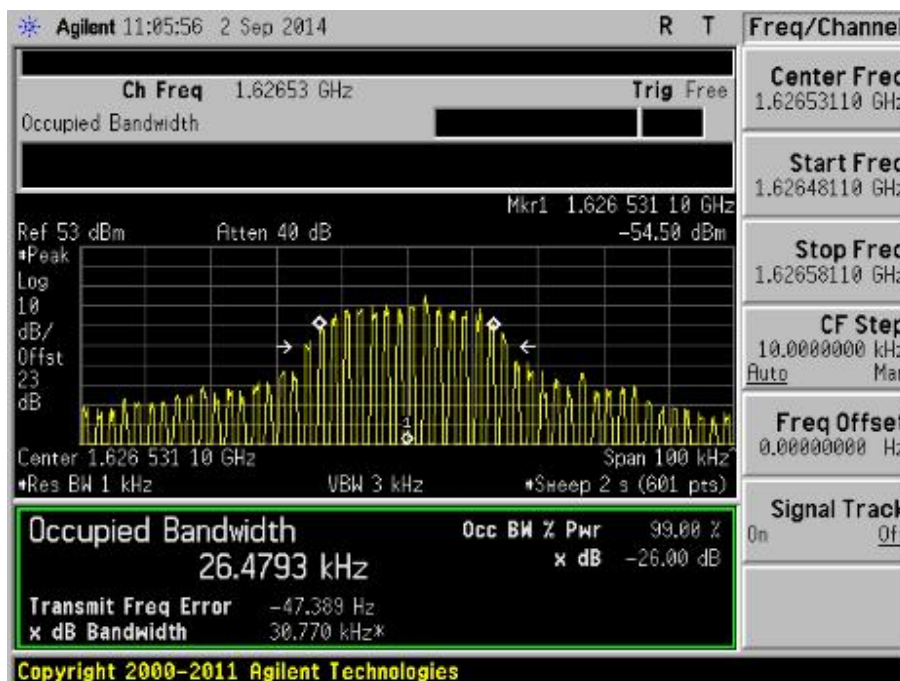
1. The Resolution Bandwidth (RBW) was corrected from 4kHz by  $10\log_{10} [(used\ RBW) / 4kHz]$ .
2. Emission limits are computed based on following:
  - a. Emissions Limits (dBm) (50% - 100% authorised bandwidth) =  $P - 25 + CF$
  - b. Emissions Limits (dBm) (100% - 250% authorised bandwidth) =  $P - 35 + CF$
  - c. Emissions Limits (dBm) (> 250% authorised bandwidth) =  $P - [43 + 10\log_{10} P_w] + 30 + CF$

where

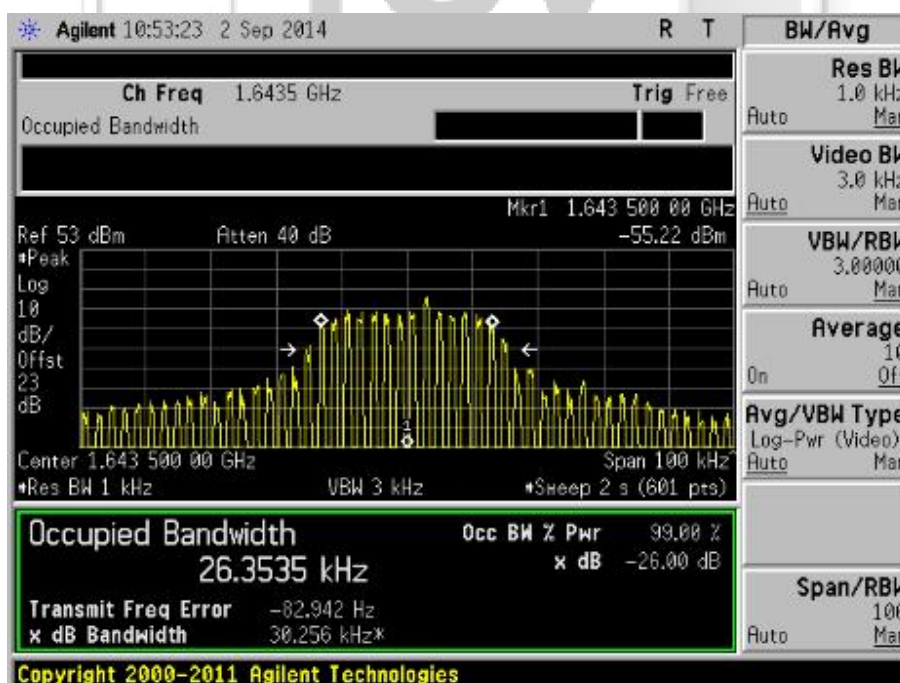
P	=	Measured mean power in dBm
$P_w$	=	Measured mean power in W
CF	=	RBW correction factor (see Note 1)

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – RACH



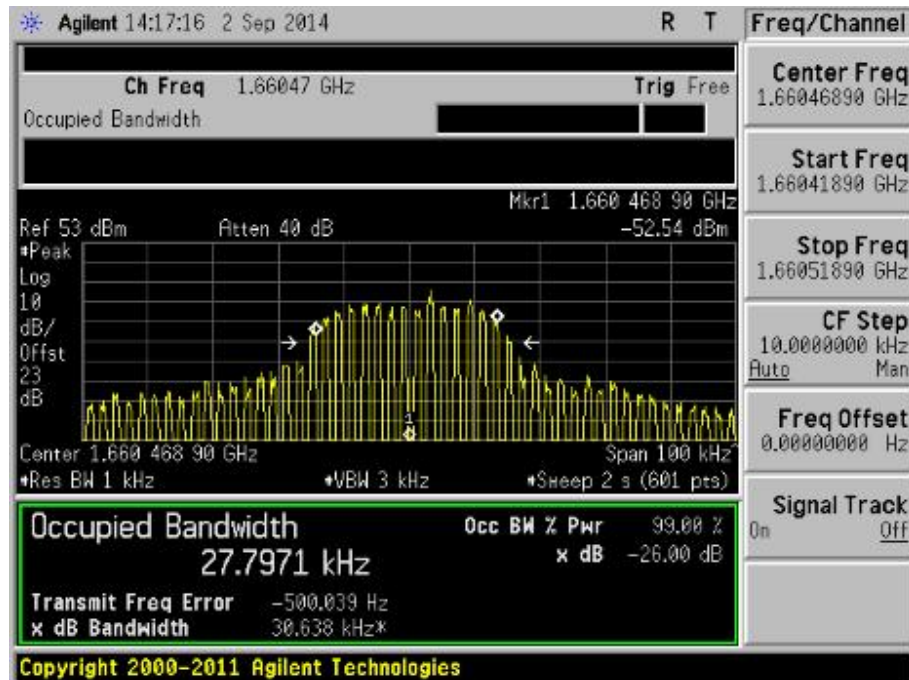
Plot 127 – Lower Channel



Plot 128 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

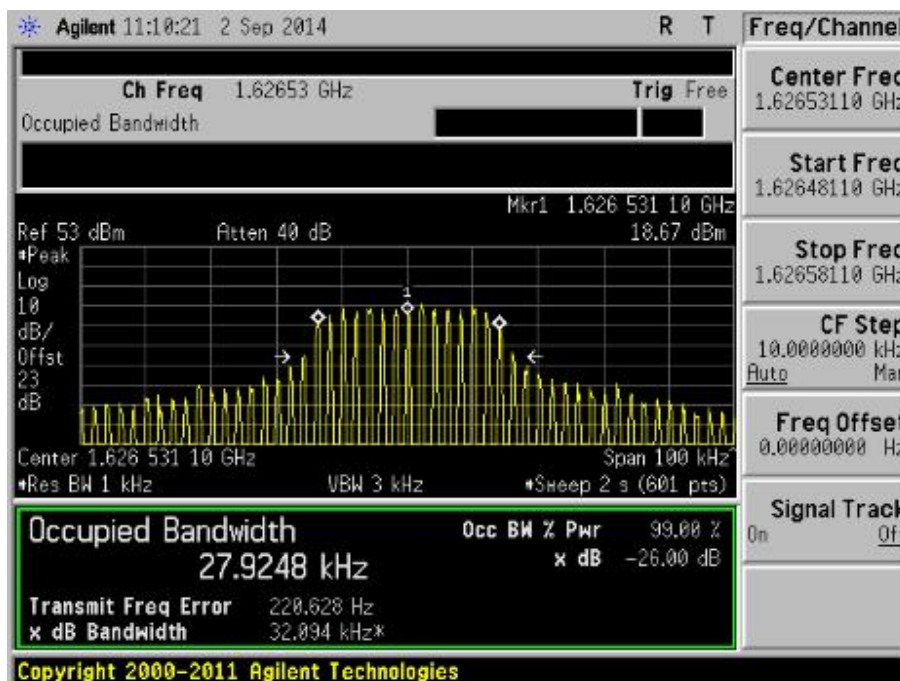
### 26dB Bandwidth Plots – RACH



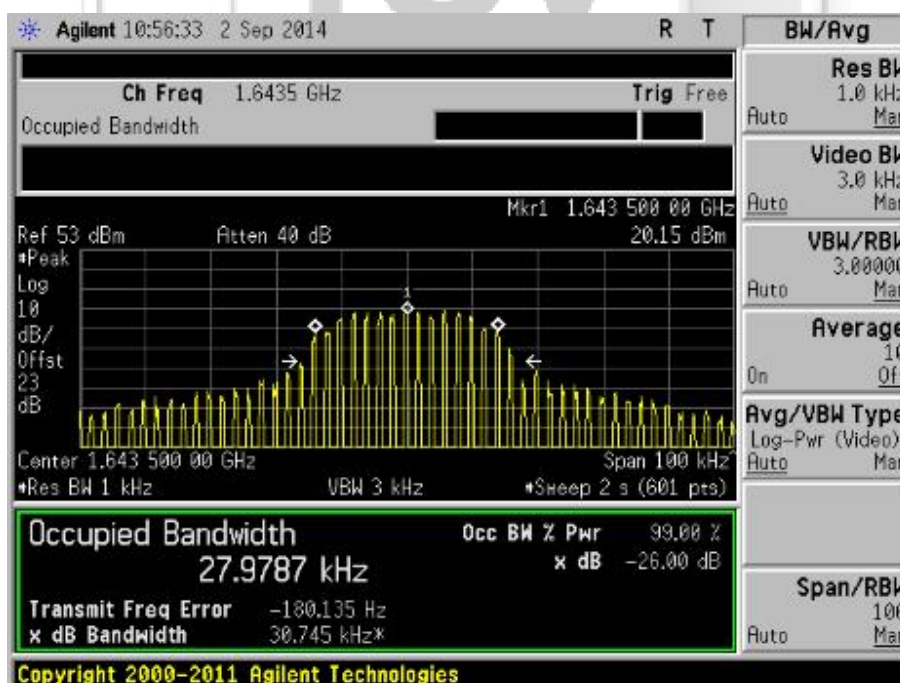
Plot 129 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – AGCH



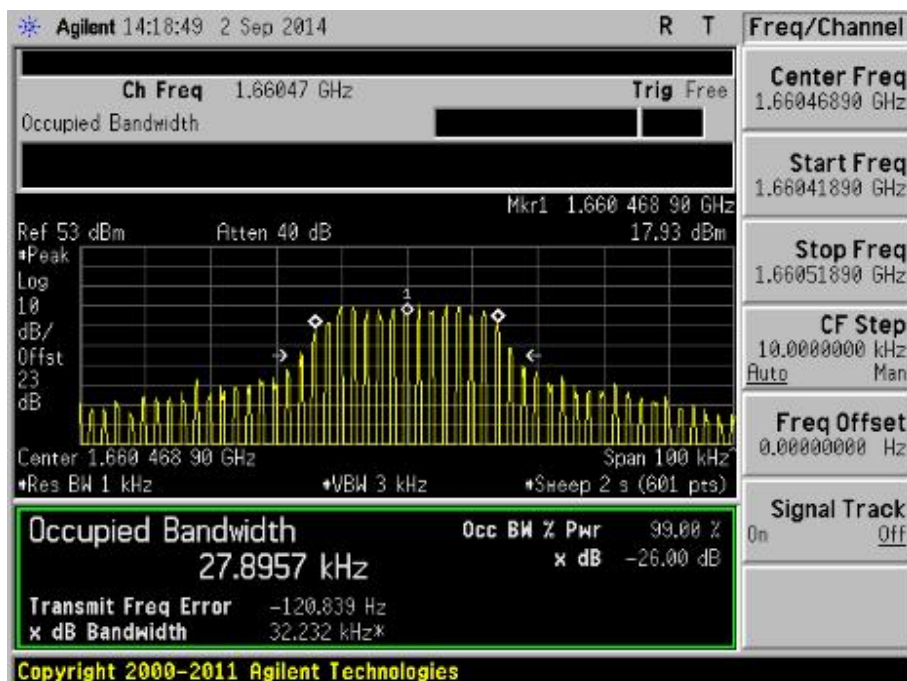
Plot 130 – Lower Channel



Plot 131 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – AGCH

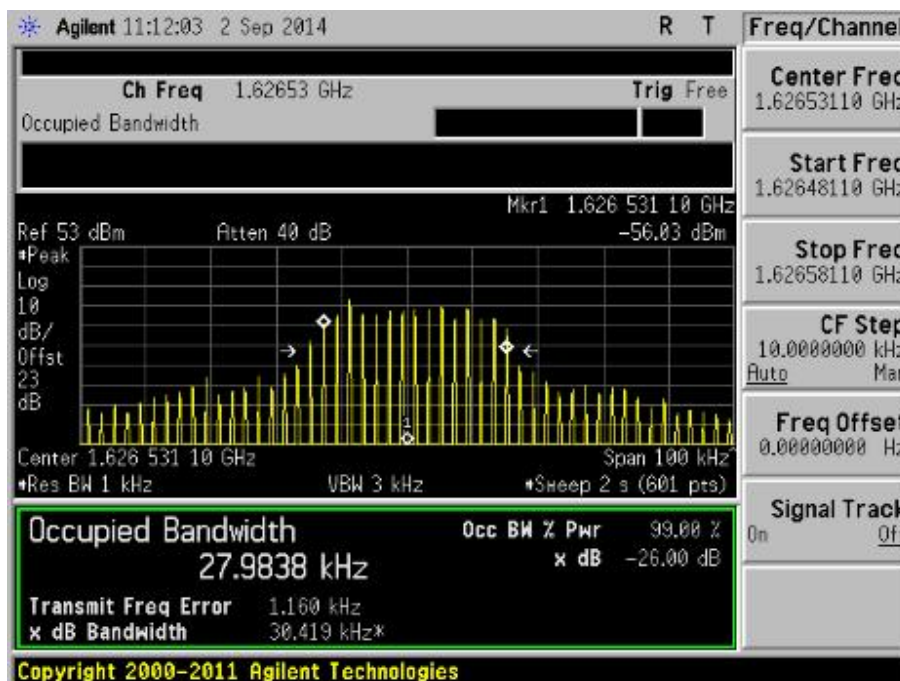


Plot 132 – Upper Channel

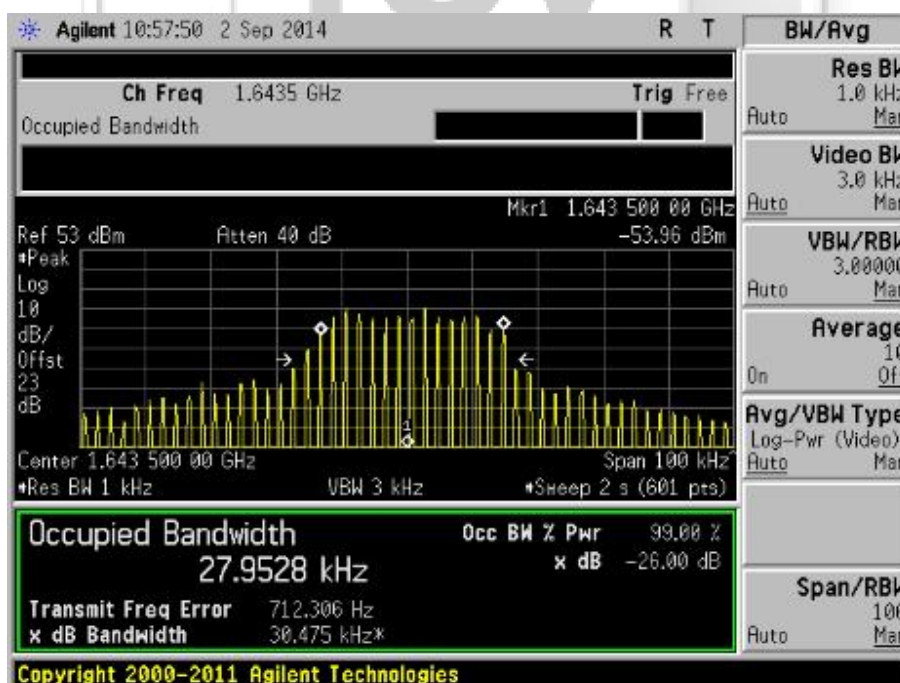


## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – FACCH



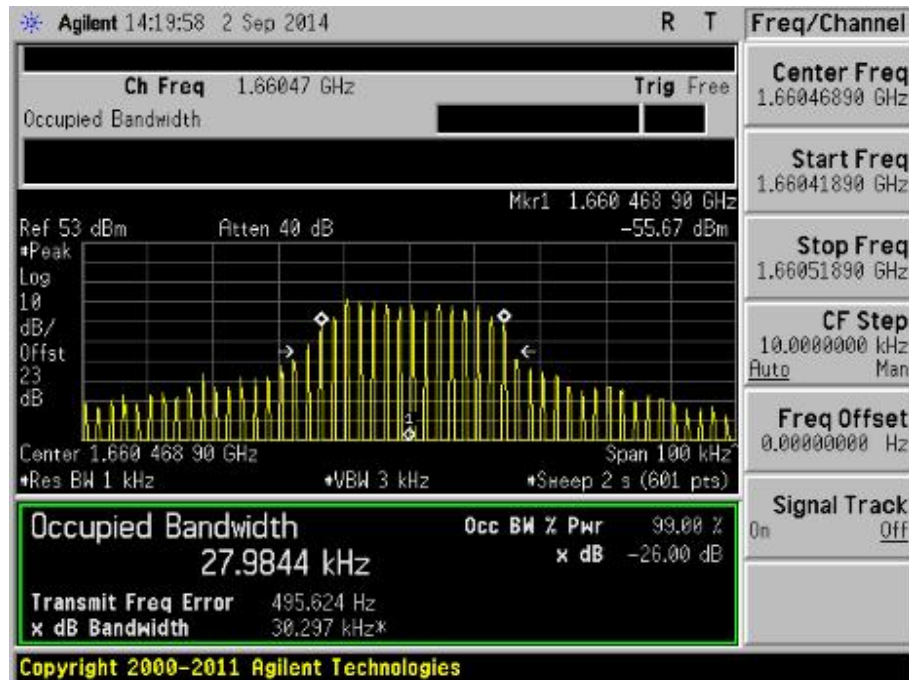
Plot 133 – Lower Channel



Plot 134 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

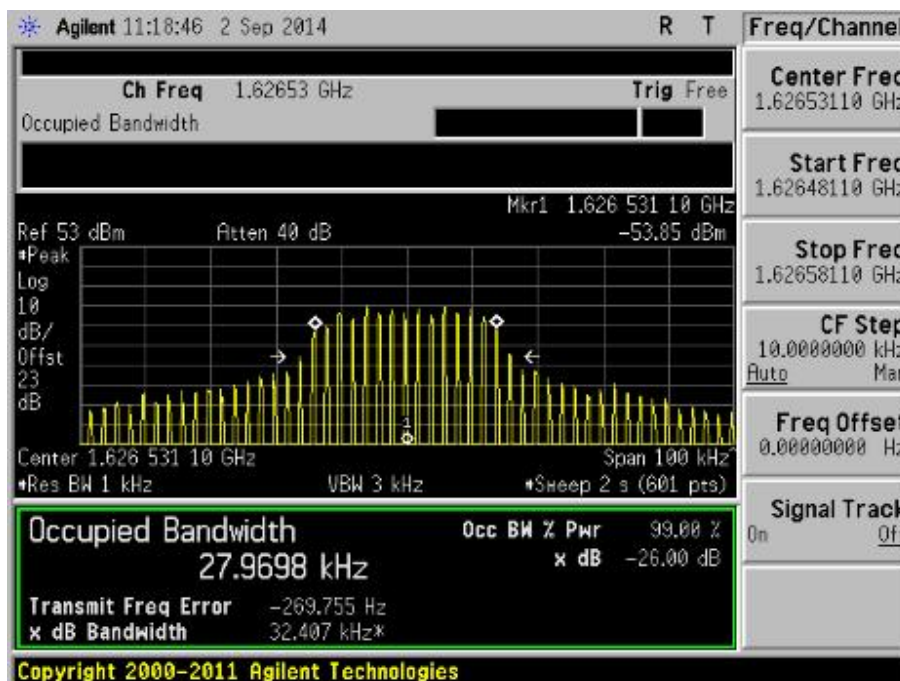
### 26dB Bandwidth Plots – FACCH



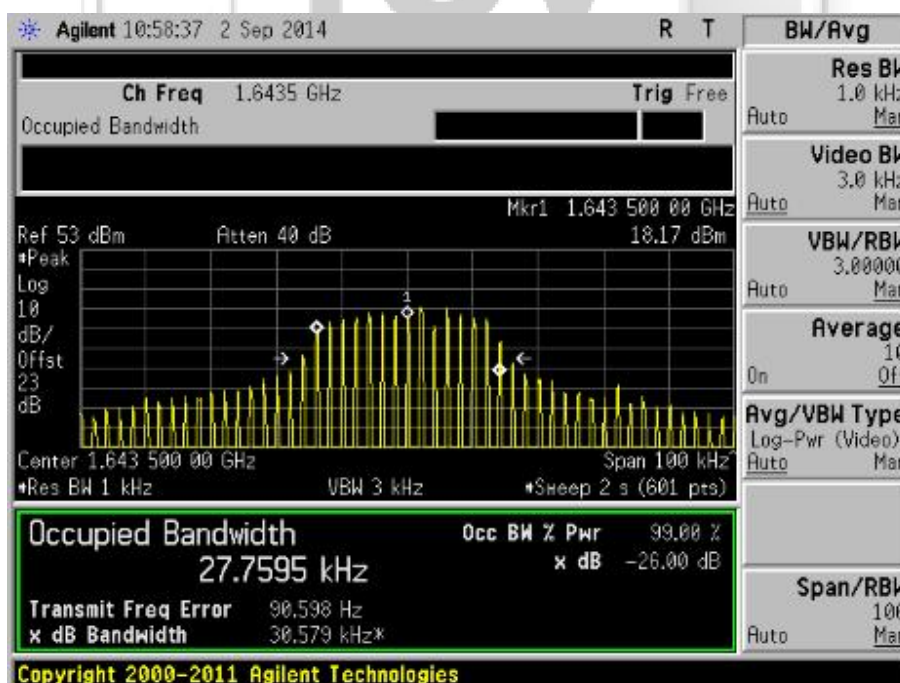
Plot 135 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – TCH3



Plot 136 – Lower Channel

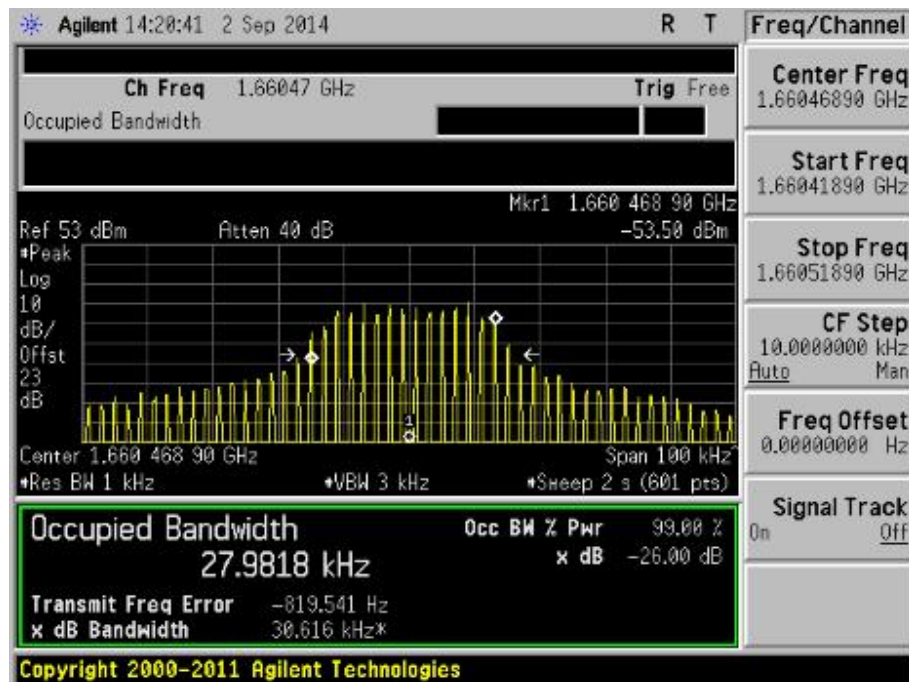


Plot 137 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

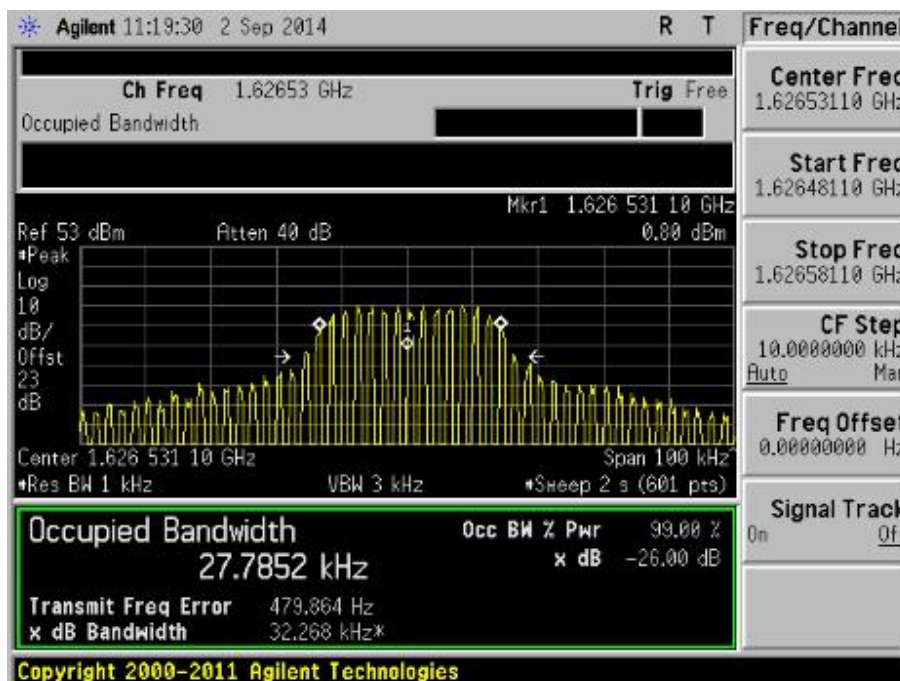
### 26dB Bandwidth Plots – TCH3



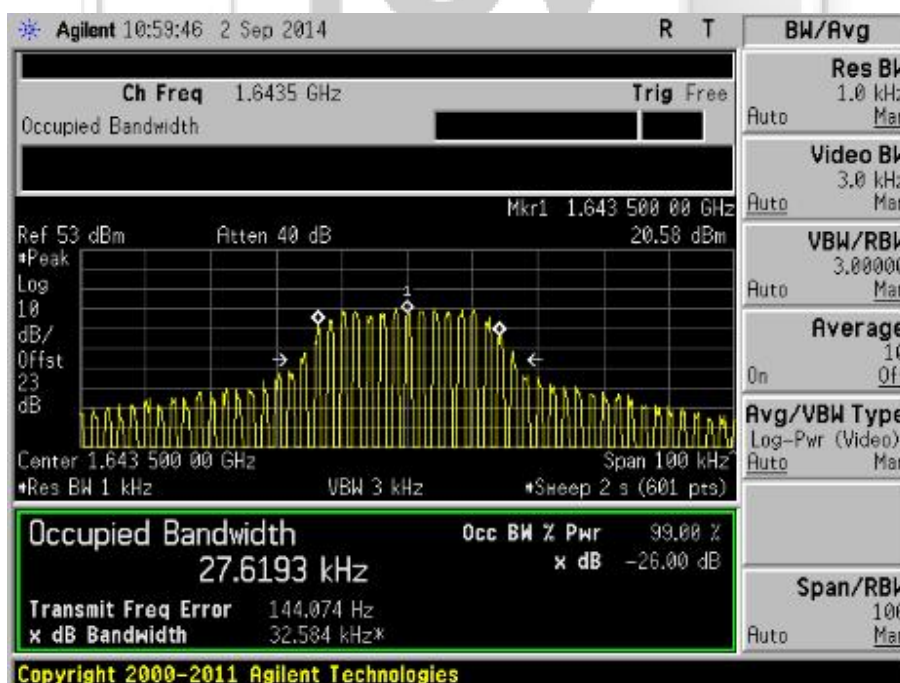
Plot 138 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – FACCH9



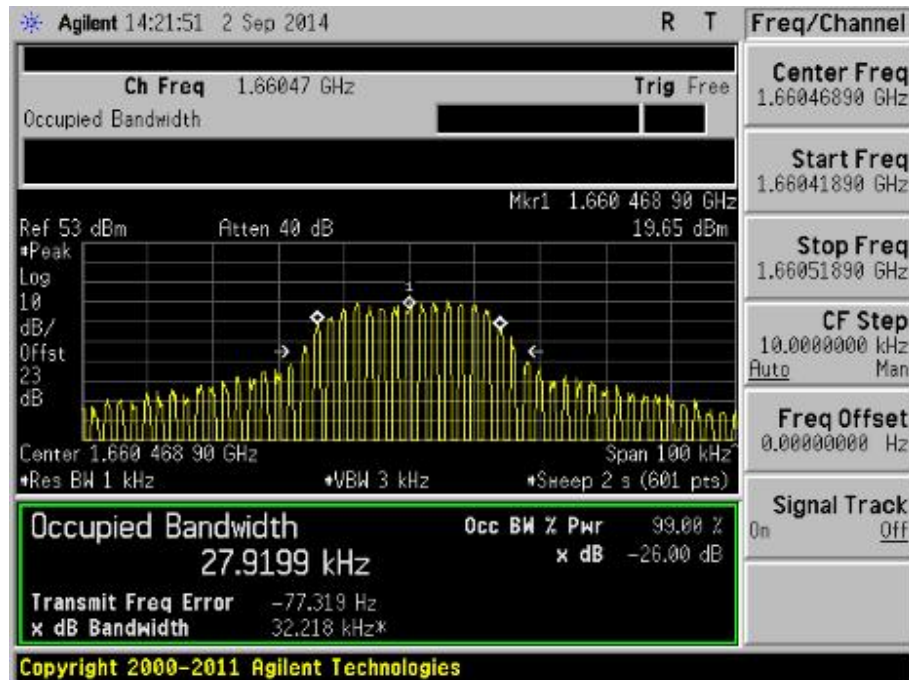
Plot 139 – Lower Channel



Plot 140 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

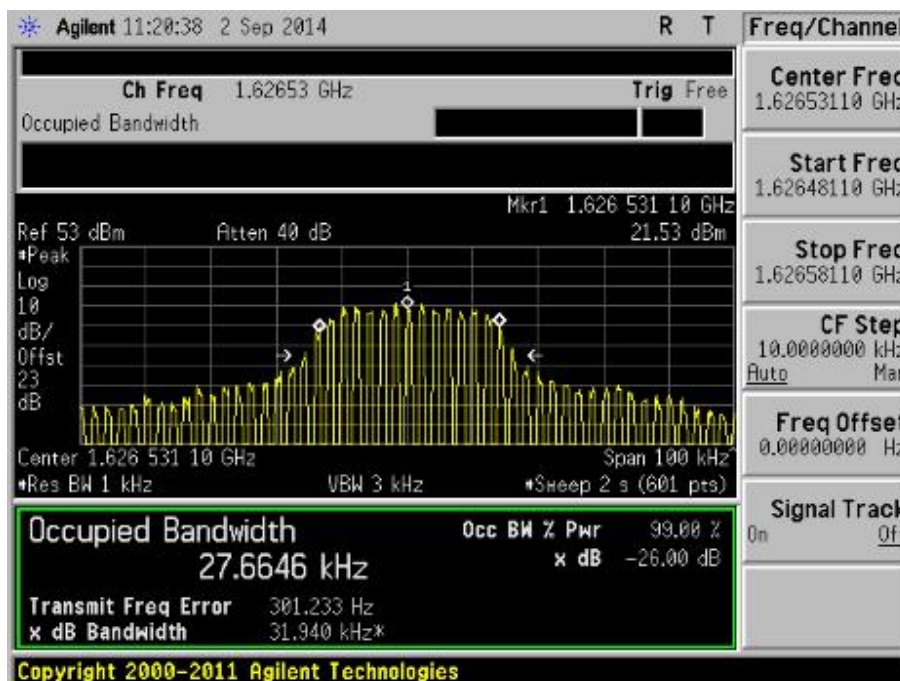
### 26dB Bandwidth Plots – FACCH9



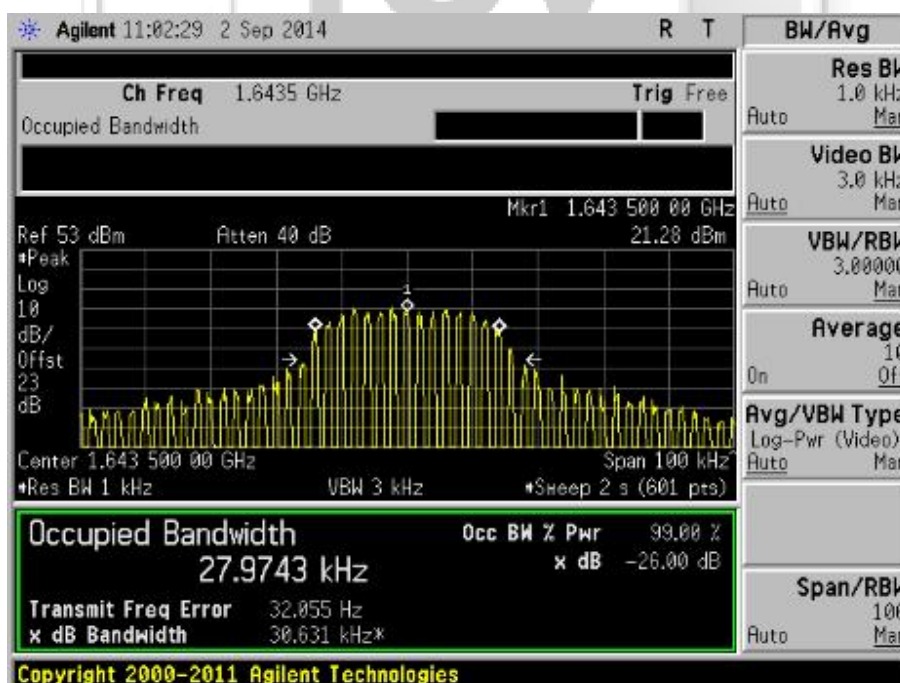
Plot 141 – Upper Channel

# UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

## 26dB Bandwidth Plots – TCH9



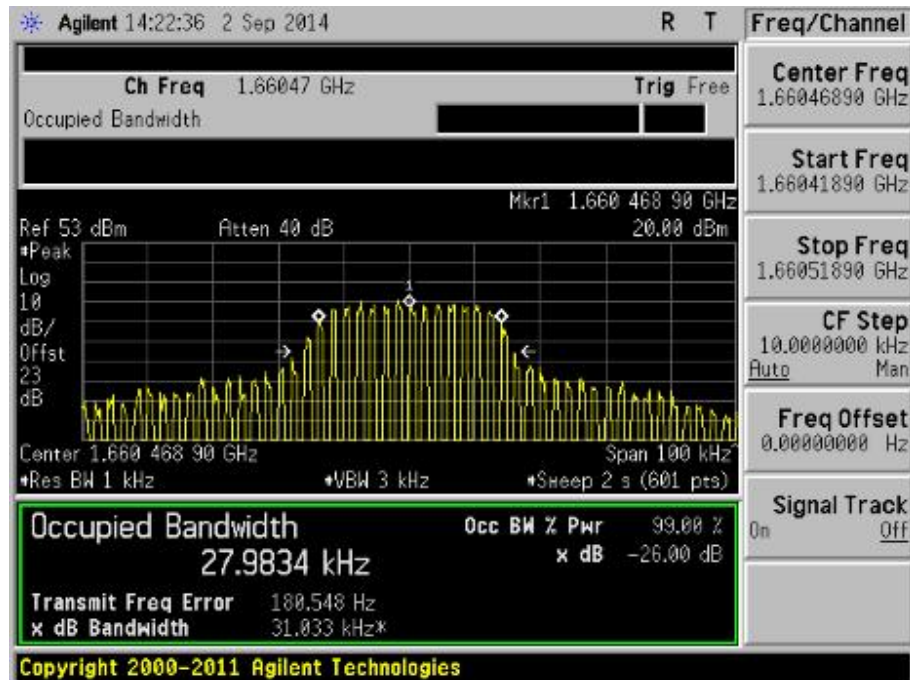
Plot 142 – Lower Channel



Plot 143 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – TCH9

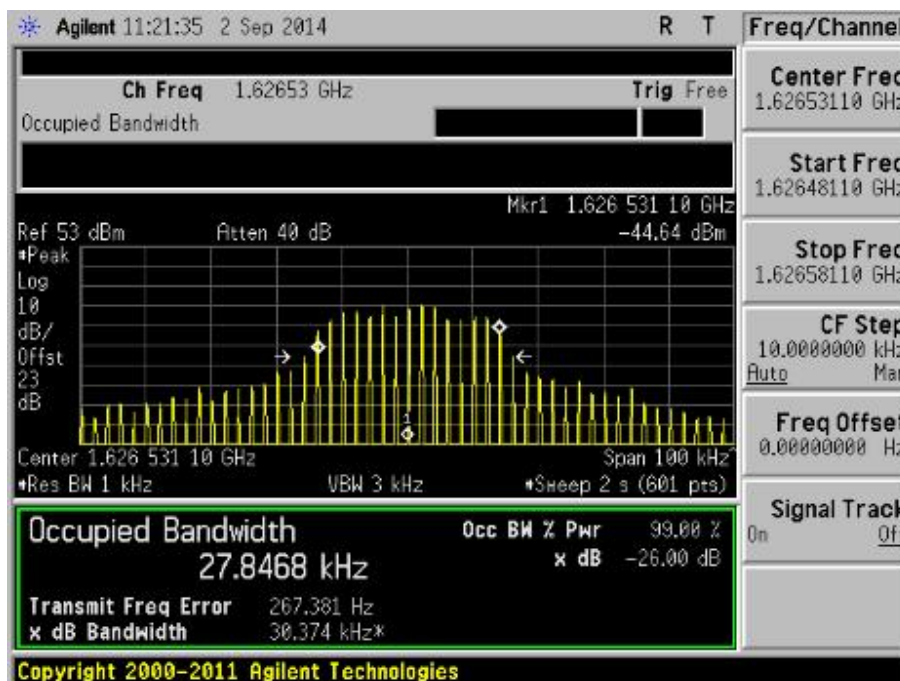


Plot 144 – Upper Channel

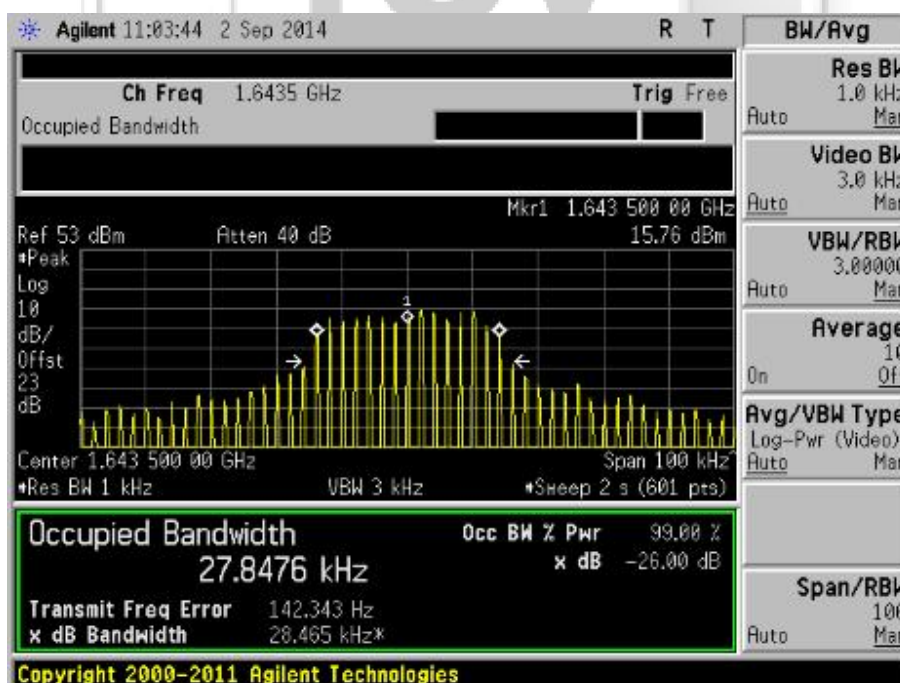


# UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

## 26dB Bandwidth Plots – PAB



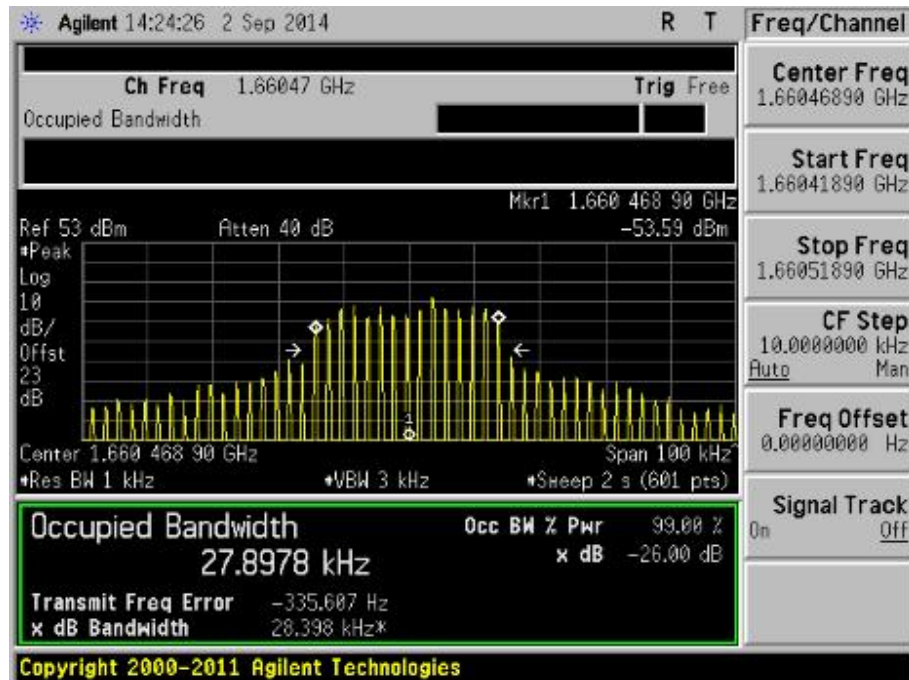
Plot 145 – Lower Channel



Plot 146 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

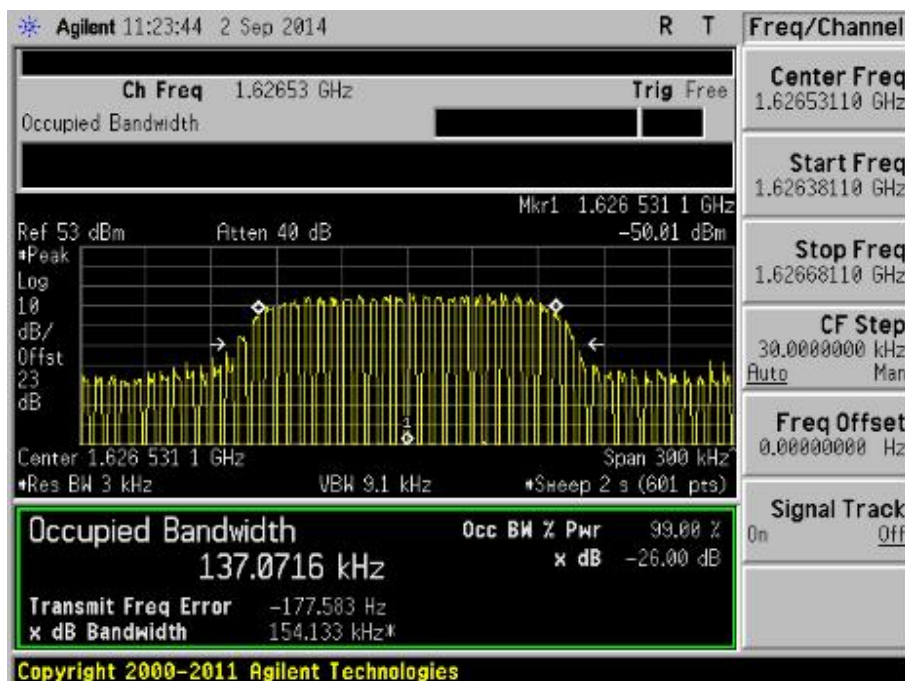
### 26dB Bandwidth Plots – PAB



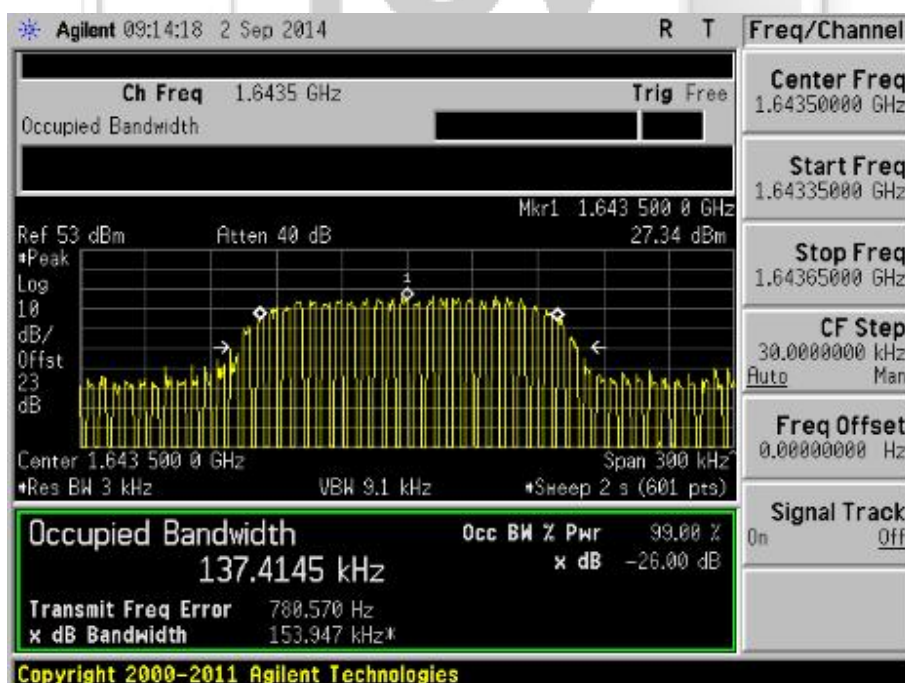
Plot 147 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – PNB512\_12\_QPSK



Plot 148 – Lower Channel

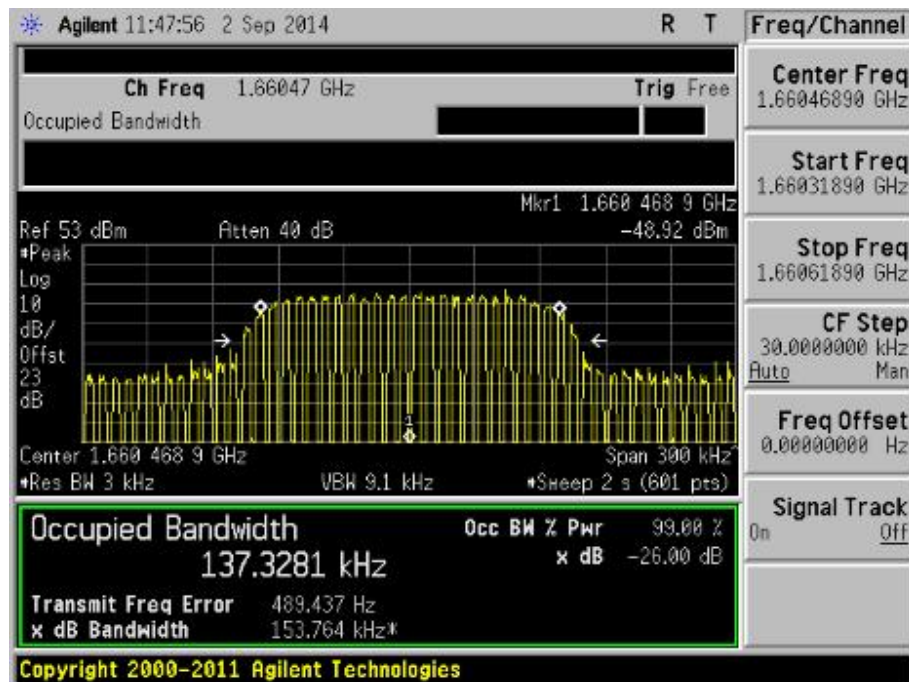


Plot 149 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

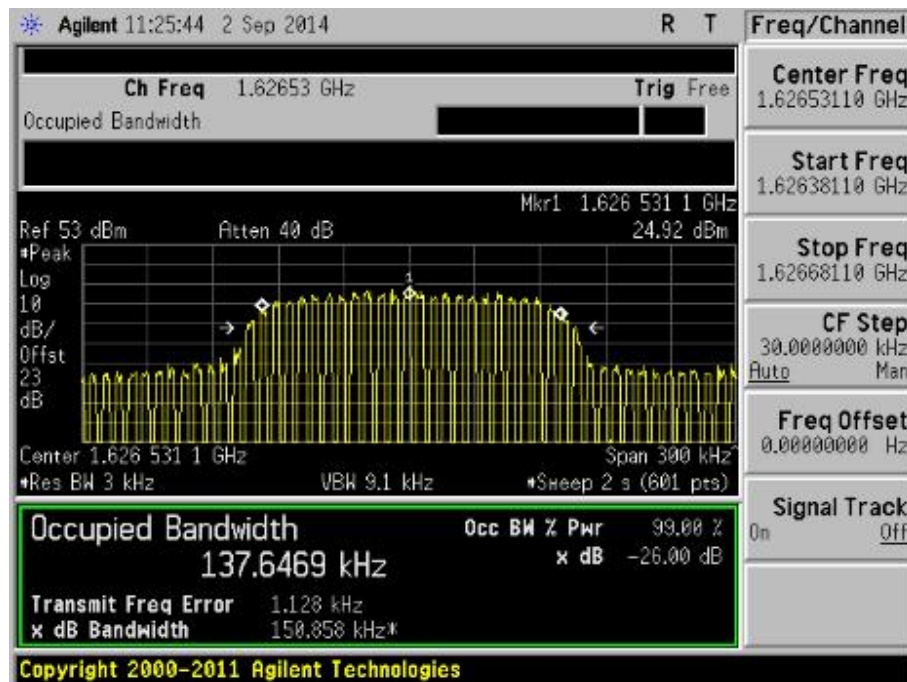
### 26dB Bandwidth Plots – PNB512\_12\_QPSK



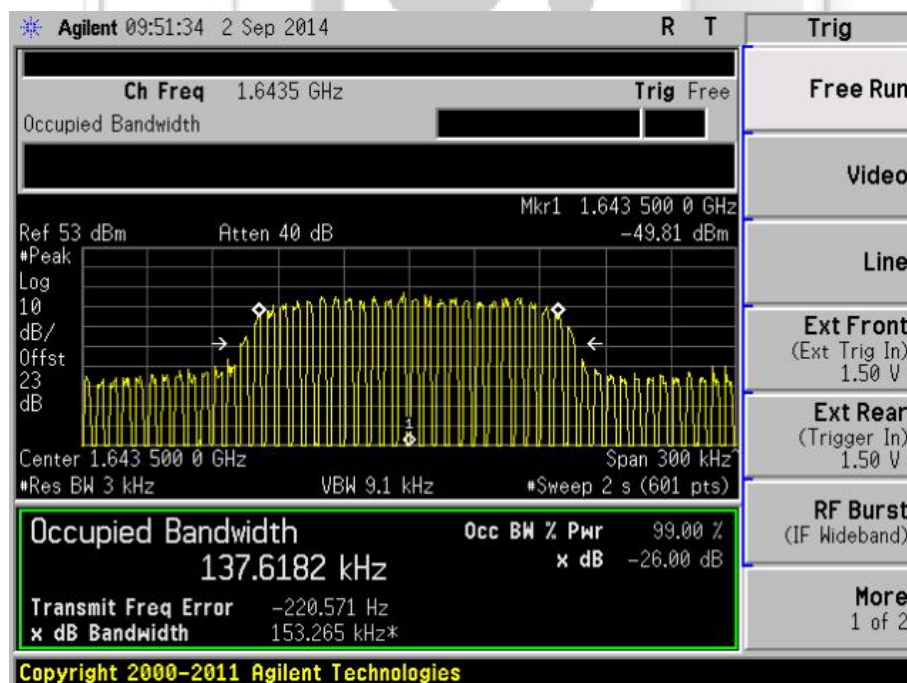
Plot 150 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB512\_23\_16APSK



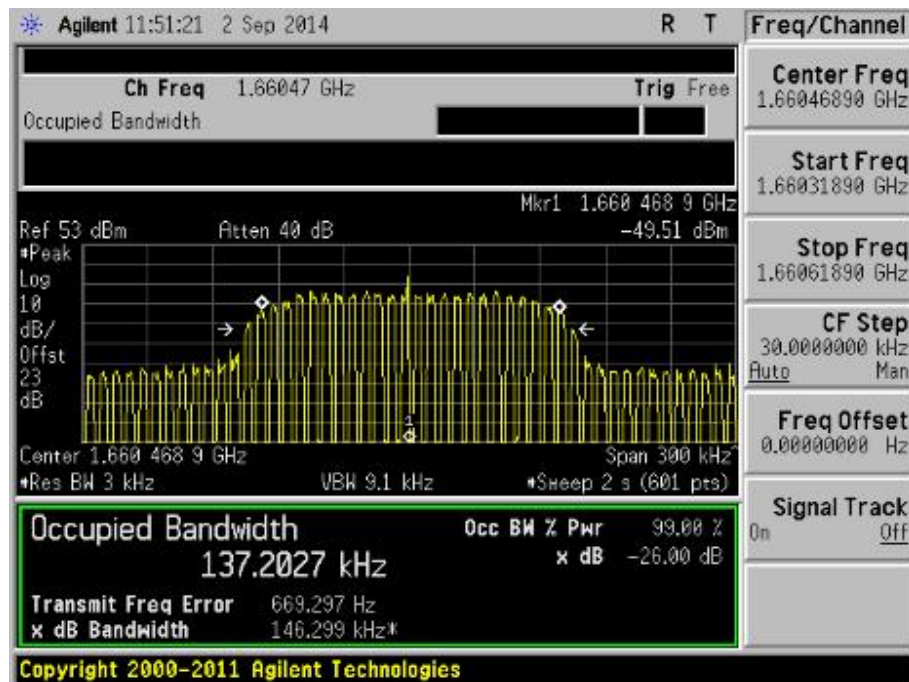
Plot 151 – Lower Channel



Plot 152 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

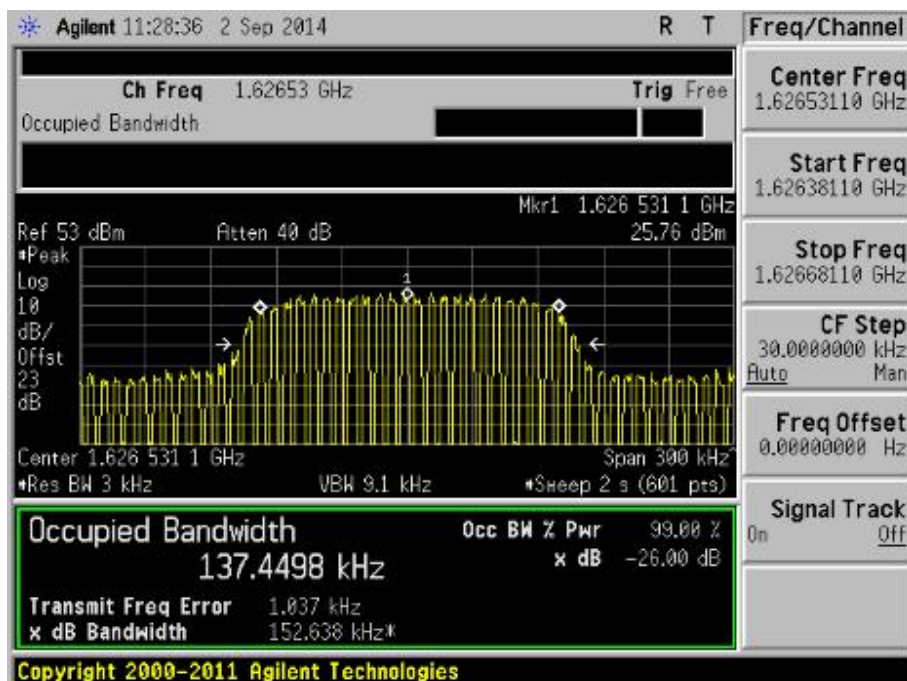
### 26dB Bandwidth Plots – PNB512\_23\_16APSK



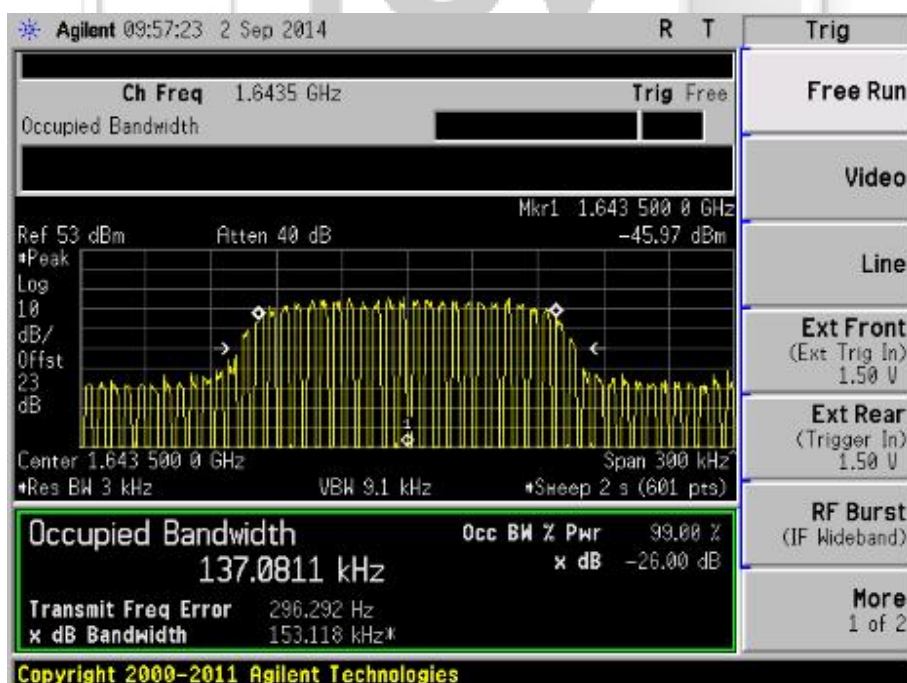
Plot 153 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### 26dB Bandwidth Plots – PNB512\_23\_QPSK



Plot 154 – Lower Channel

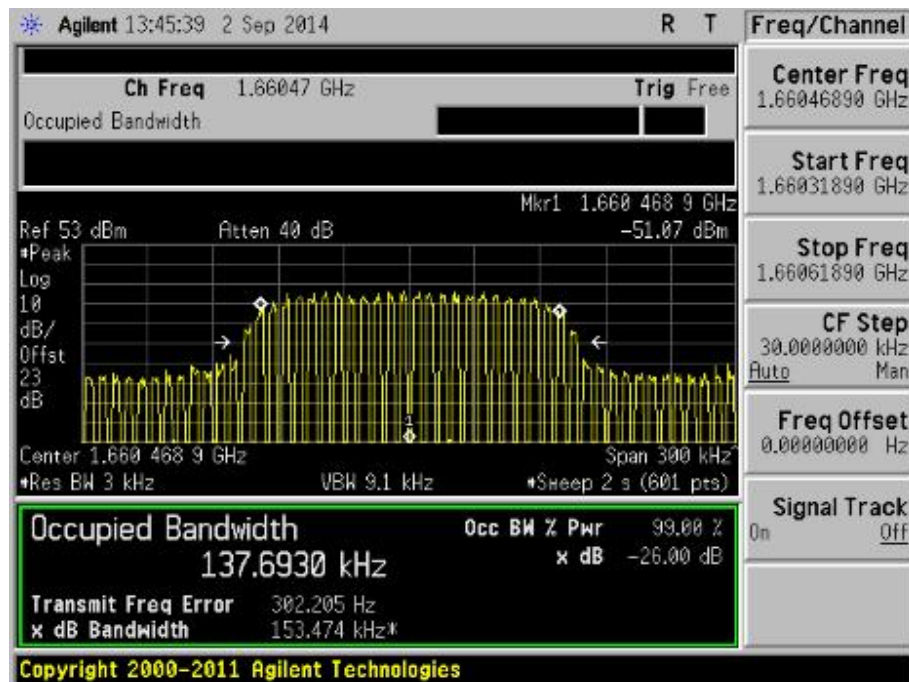


Plot 155 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

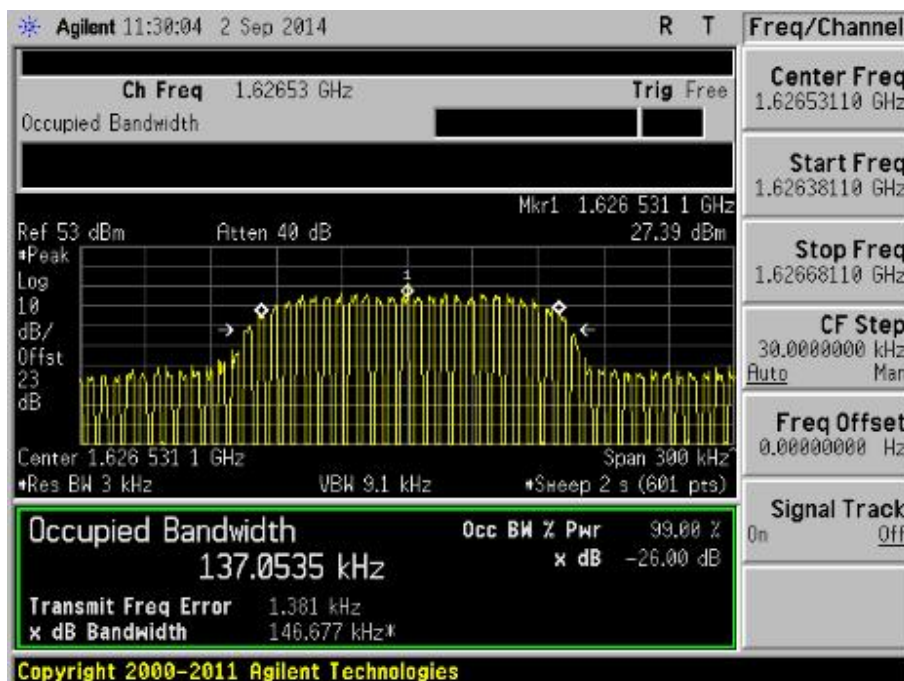
### 26dB Bandwidth Plots – PNB512\_23\_QPSK



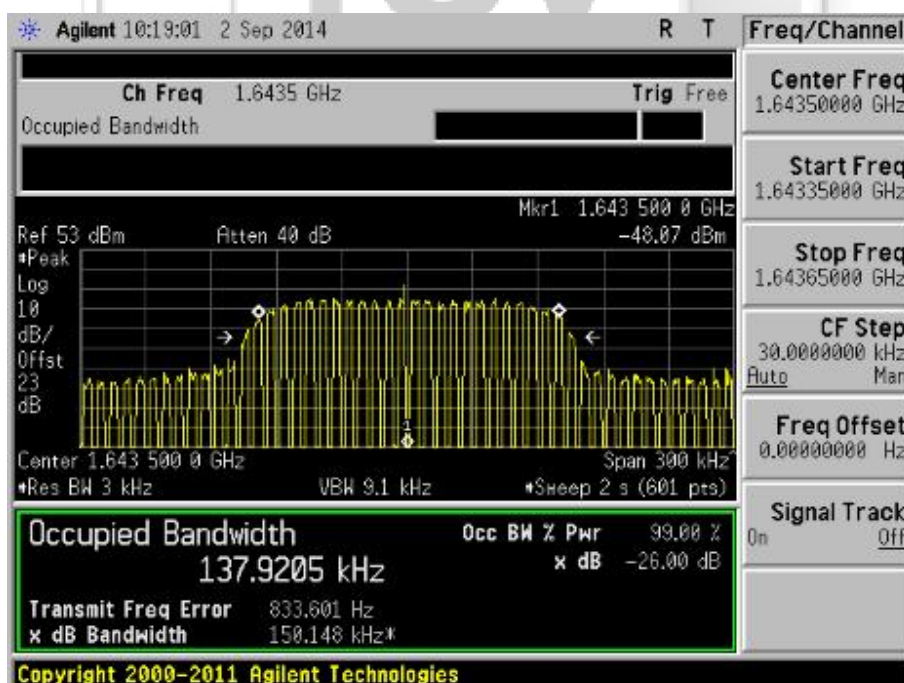
Plot 156 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB512\_45\_16APSK



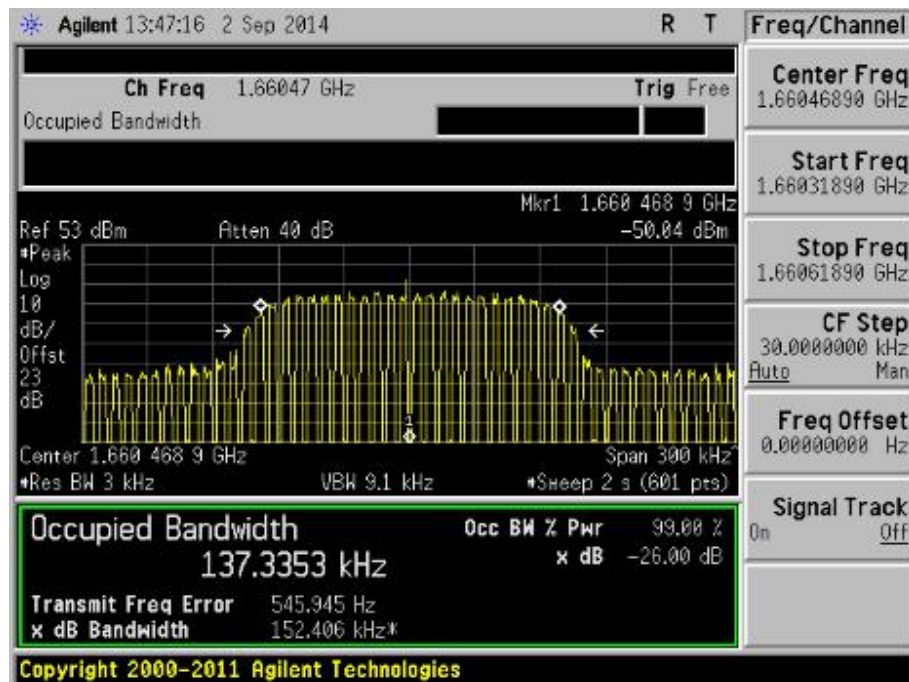
Plot 157 – Lower Channel



Plot 158 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

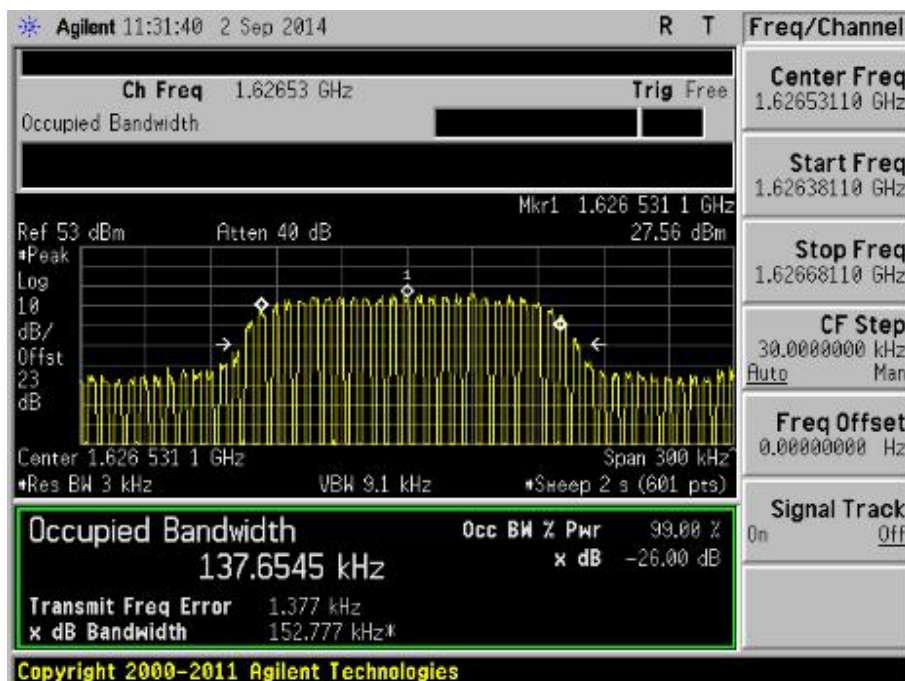
### 26dB Bandwidth Plots – PNB512\_45\_16APSK



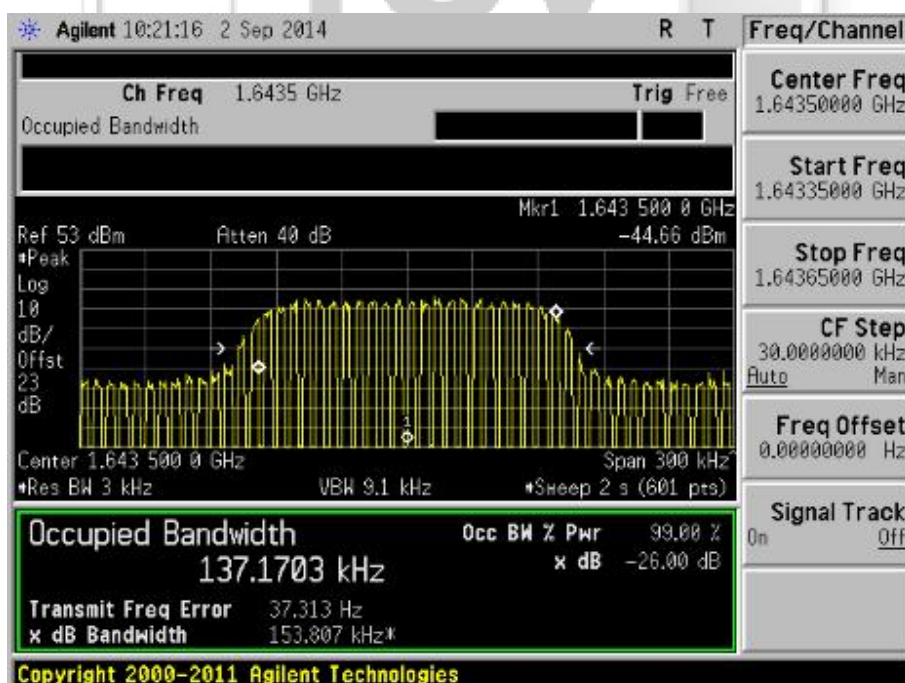
Plot 159 – Upper Channel

# UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

## 26dB Bandwidth Plots – PNB512\_45\_QPSK



Plot 160 – Lower Channel

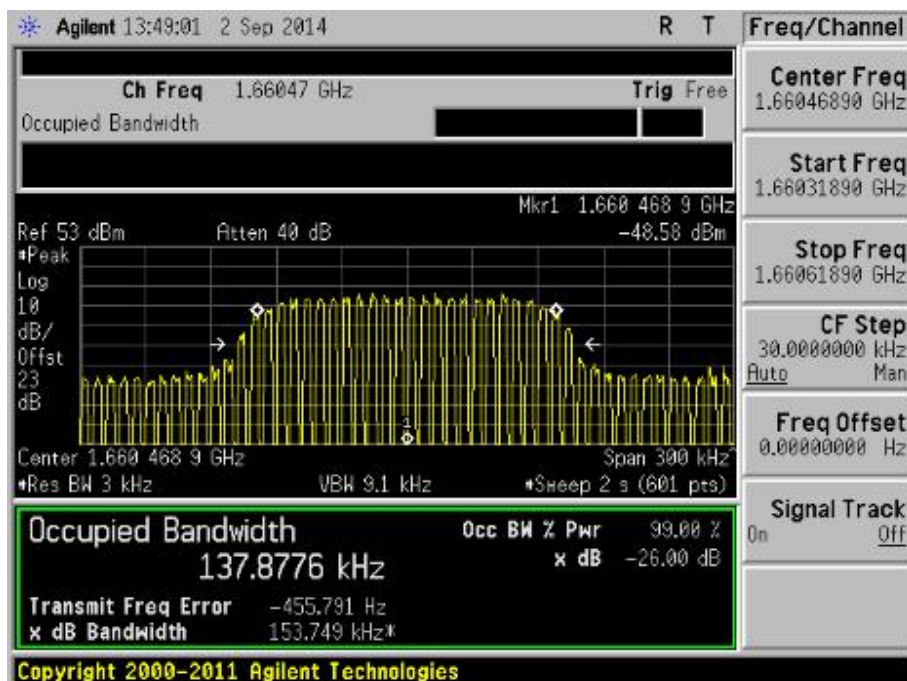


Plot 161 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

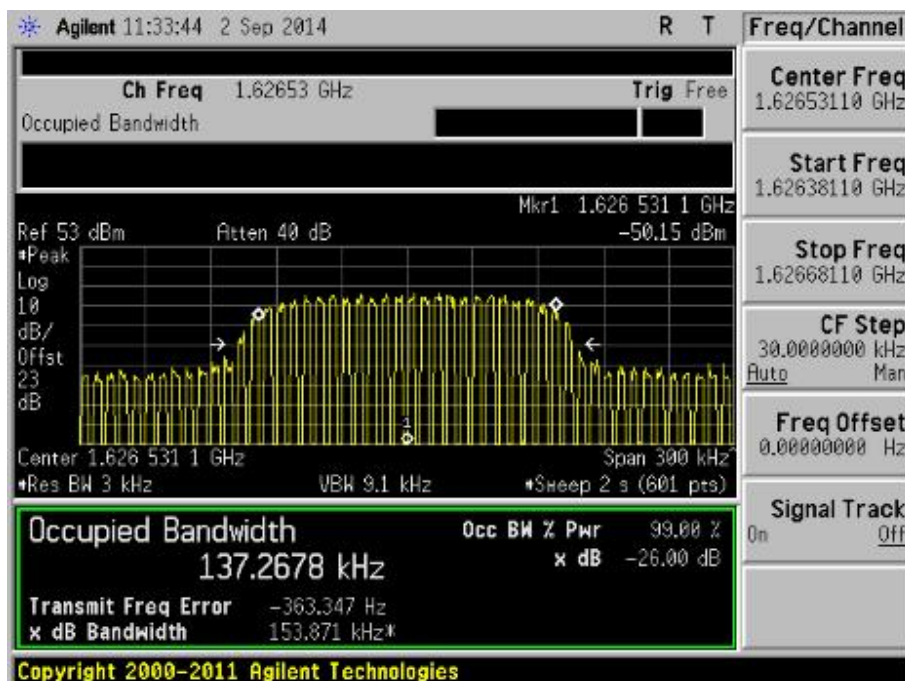
### 26dB Bandwidth Plots – PNB512\_45\_QPSK



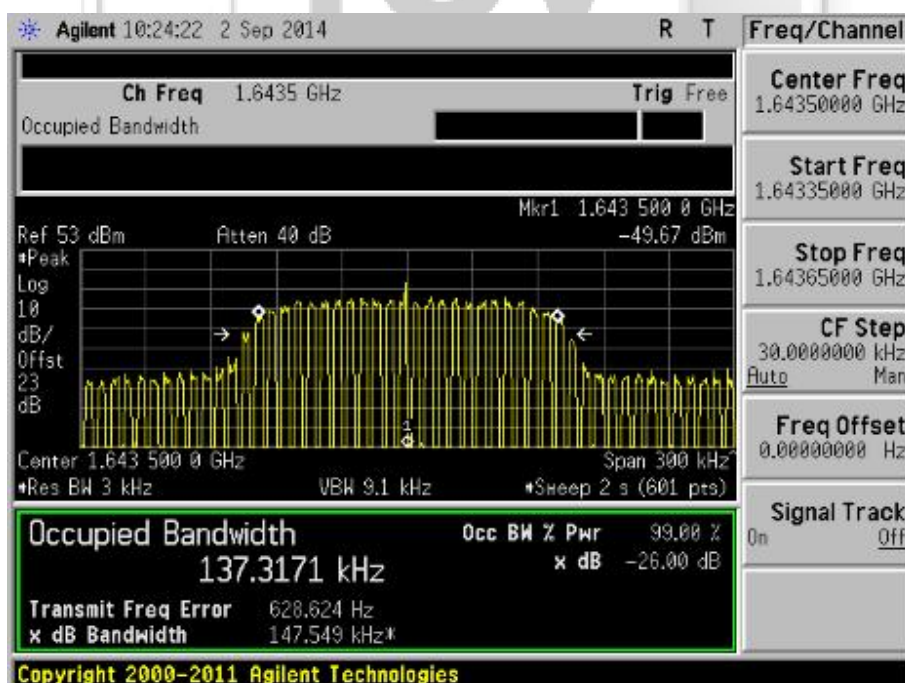
Plot 162 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB512\_910\_16APSK



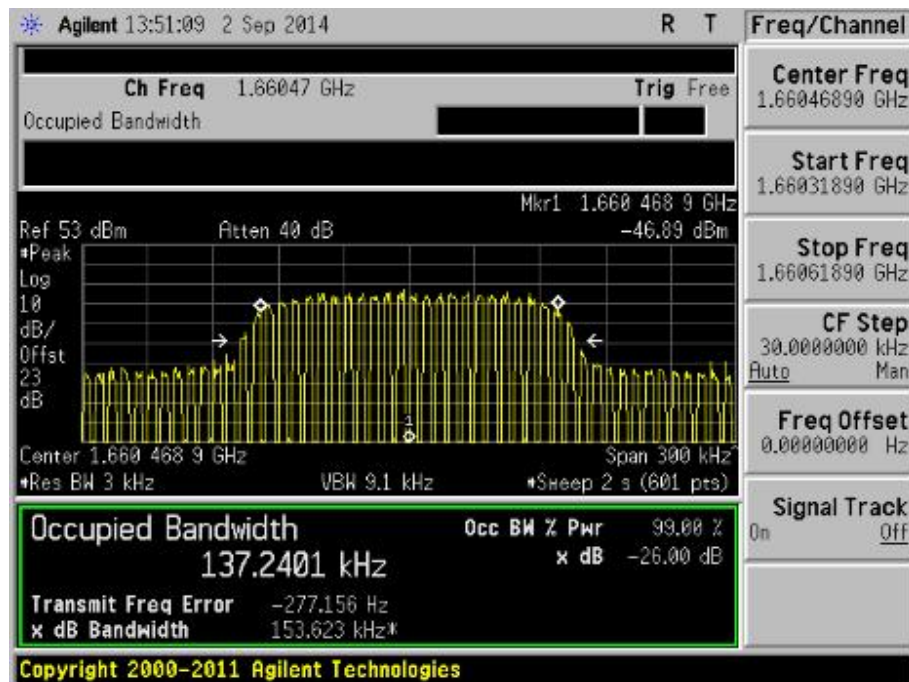
Plot 163 – Lower Channel



Plot 164 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

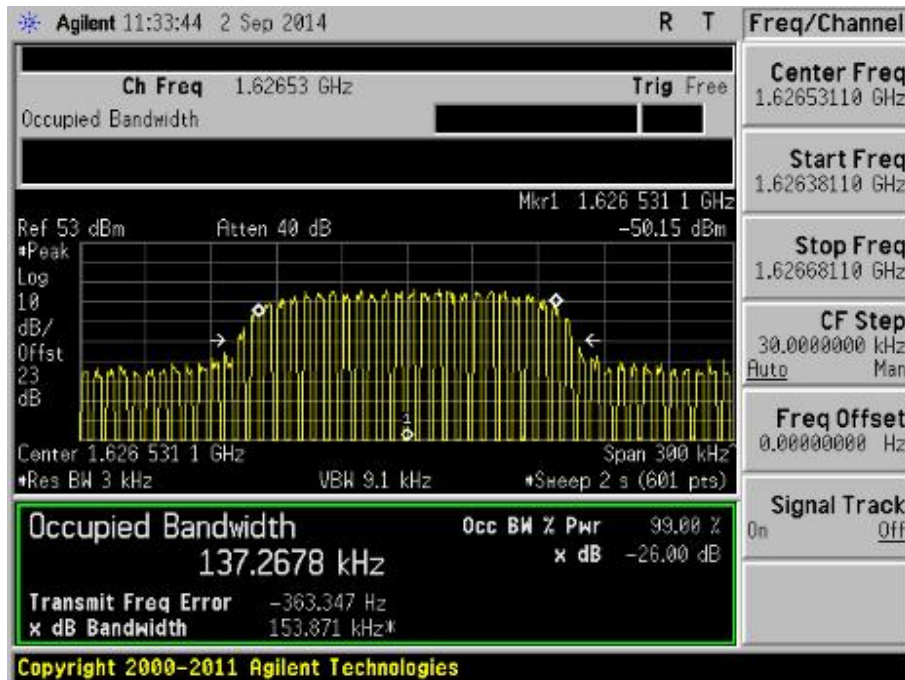
### 26dB Bandwidth Plots – PNB512\_910\_16APSK



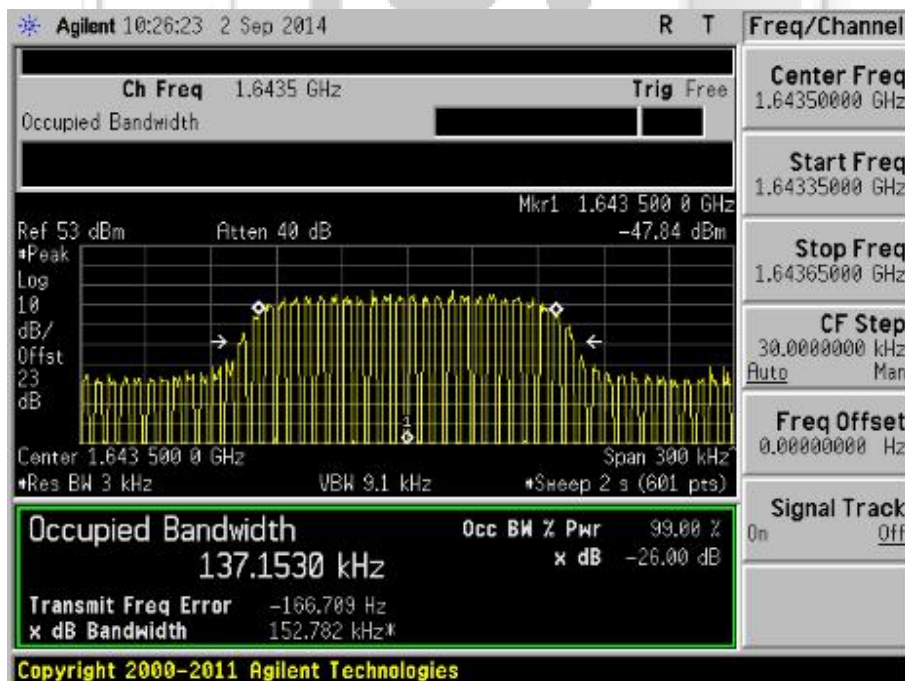
Plot 165 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB512\_910\_QPSK



Plot 166 – Lower Channel

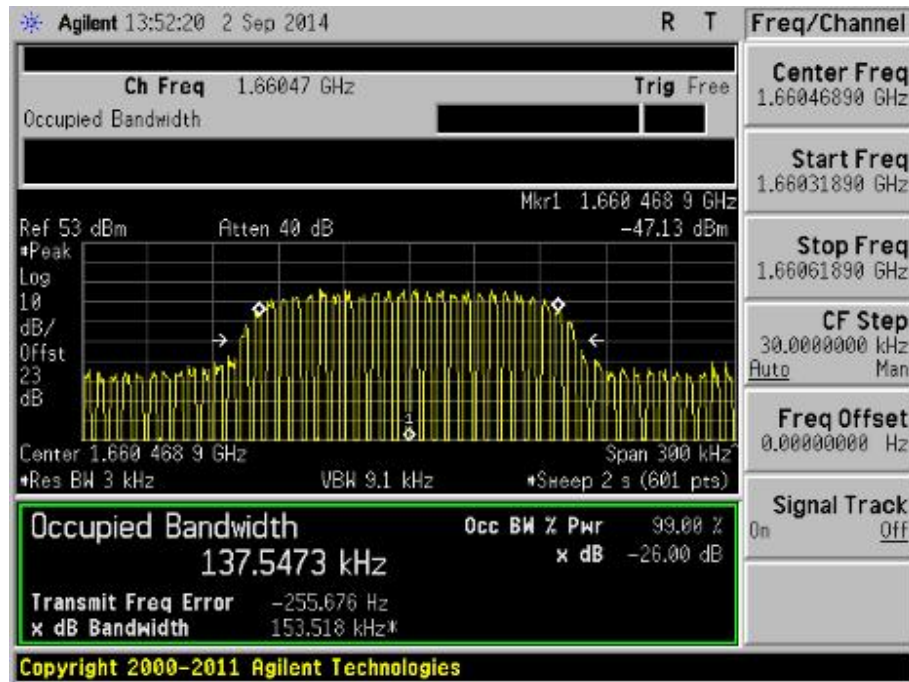


Plot 167 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

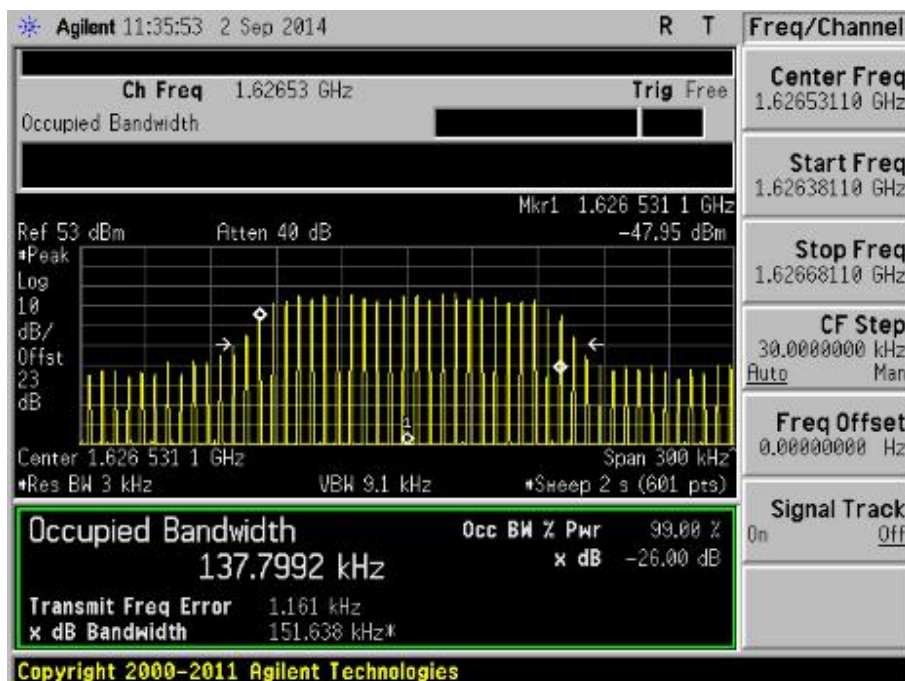
26dB Bandwidth Plots – PNB512\_910\_QPSK



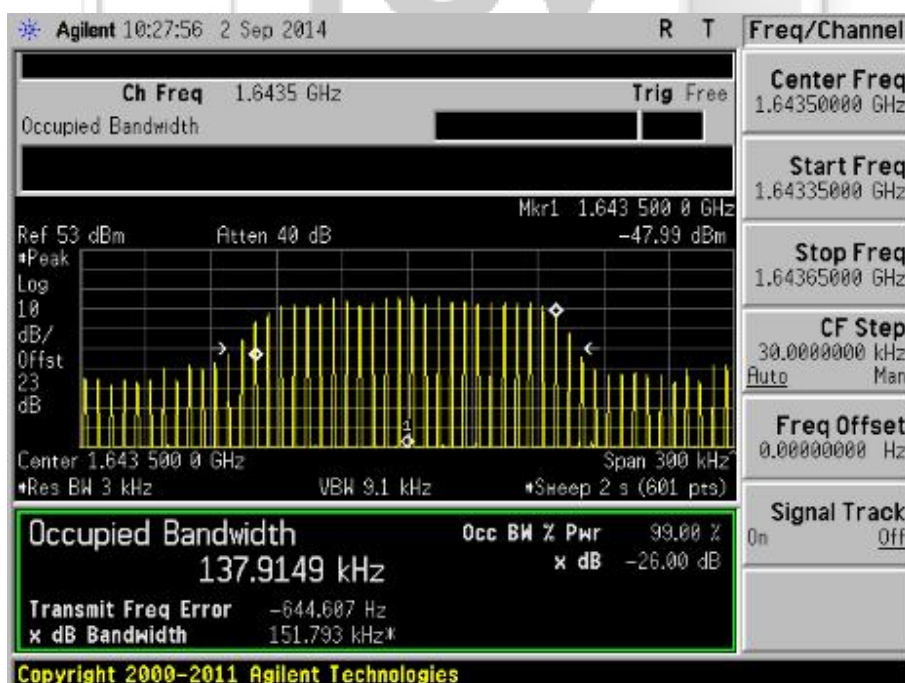
Plot 168 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB53\_12\_QPSK



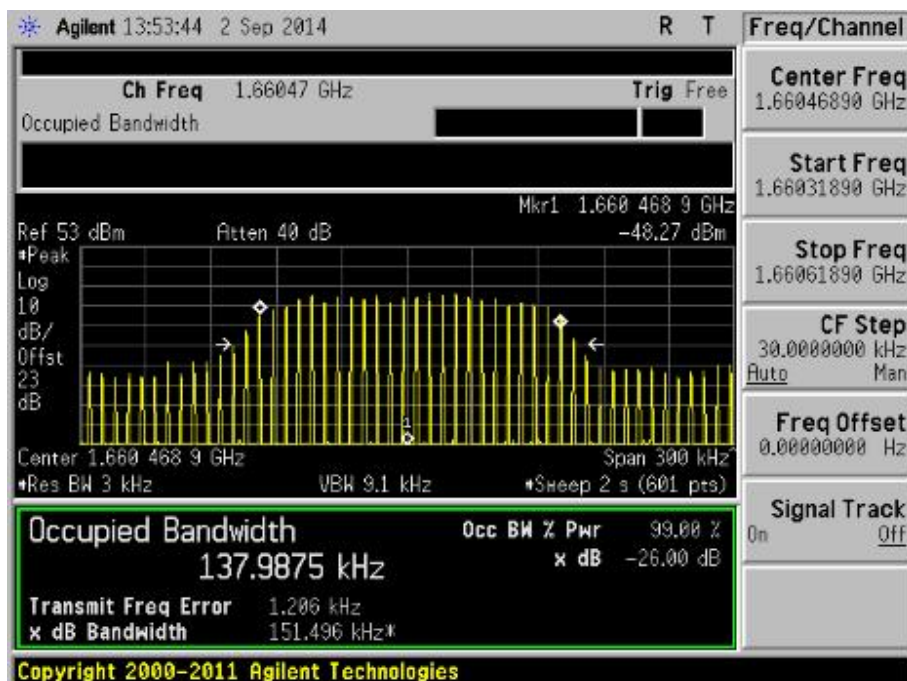
Plot 169 – Lower Channel



Plot 170 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

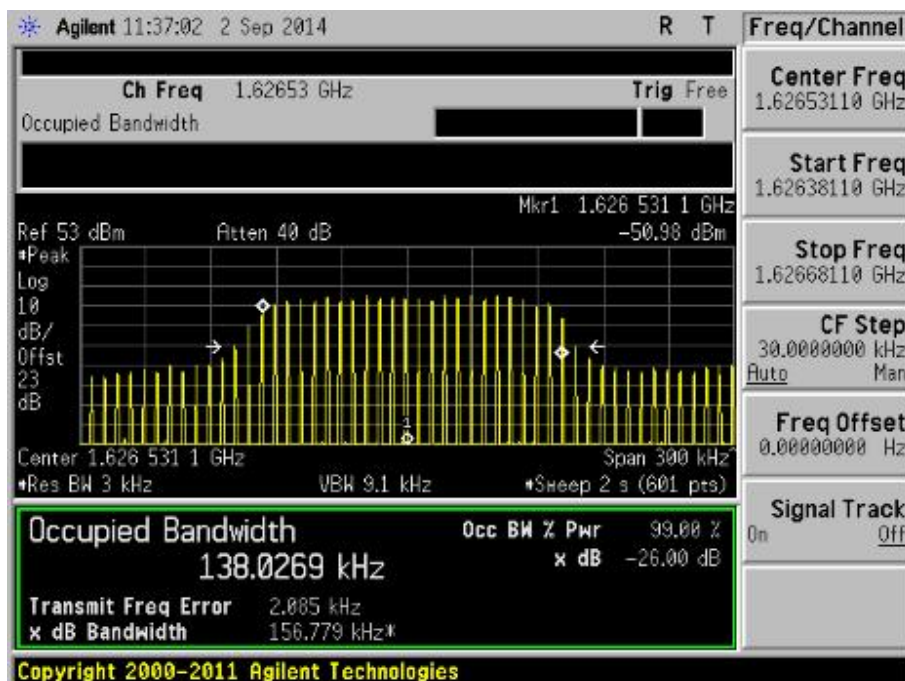
### 26dB Bandwidth Plots – PNB53\_12\_QPSK



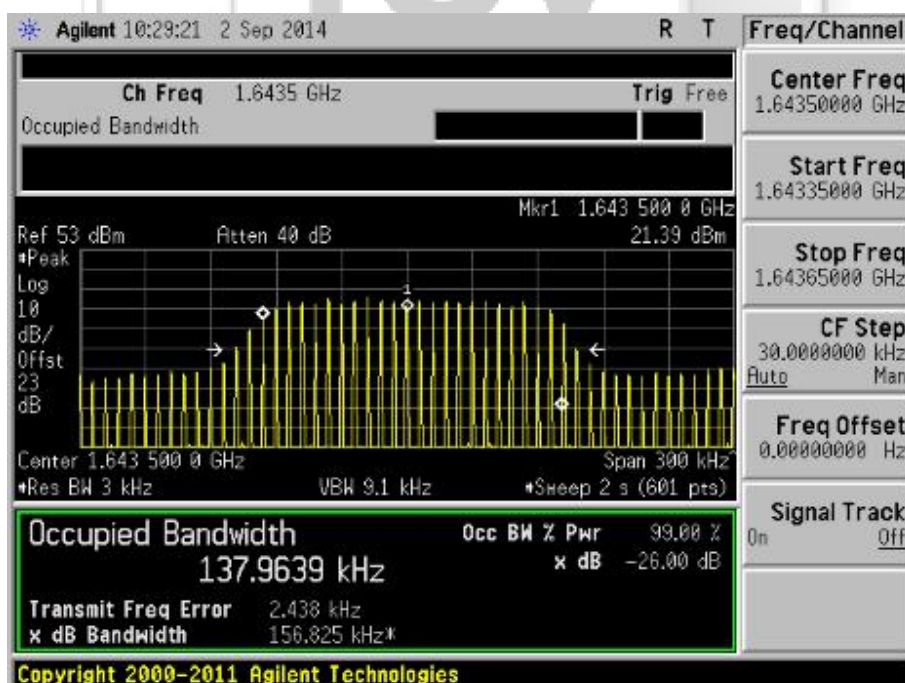
Plot 171 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB53\_23\_16APSK



Plot 172 – Lower Channel

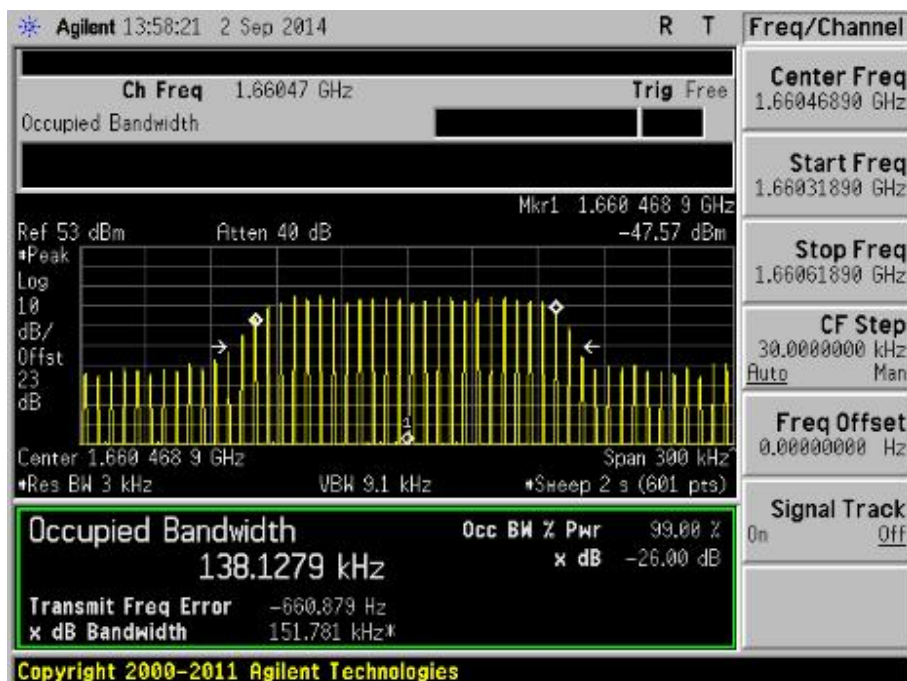


Plot 173 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

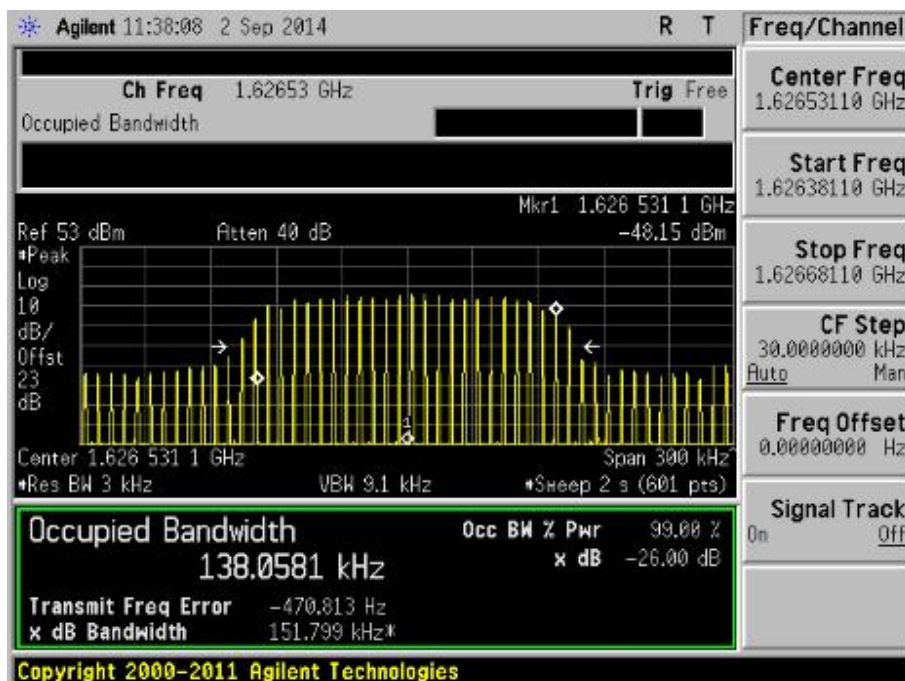
### 26dB Bandwidth Plots – PNB53\_23\_16APSK



Plot 174 – Upper Channel

# UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

## 26dB Bandwidth Plots – PNB53\_23\_QPSK



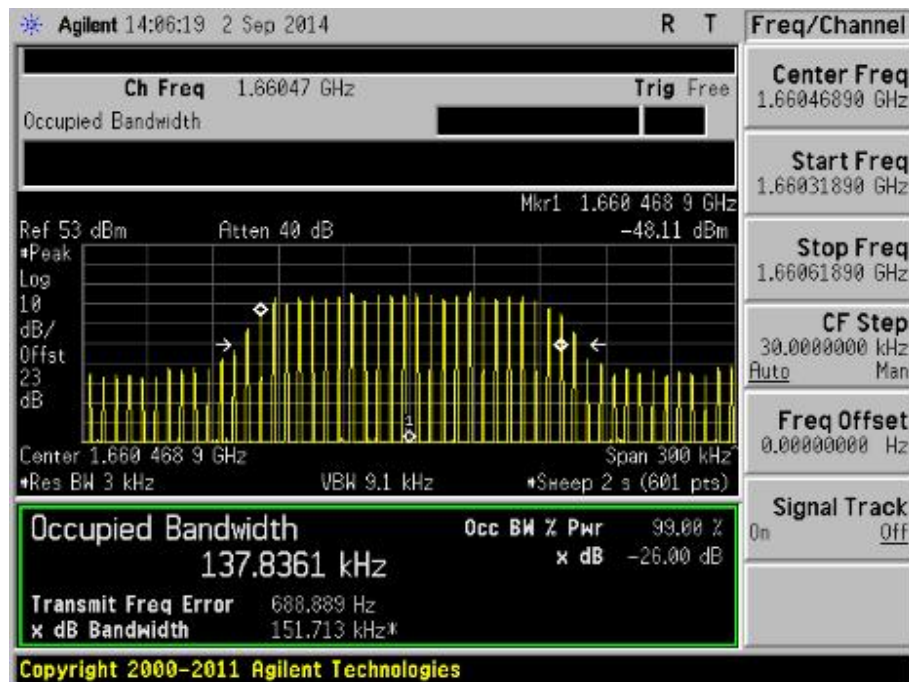
Plot 175 – Lower Channel



Plot 176 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

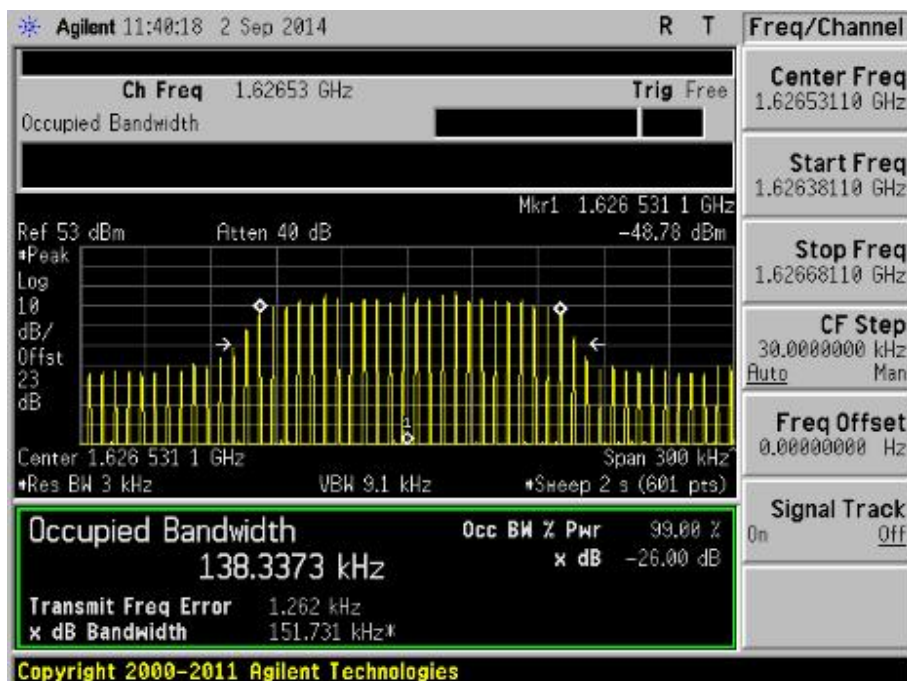
26dB Bandwidth Plots – PNB53\_23\_QPSK



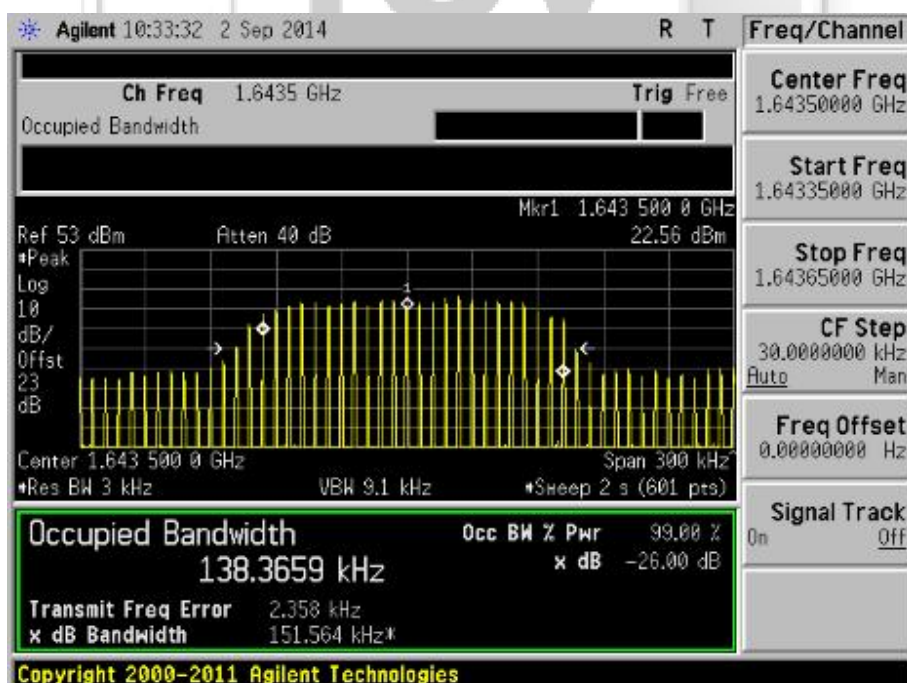
Plot 177 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB53\_45\_16APSK



Plot 178 – Lower Channel

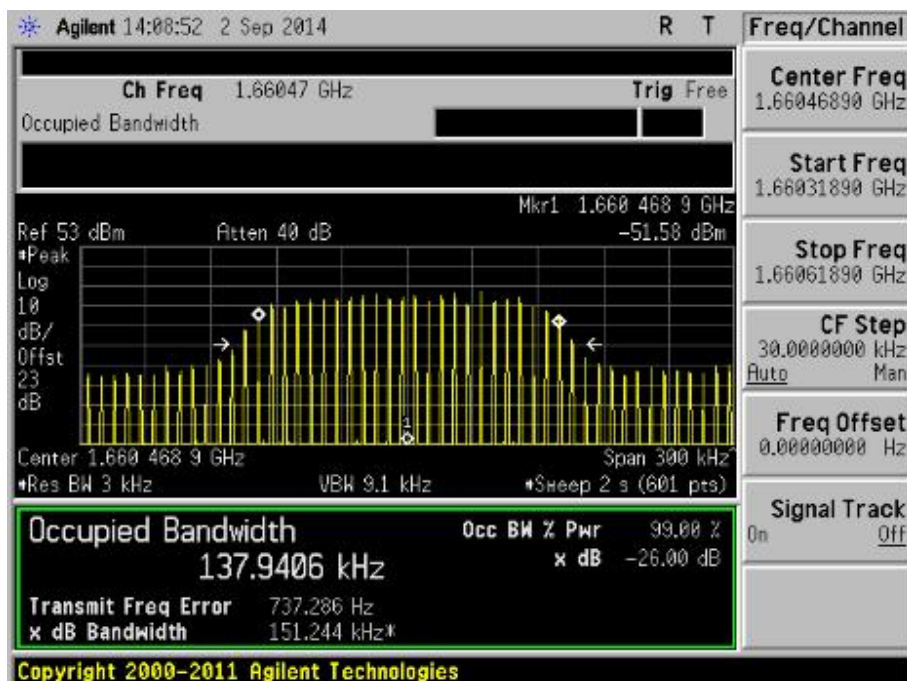


Plot 179 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

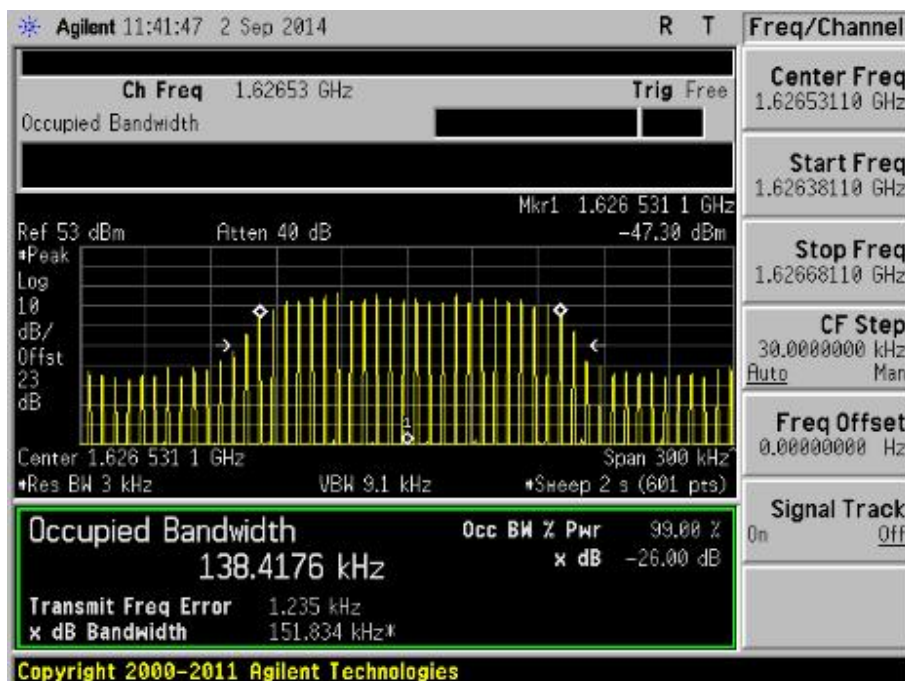
### 26dB Bandwidth Plots – PNB53\_45\_16APSK



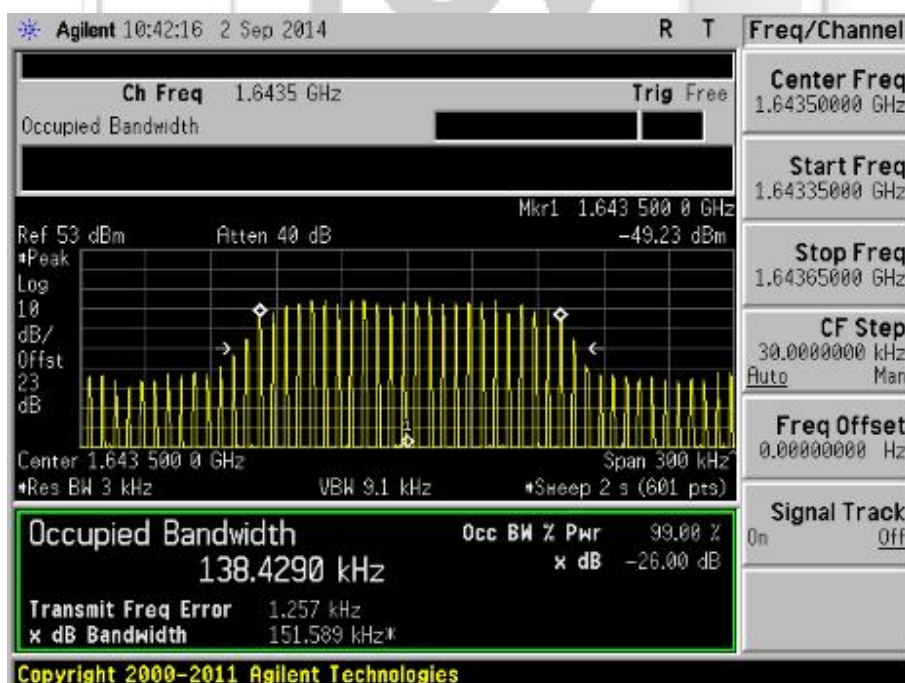
Plot 180 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB53\_45\_QPSK



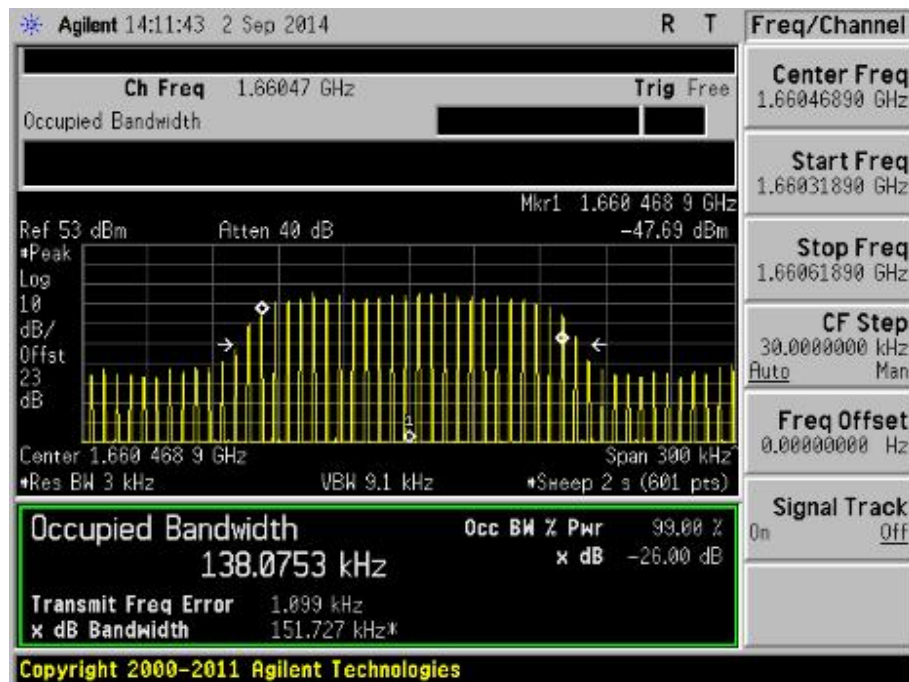
Plot 181 – Lower Channel



Plot 182 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

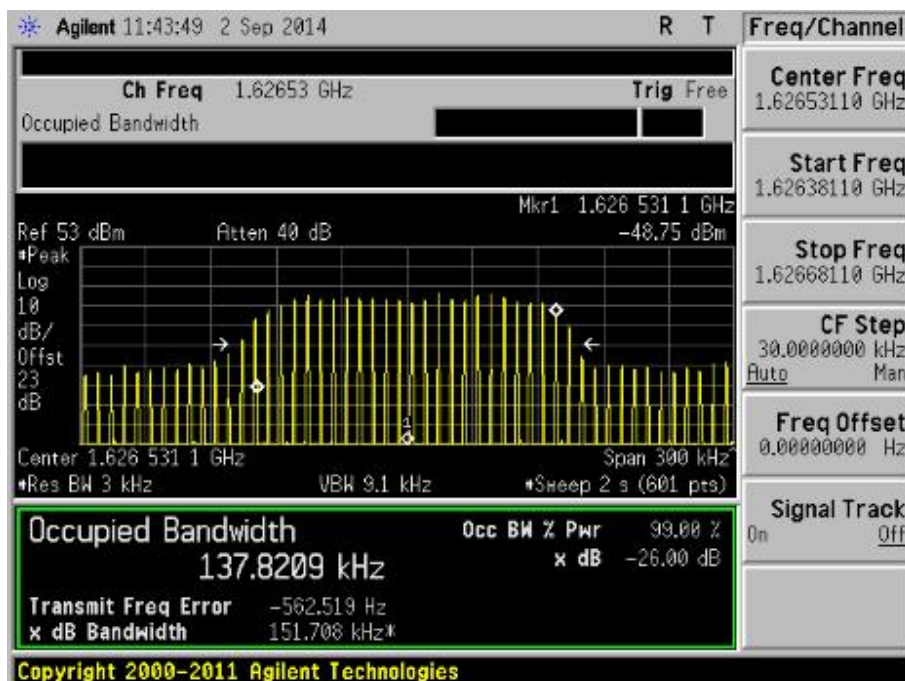
26dB Bandwidth Plots – PNB53\_45\_QPSK



Plot 183 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB53\_910\_16APSK



Plot 184 – Lower Channel

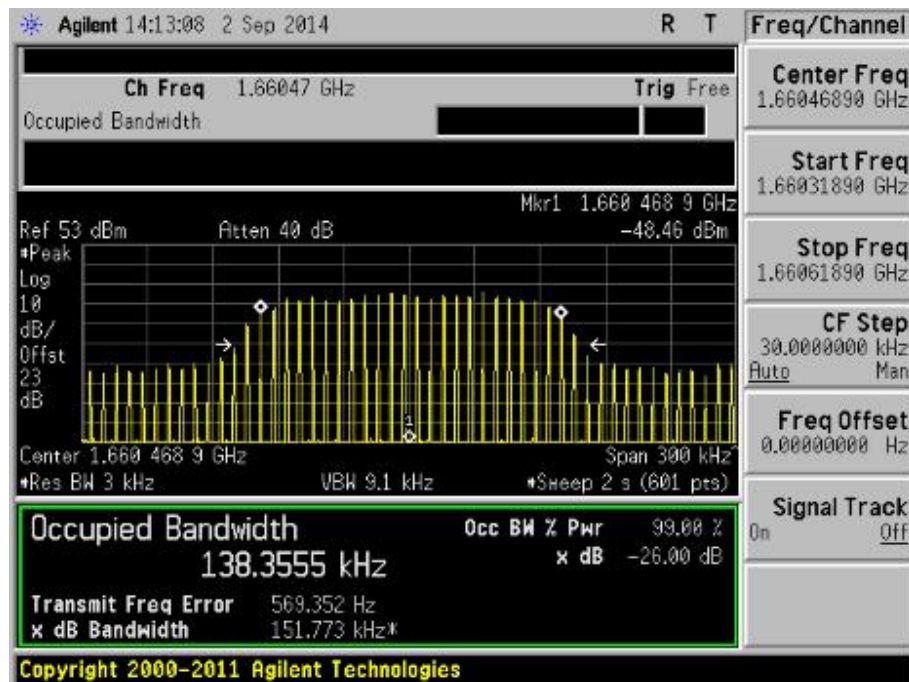


Plot 185 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

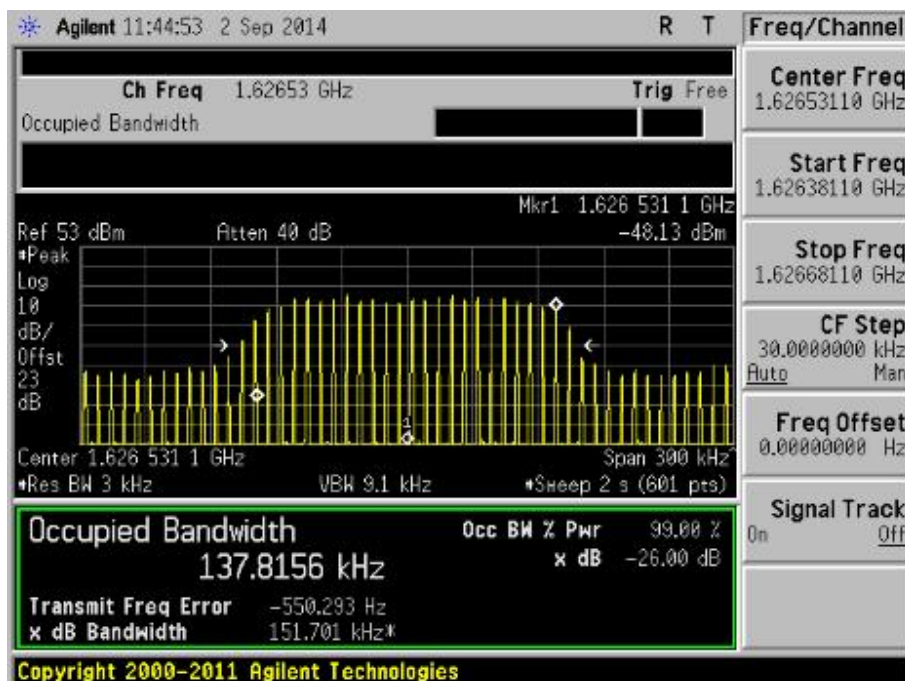
### 26dB Bandwidth Plots – PNB53\_910\_16APSK



Plot 186 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

26dB Bandwidth Plots – PNB53\_910\_QPSK



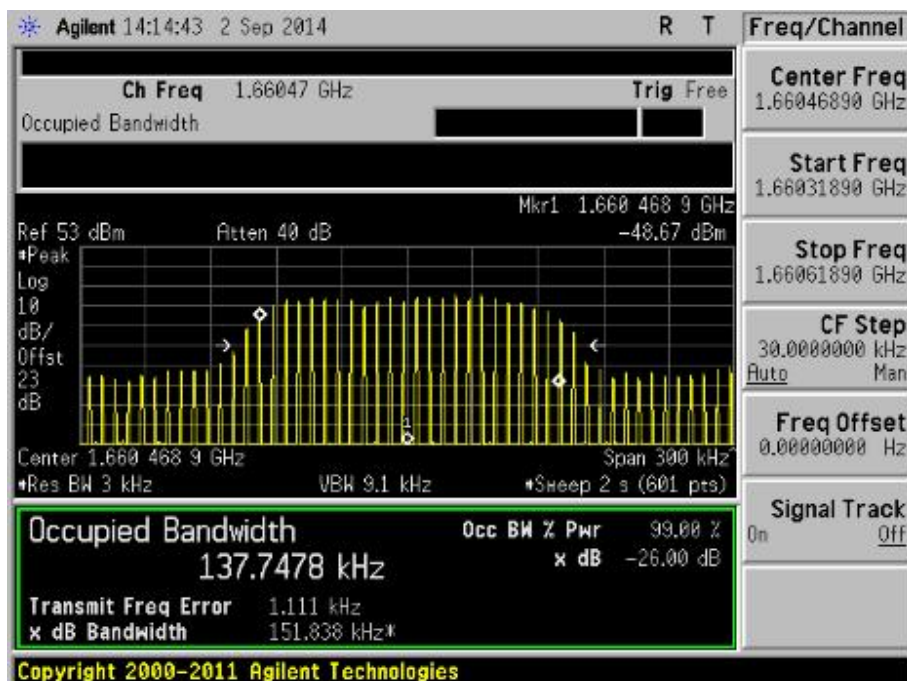
Plot 187 – Lower Channel



Plot 188 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

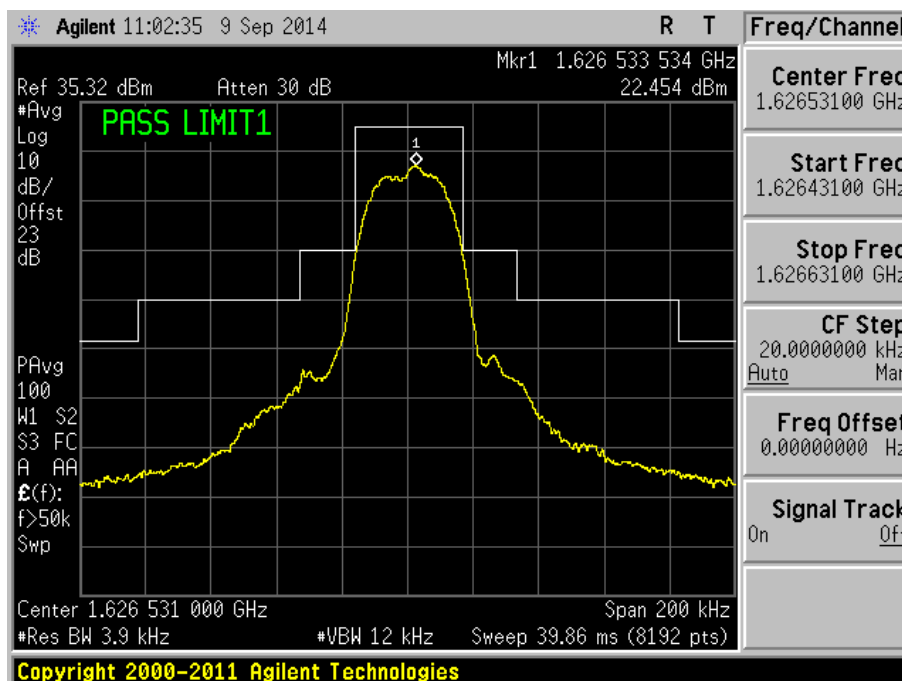
### 26dB Bandwidth Plots – PNB53\_910\_QPSK



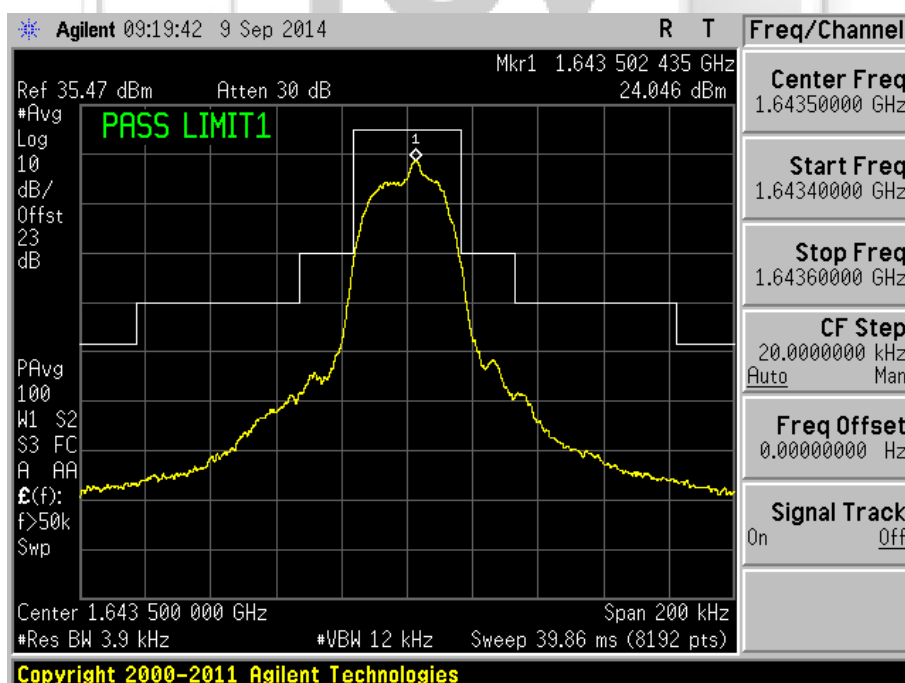
Plot 189 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### In Band Emissions Plots – RACH



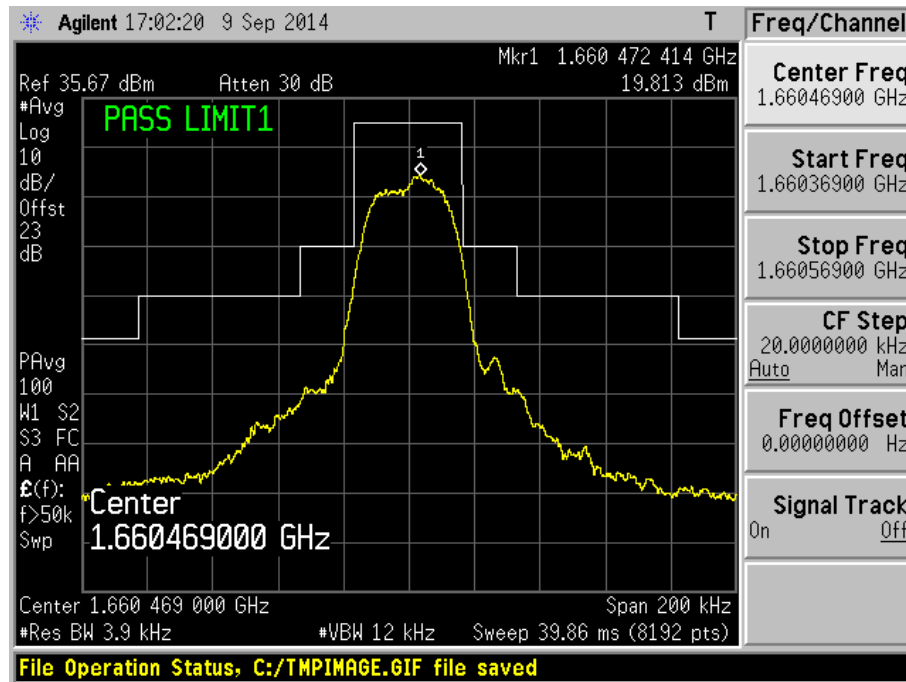
Plot 190 - Lower Channel



Plot 191 - Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

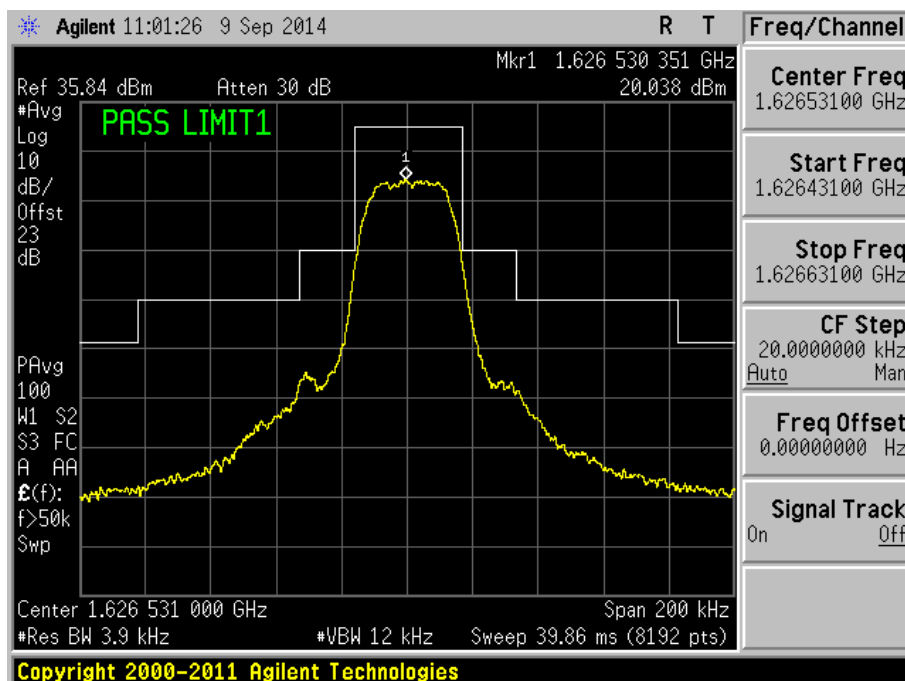
In Band Emissions Plots – RACH



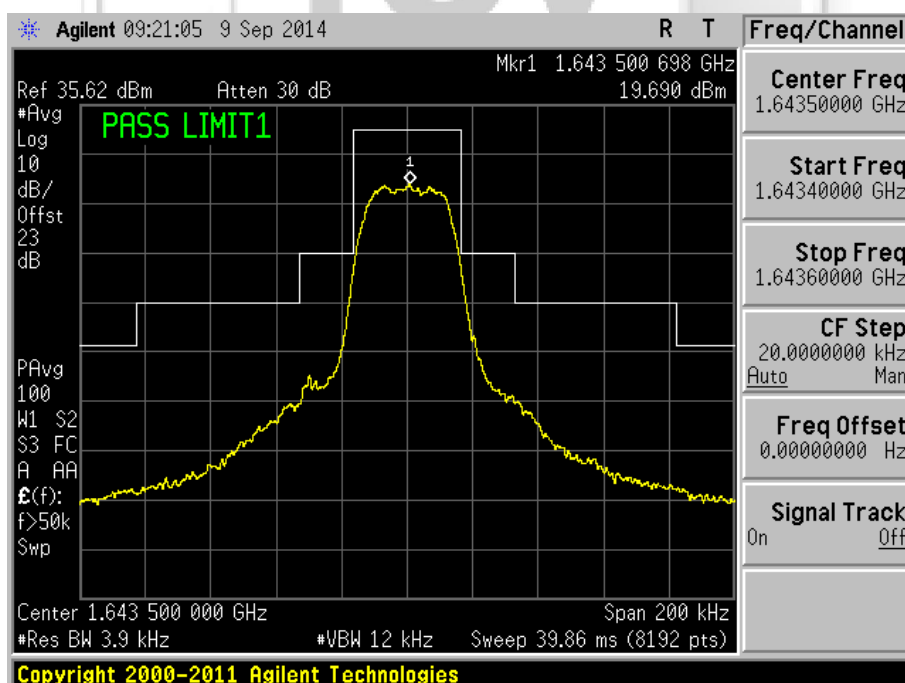
Plot 192 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### In Band Emissions Plots –AGCH



Plot 193 – Lower Channel

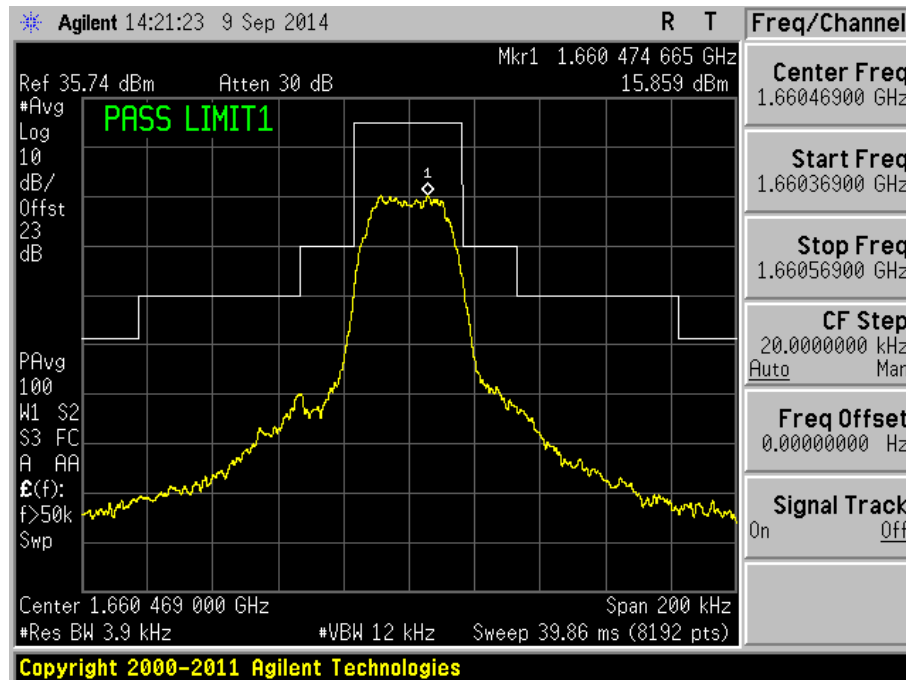


Plot 194 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### In Band Emissions Plots – AGCH

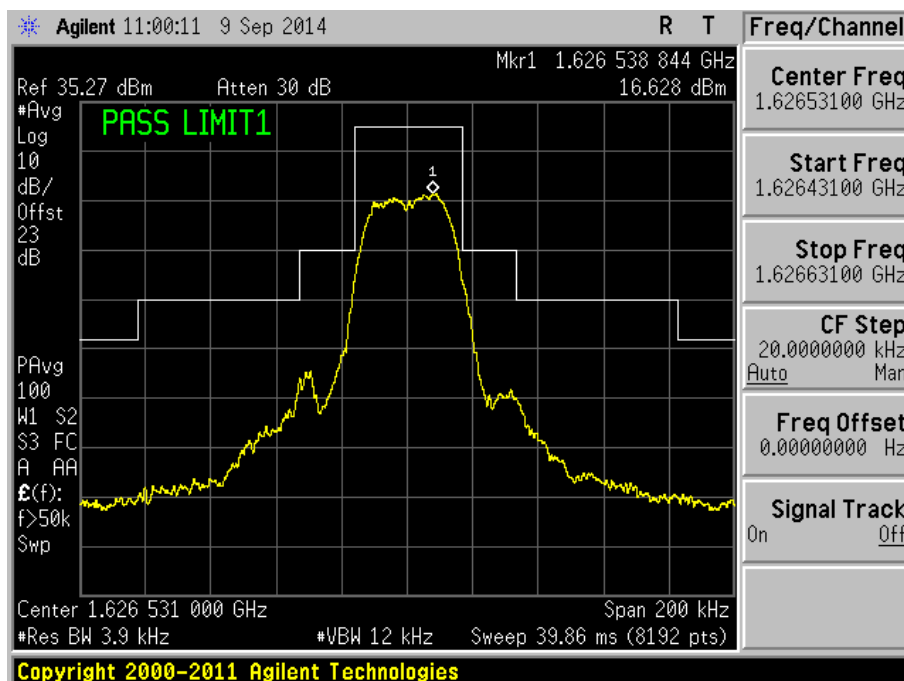


Plot 195 – Upper Channel

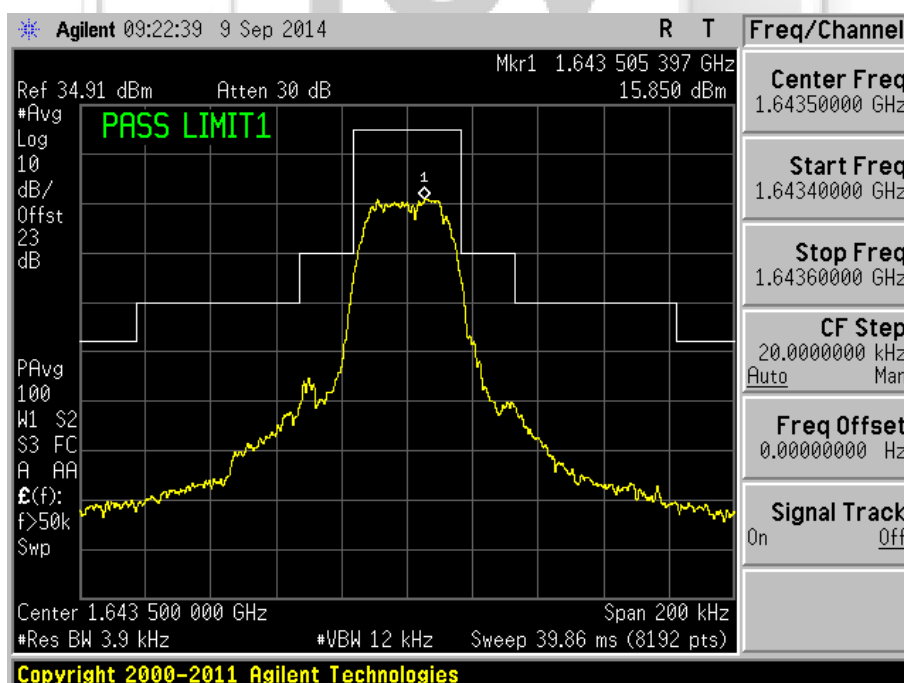


## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### In Band Emissions Plots – FACCH



Plot 196 – Lower Channel

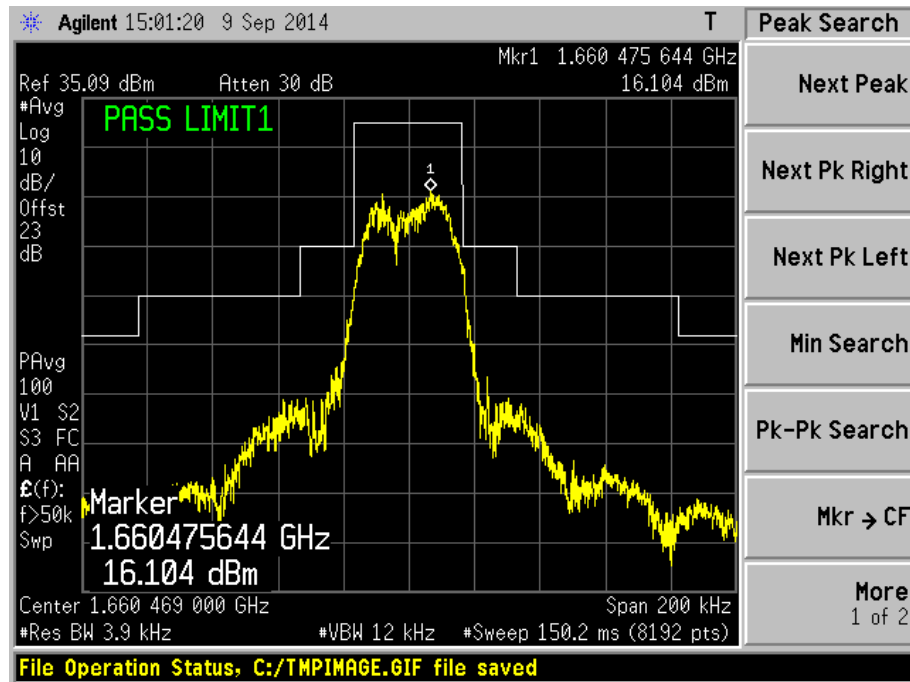


Plot 197 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

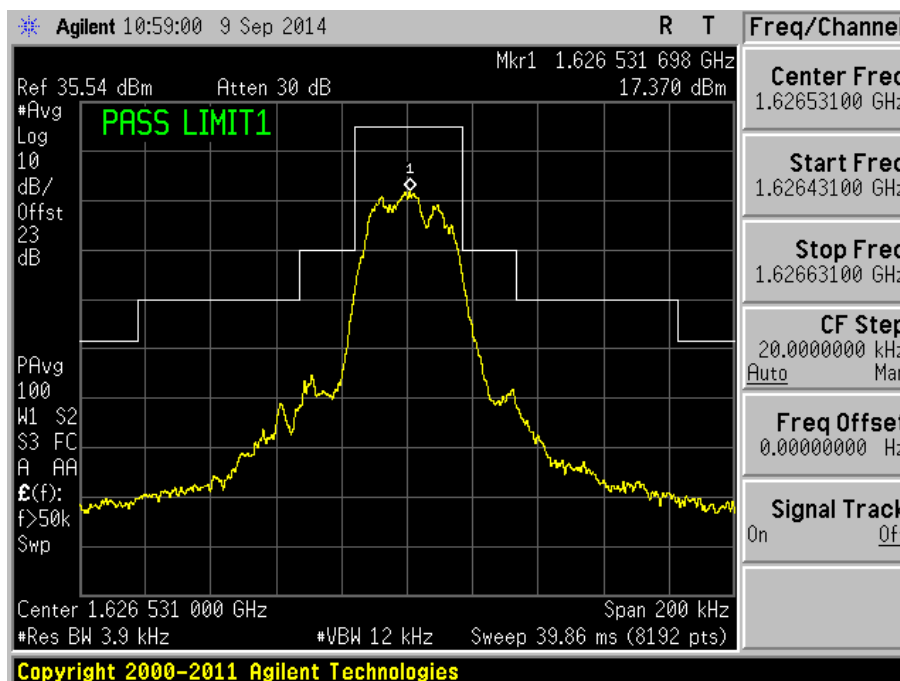
In Band Emissions Plots – FACCH



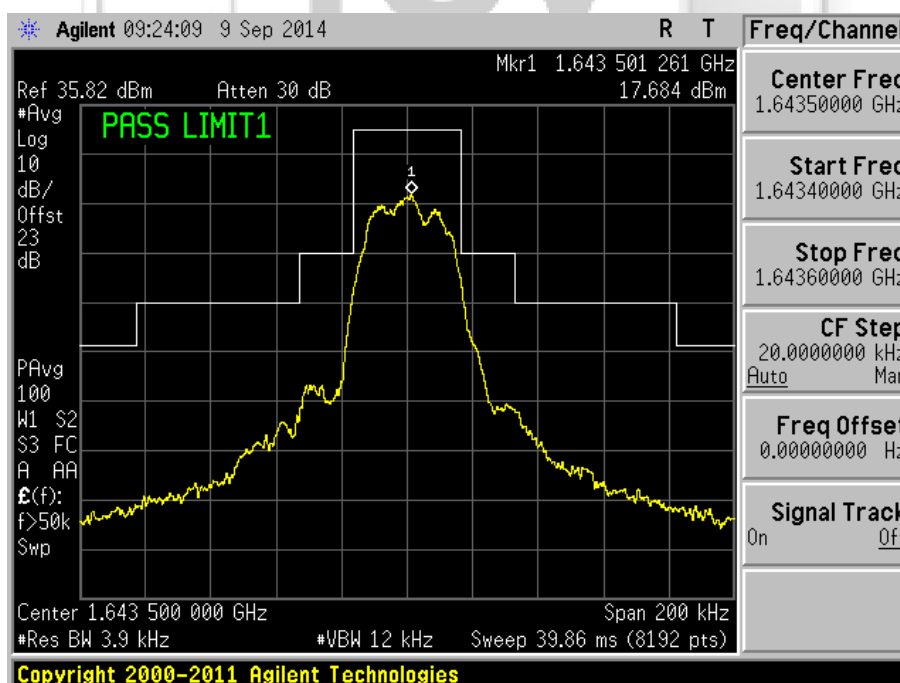
Plot 198 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### In Band Emissions Plots – TCH3



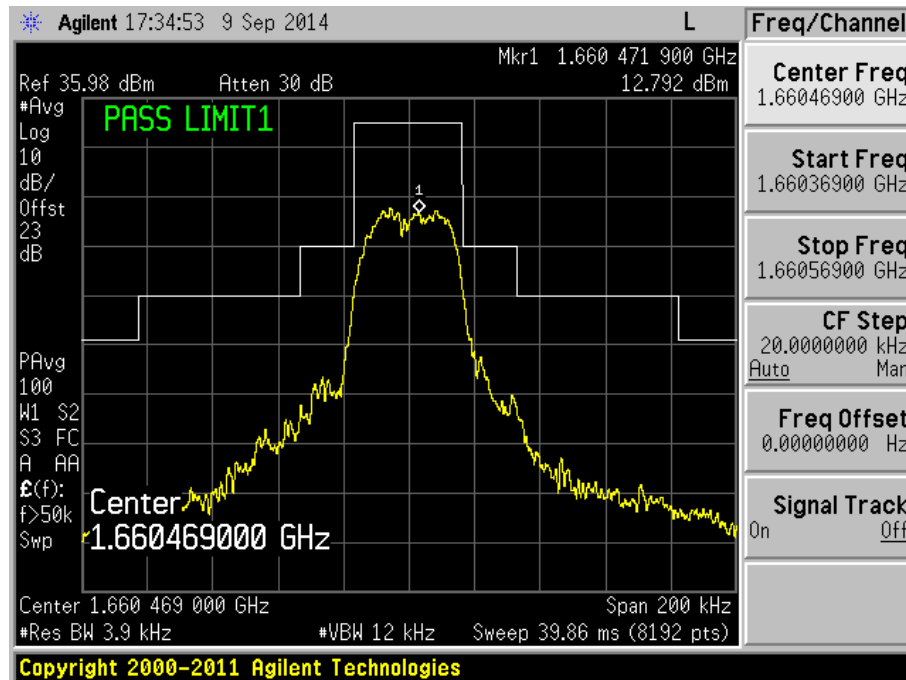
Plot 199 – Lower Channel



Plot 200 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

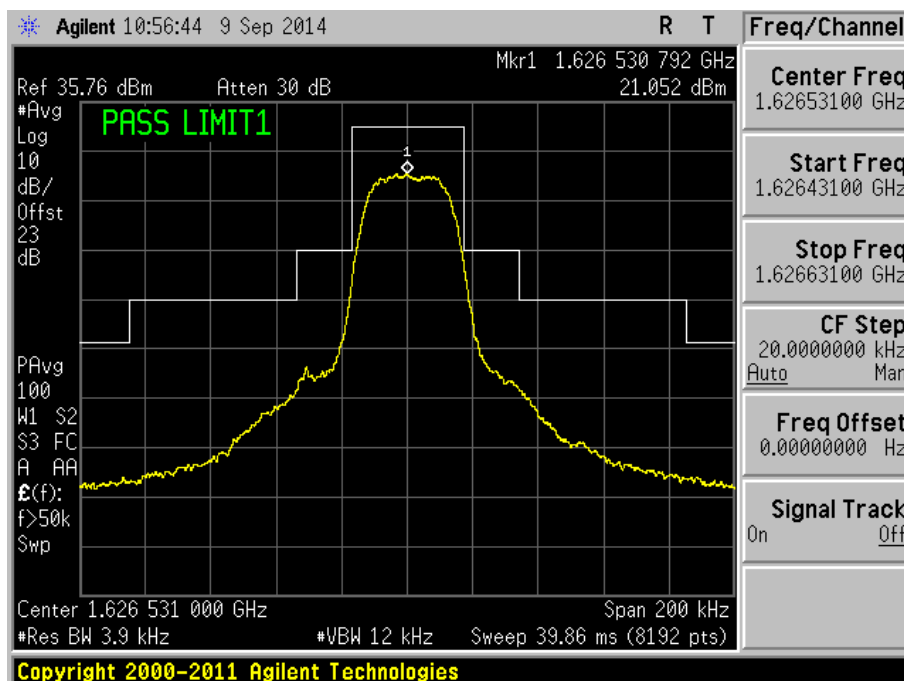
In Band Emissions Plots – TCH3



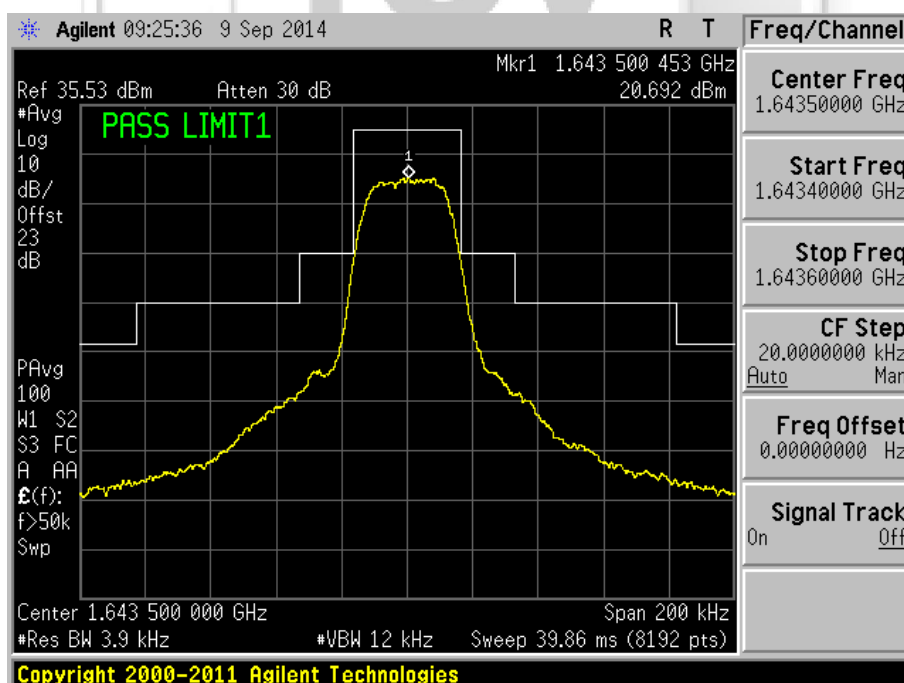
Plot 201 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### In Band Emissions Plots – FACCH9



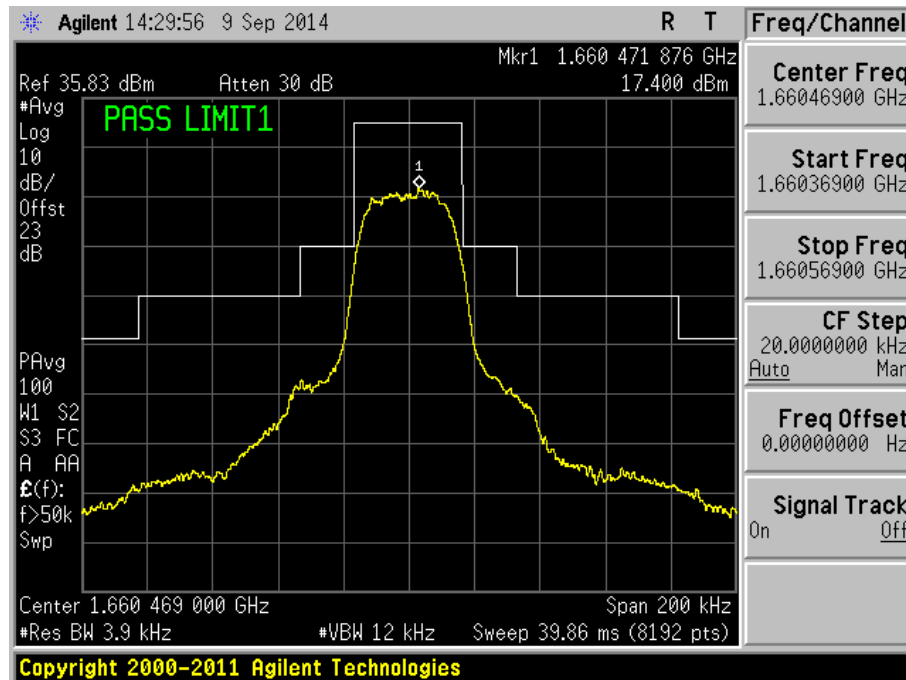
Plot 202 – Lower Channel



Plot 203 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

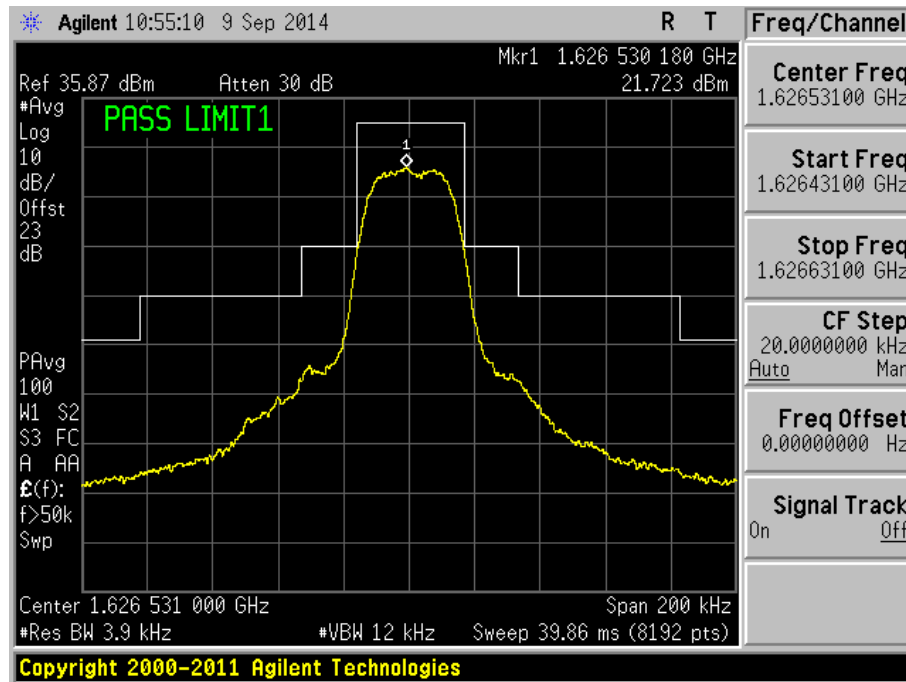
In Band Emissions Plots – FACCH9



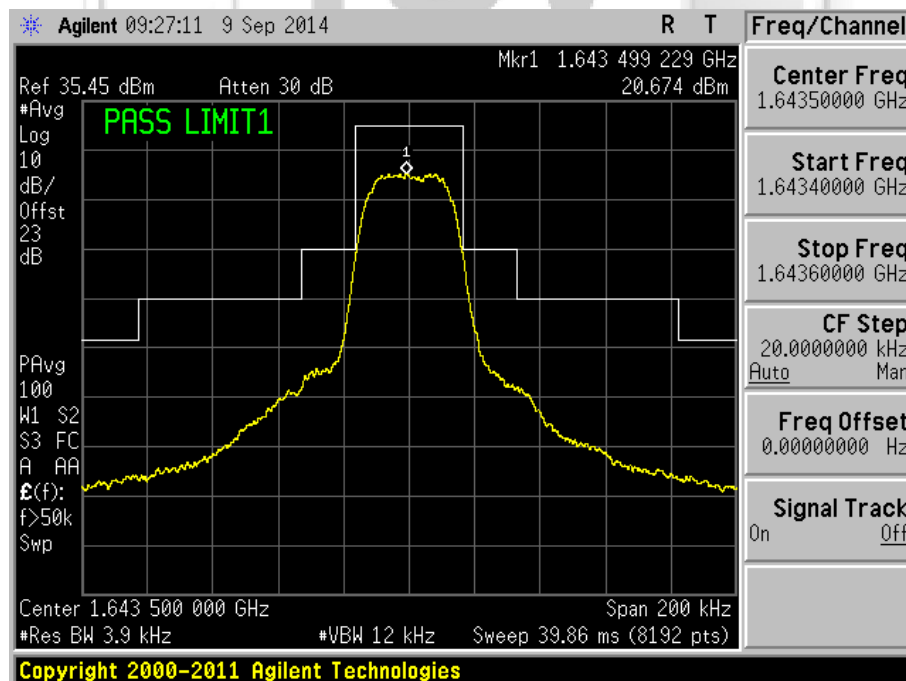
Plot 204 – High Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – TCH9



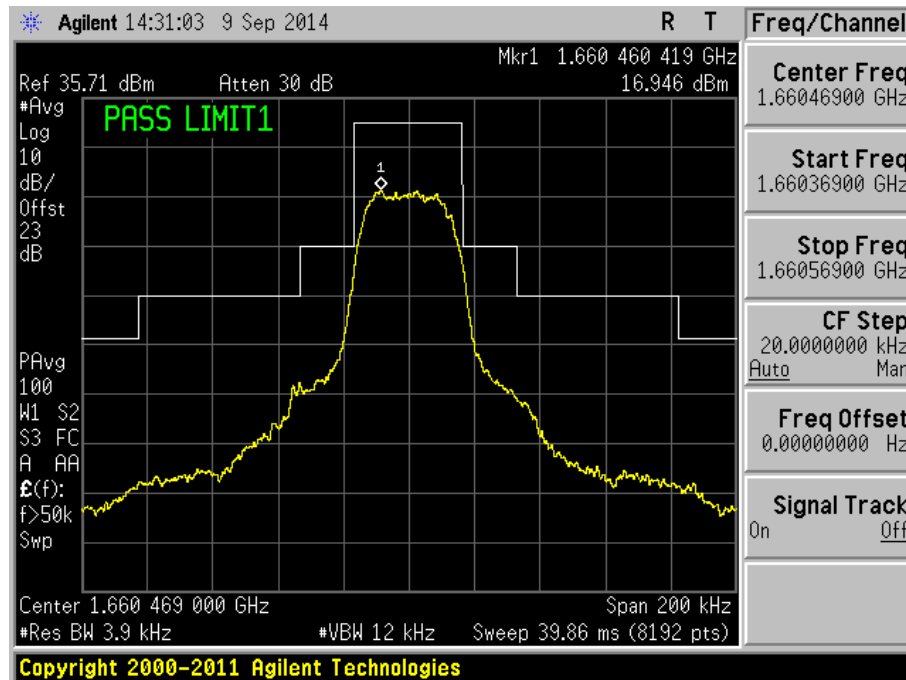
Plot 205 – Lower Channel



Plot 206 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

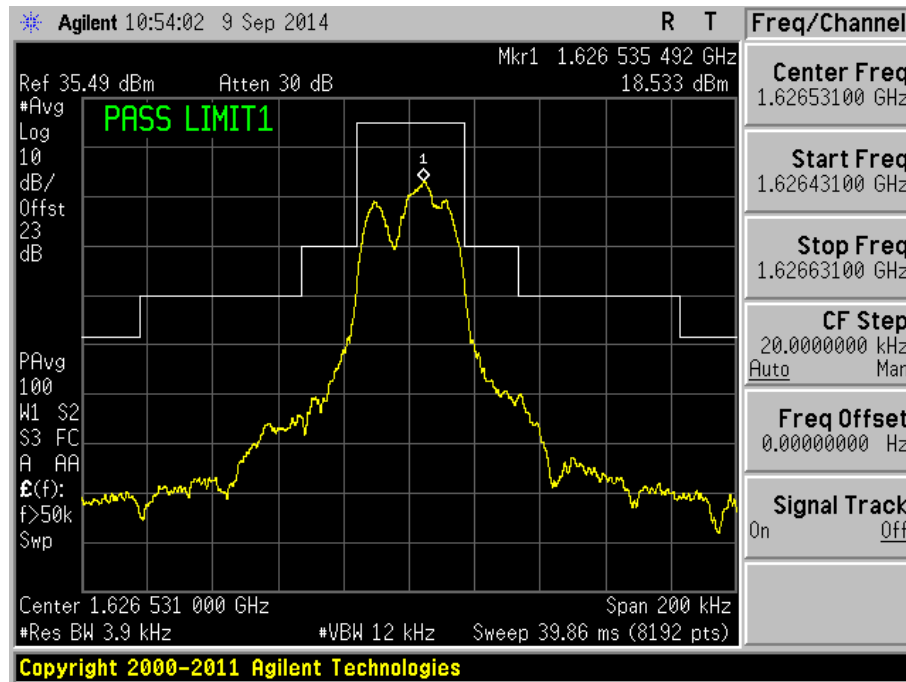
In Band Emissions Plots – TCH9



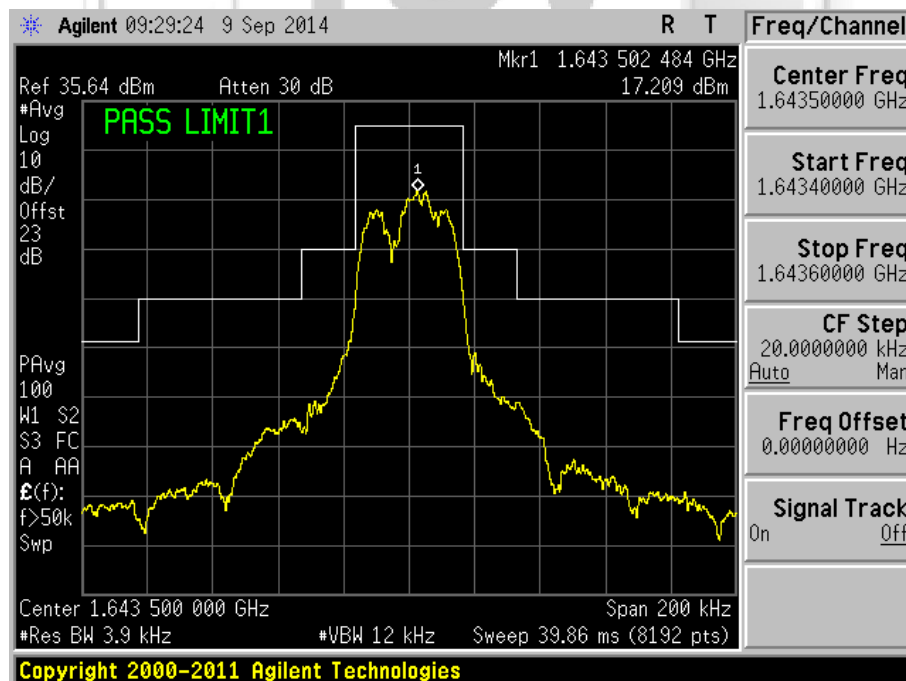
Plot 207 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PAB



Plot 208 – Lower Channel

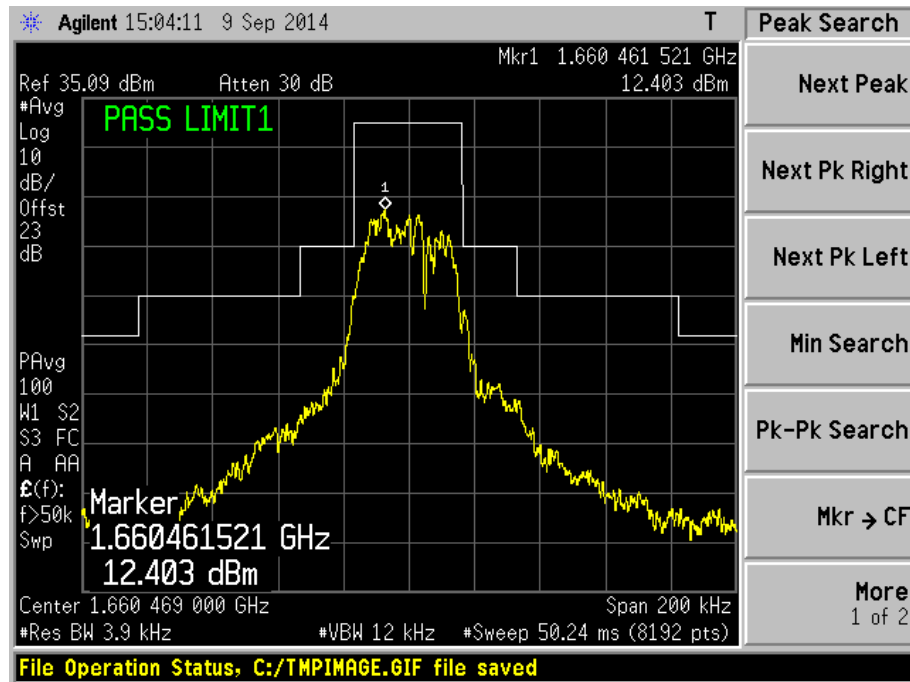


Plot 209 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

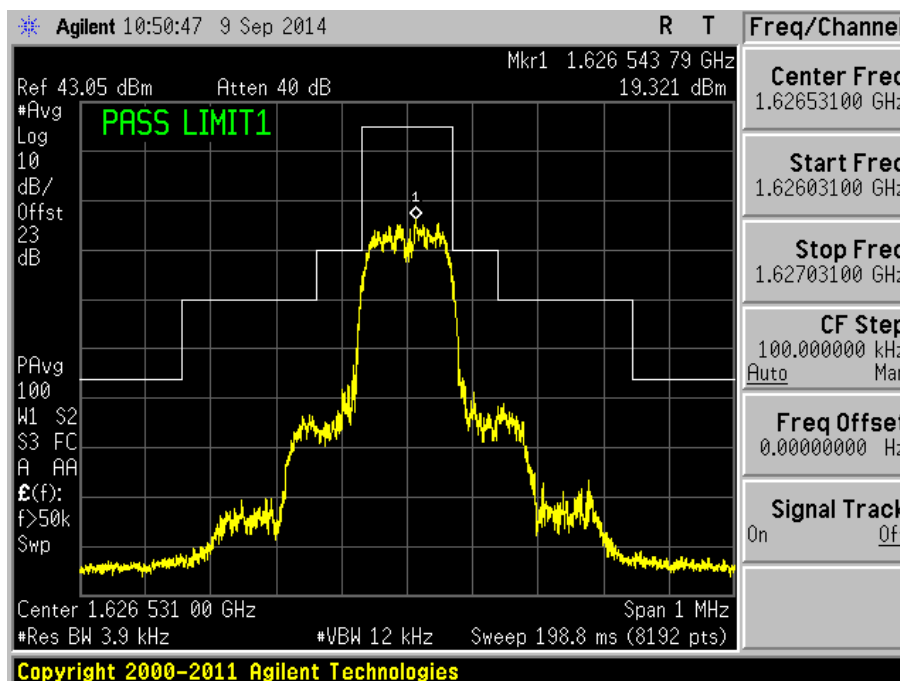
### In Band Emissions Plots – PAB



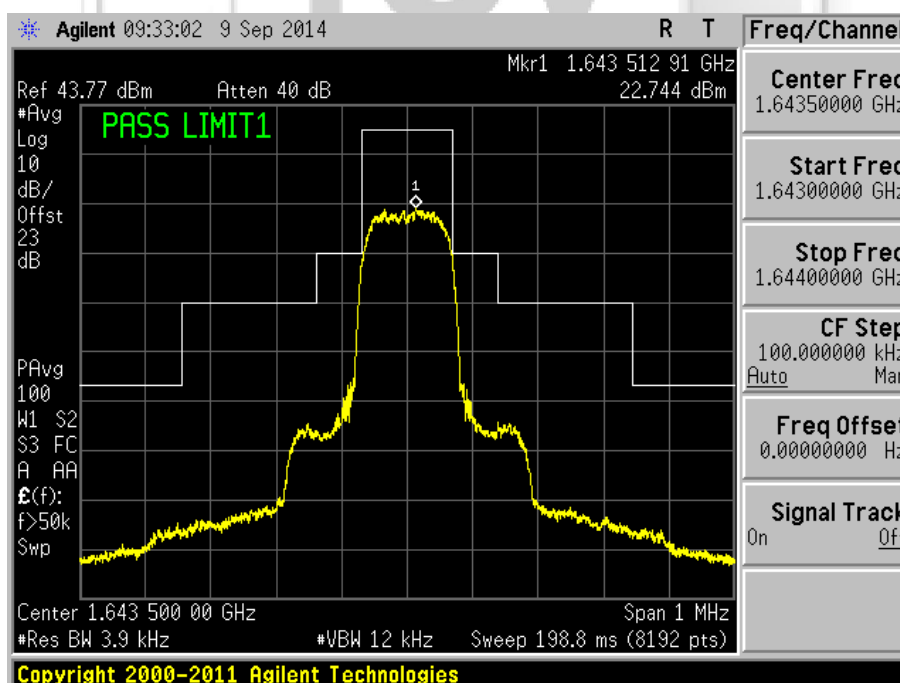
Plot 210 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### In Band Emissions Plots – PNB512\_12\_QPSK



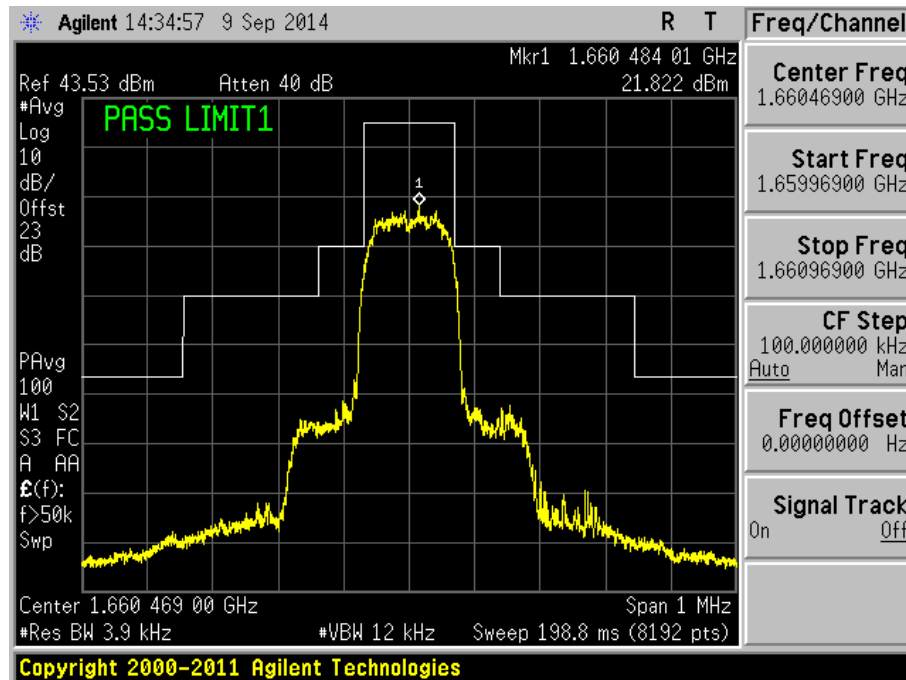
Plot 211 – Lower Channel



Plot 212 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

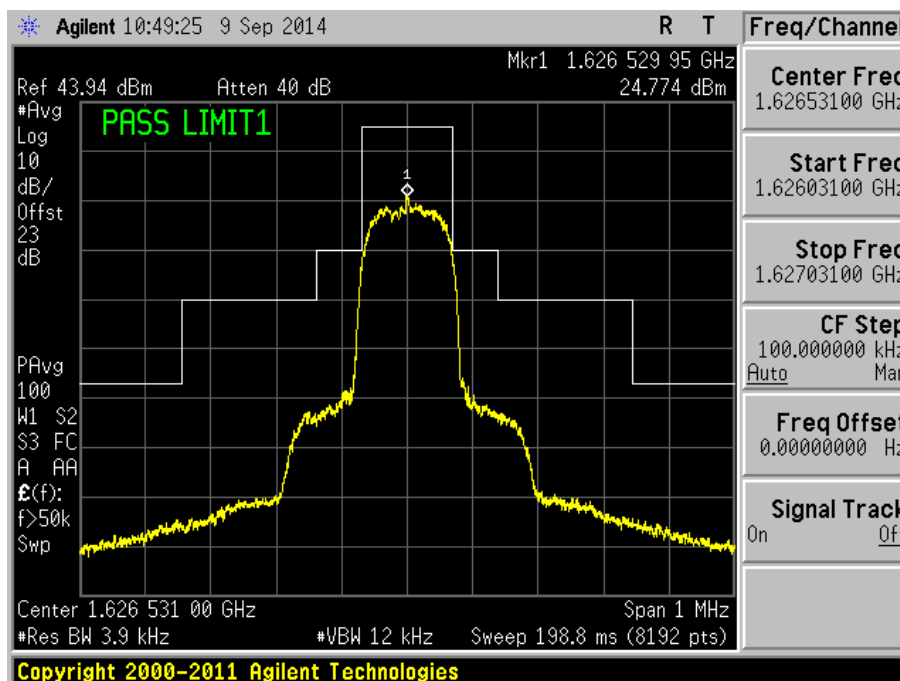
### In Band Emissions Plots – PNB512\_12\_QPSK



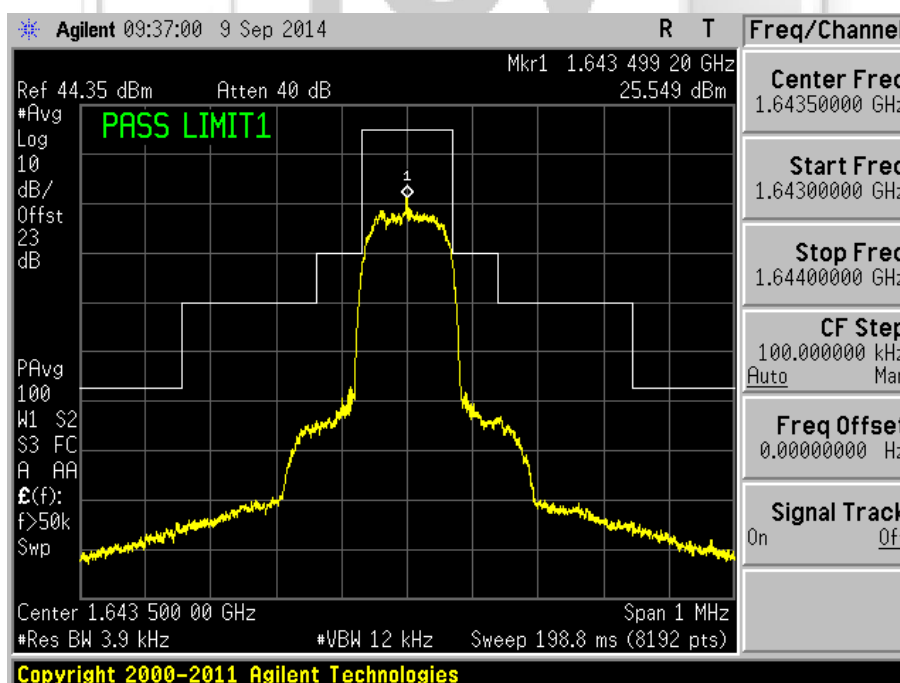
Plot 213 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB512\_23\_16APSK



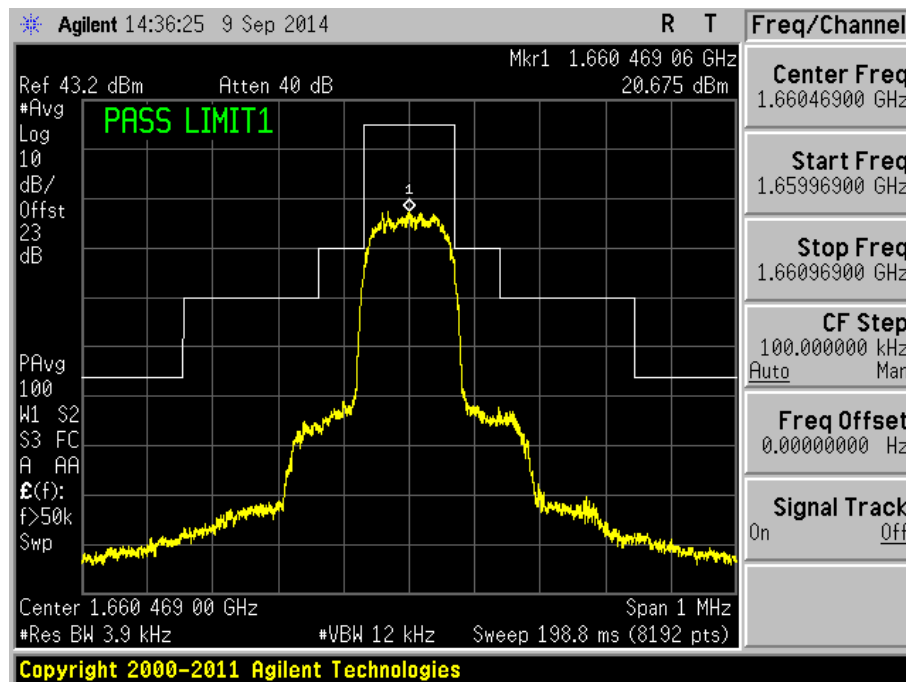
Plot 214 – Lower Channel



Plot 215 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

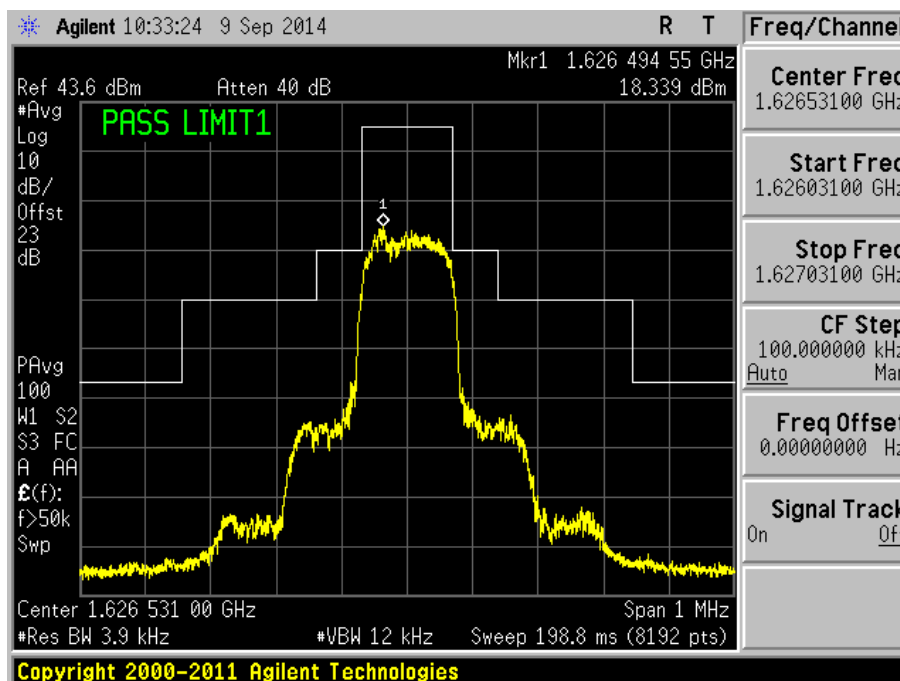
In Band Emissions Plots – PNB512\_23\_16APSK



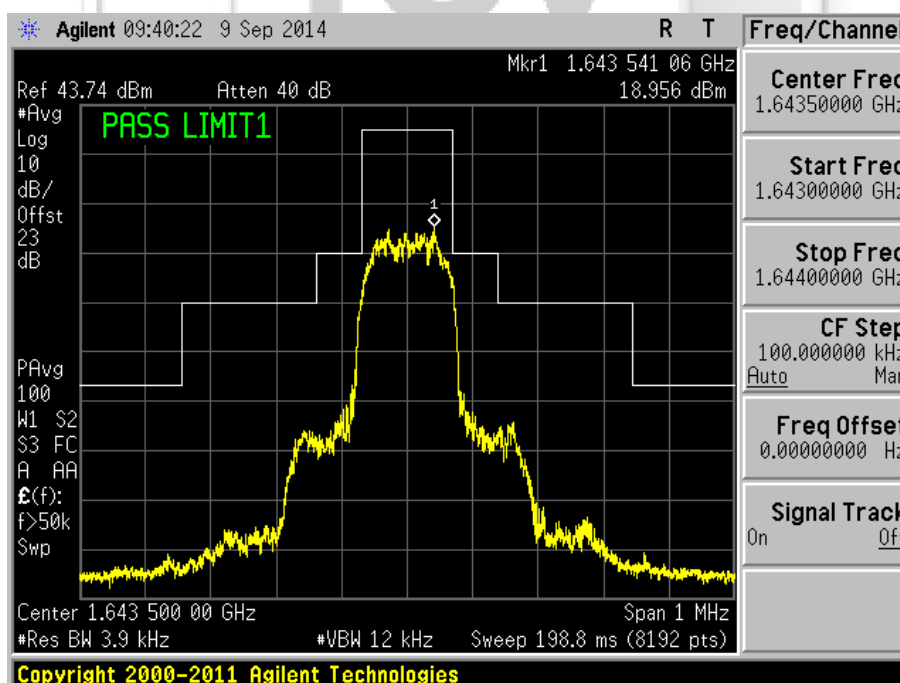
Plot 216 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_45\_QPSK



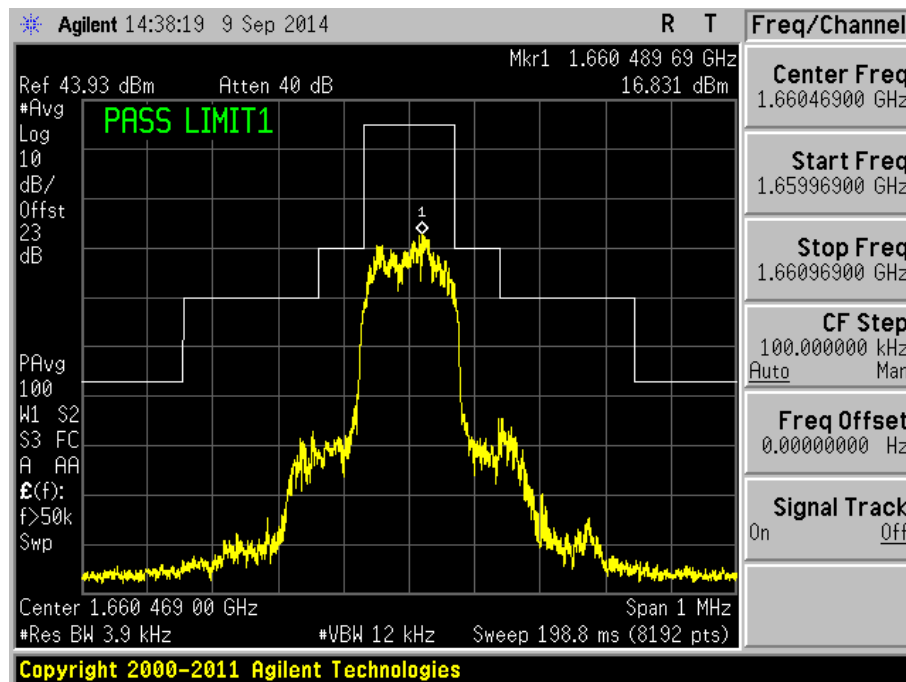
Plot 217 – Lower Channel



Plot 218 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_45\_QPSK

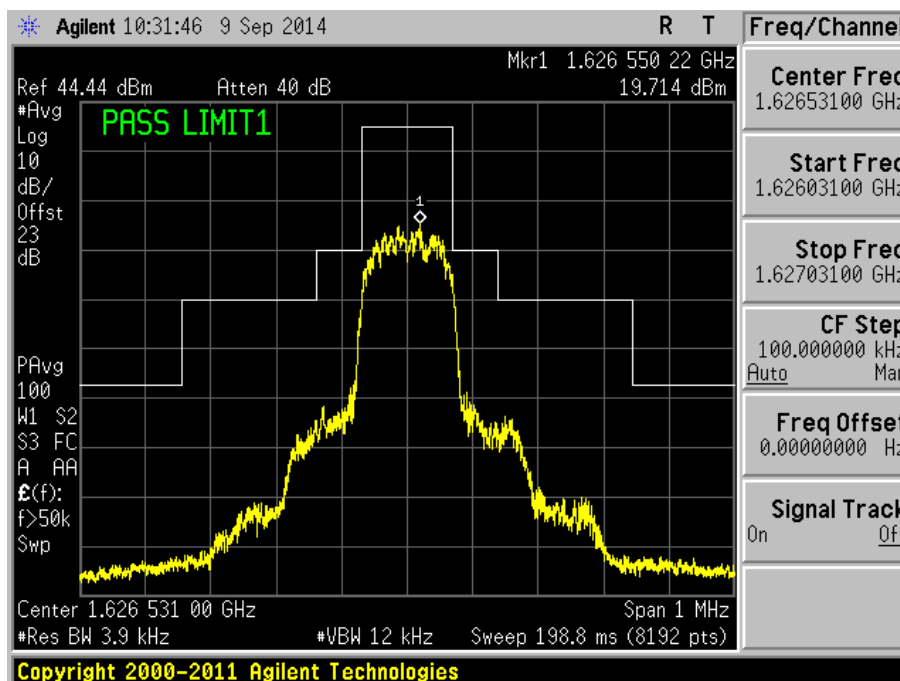


Plot 219 – Upper Channel

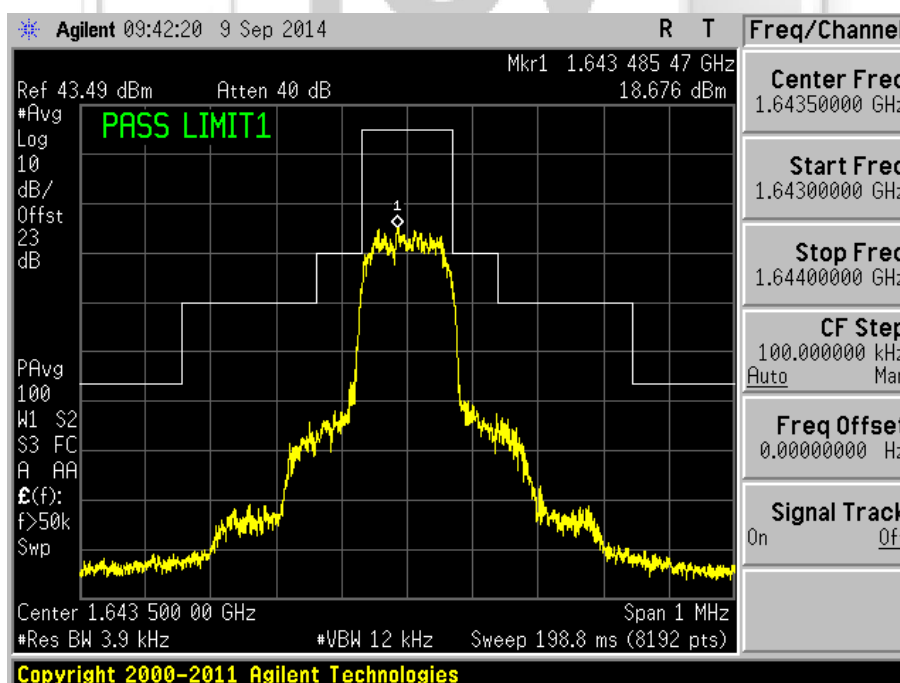


UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_910\_16APSK



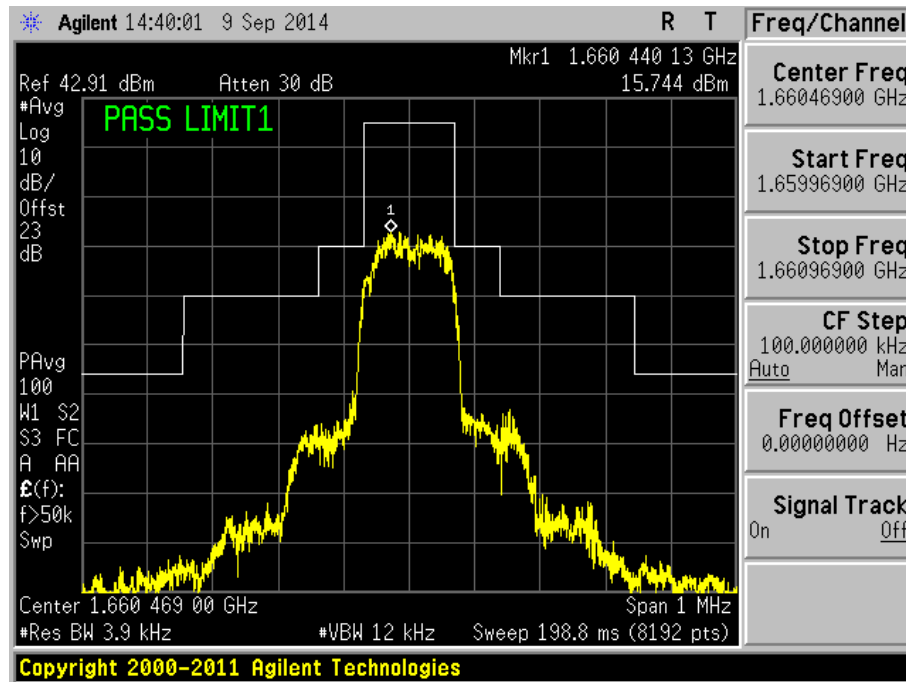
Plot 220 – Lower Channel



Plot 221 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

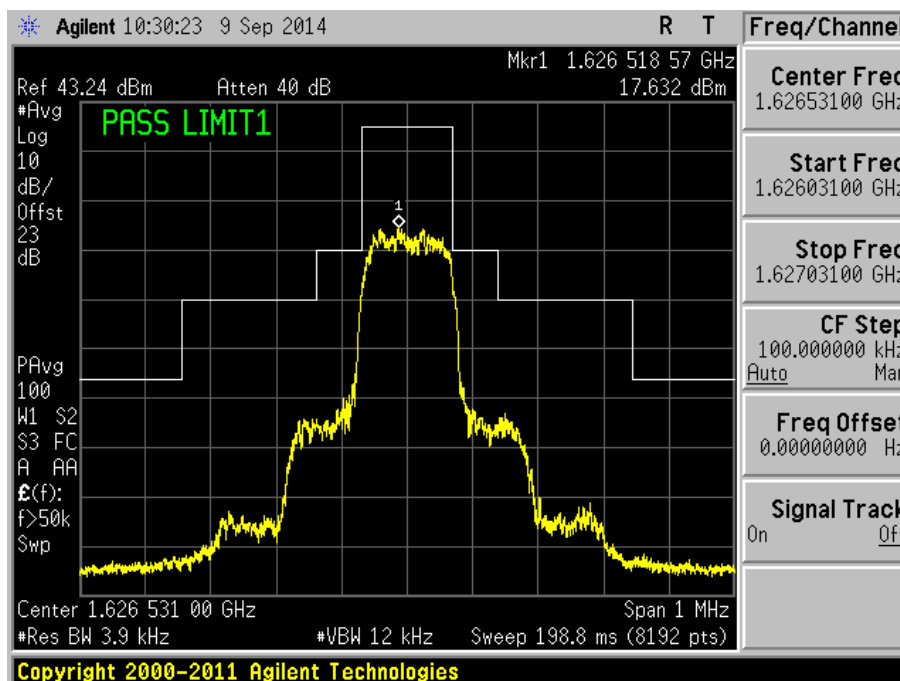
In Band Emissions Plots – PNB53\_910\_16APSK



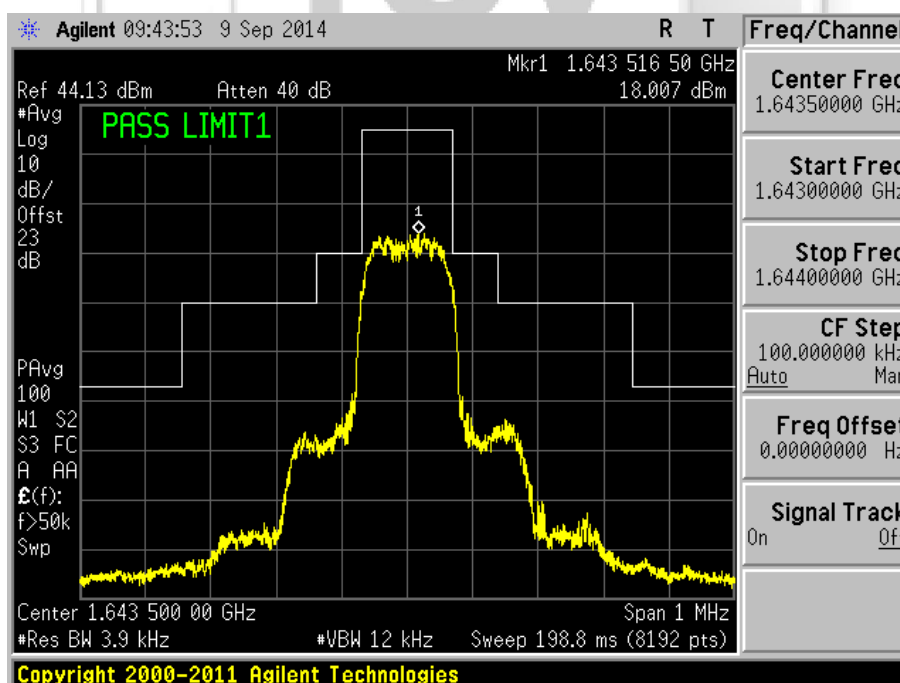
Plot 222 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_910\_QPSK



Plot 223 – Lower Channel

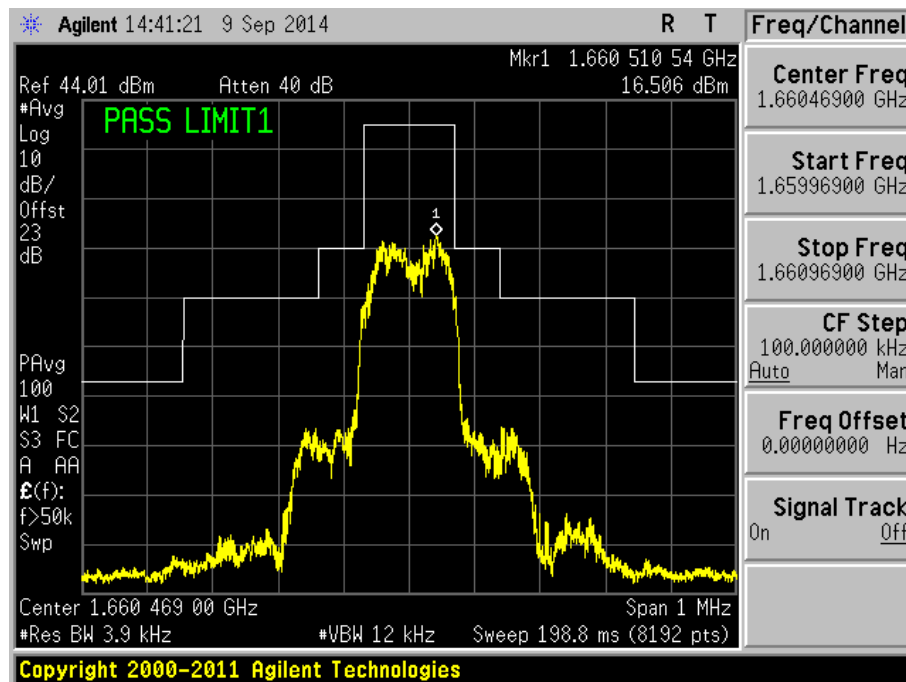


Plot 224 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

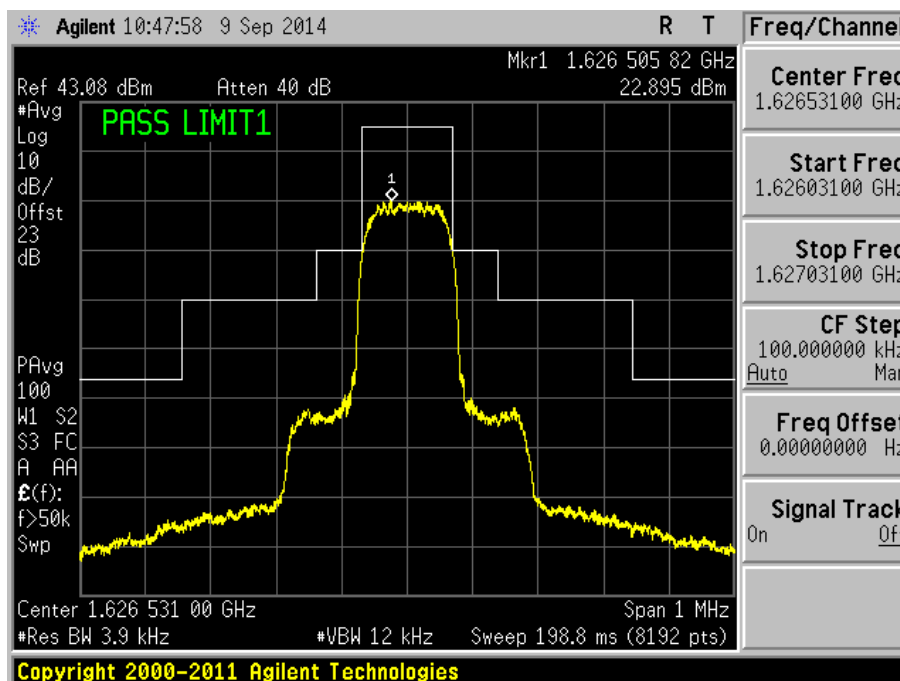
In Band Emissions Plots – PNB53\_910\_QPSK



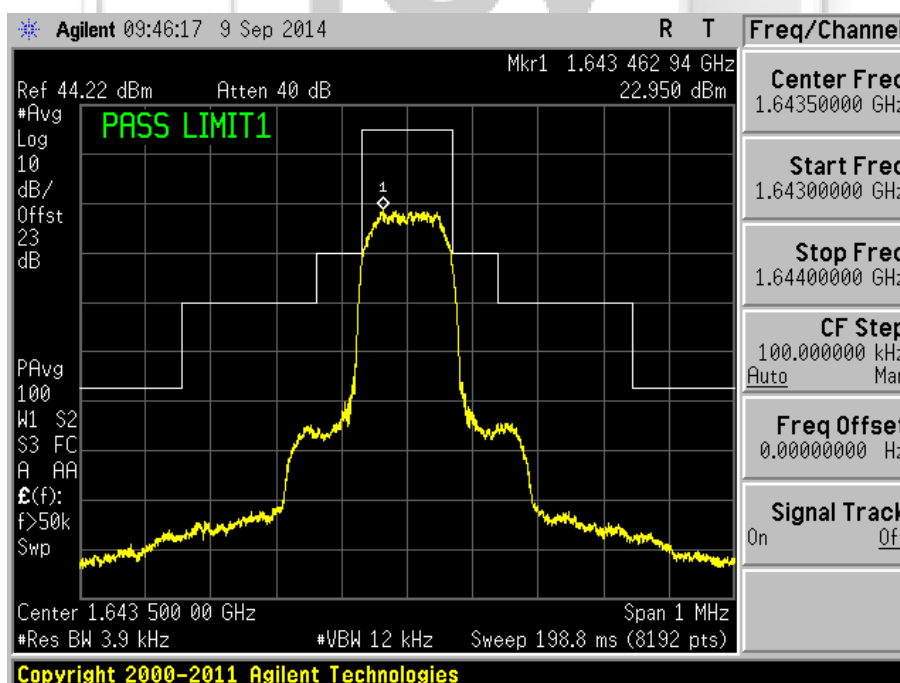
Plot 225 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB512\_23\_QPSK



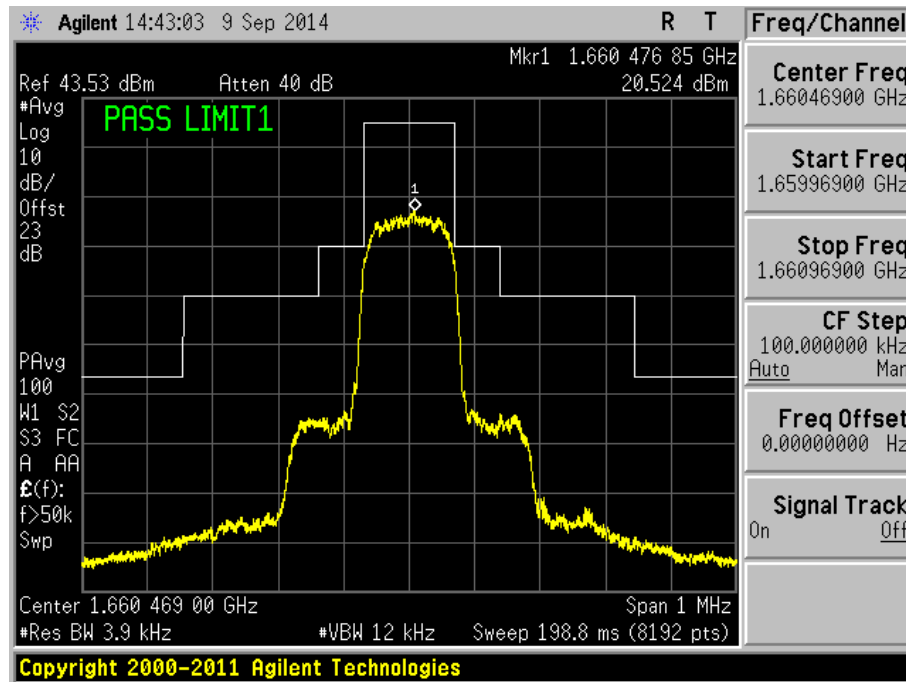
Plot 226 – Lower Channel



Plot 227 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

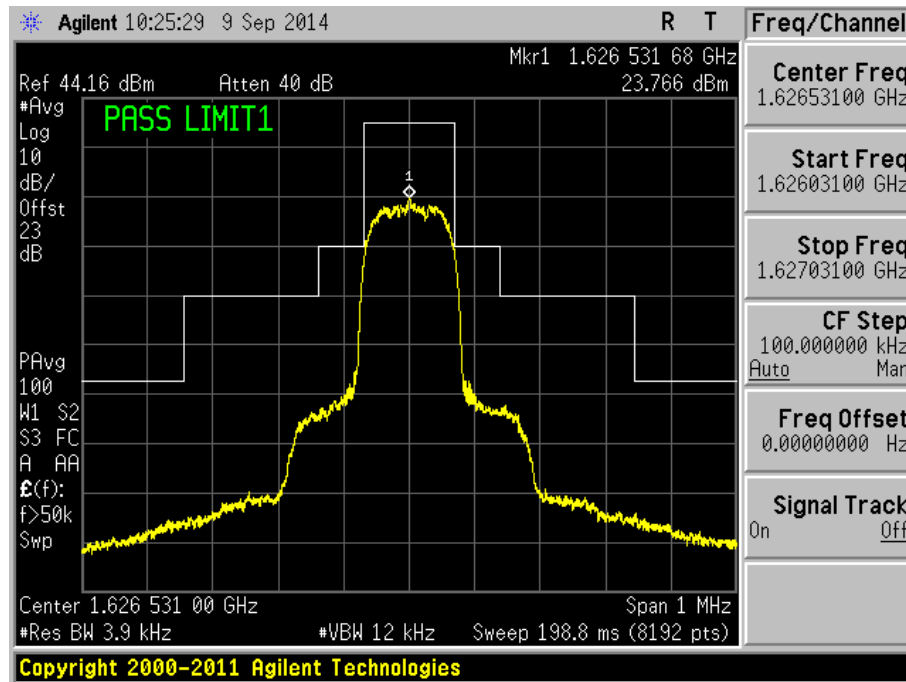
### In Band Emissions Plots – PNB512\_23\_QPSK



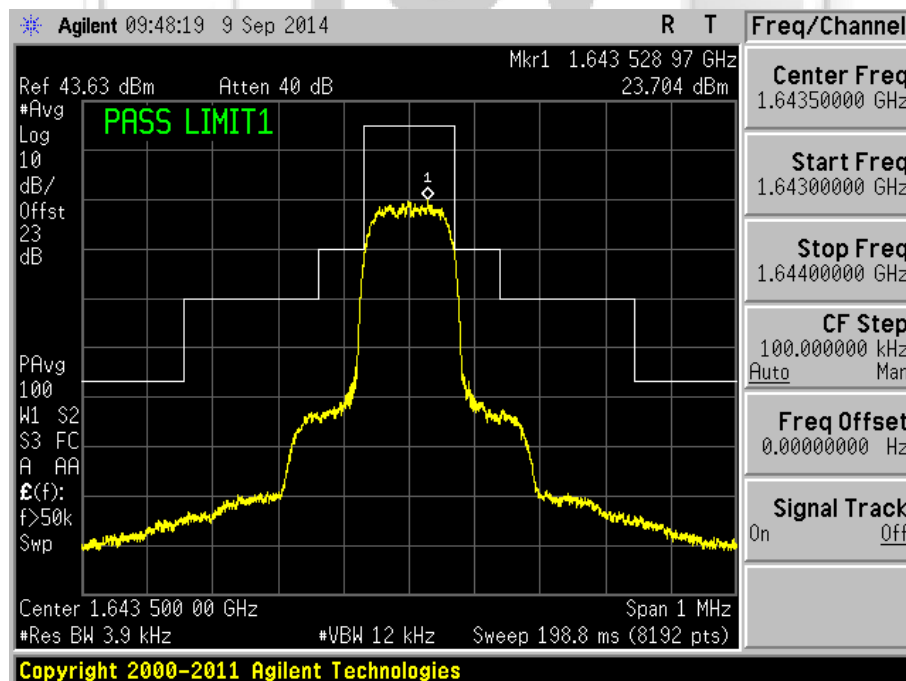
Plot 228 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB512\_45\_16APSK



Plot 229 – Lower Channel

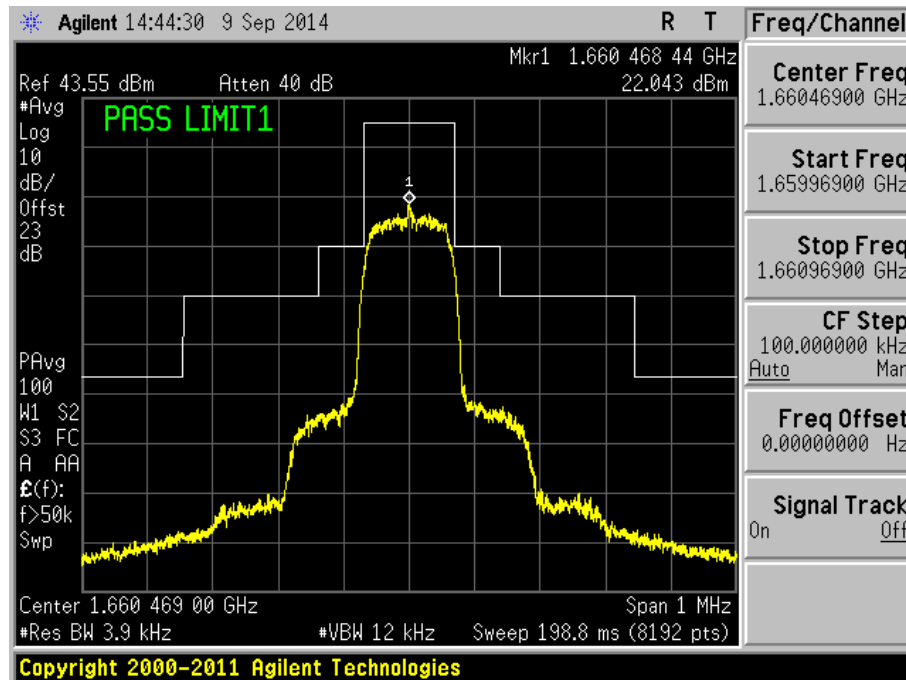


Plot 230 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

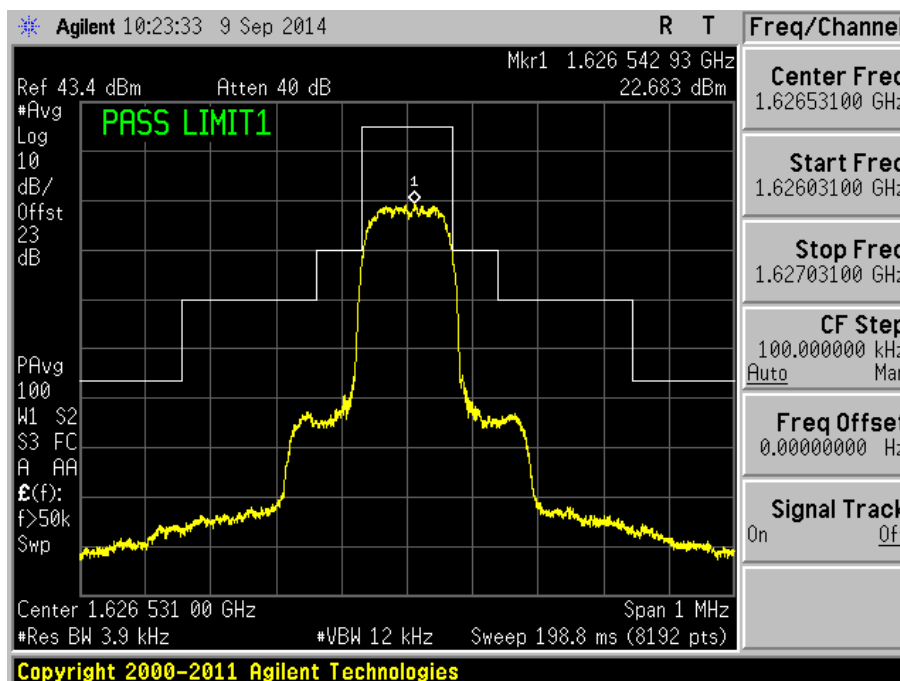
In Band Emissions Plots – PNB512\_45\_16APSK



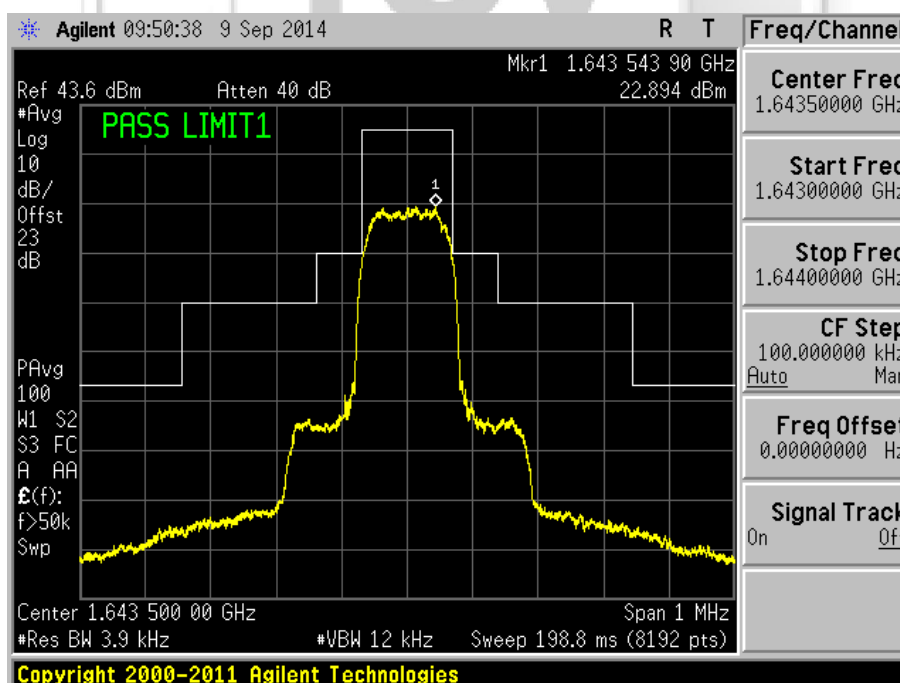
Plot 231 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB512\_45\_QPSK



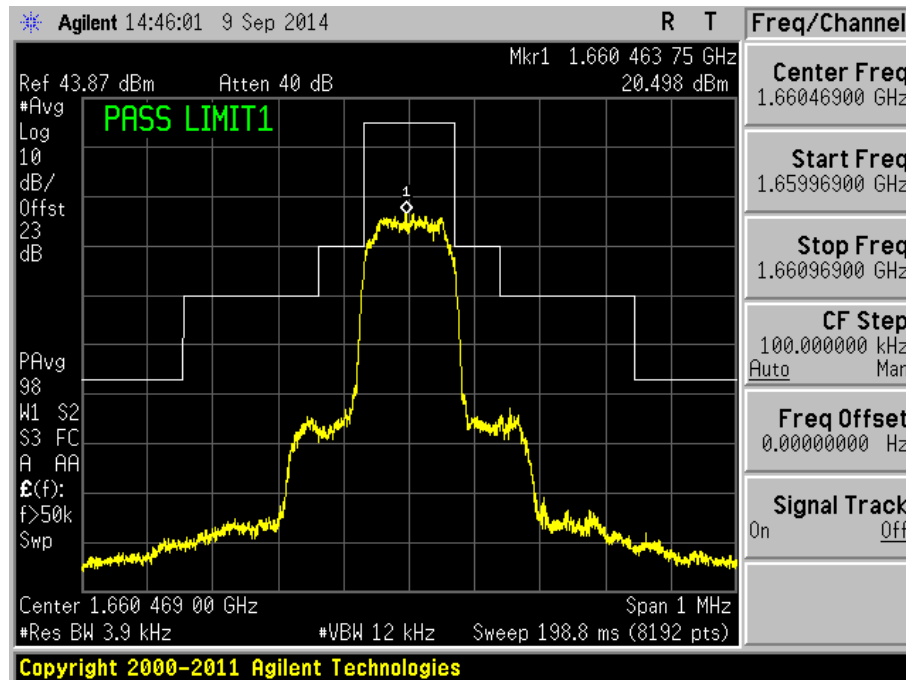
Plot 232 – Lower Channel



Plot 233 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

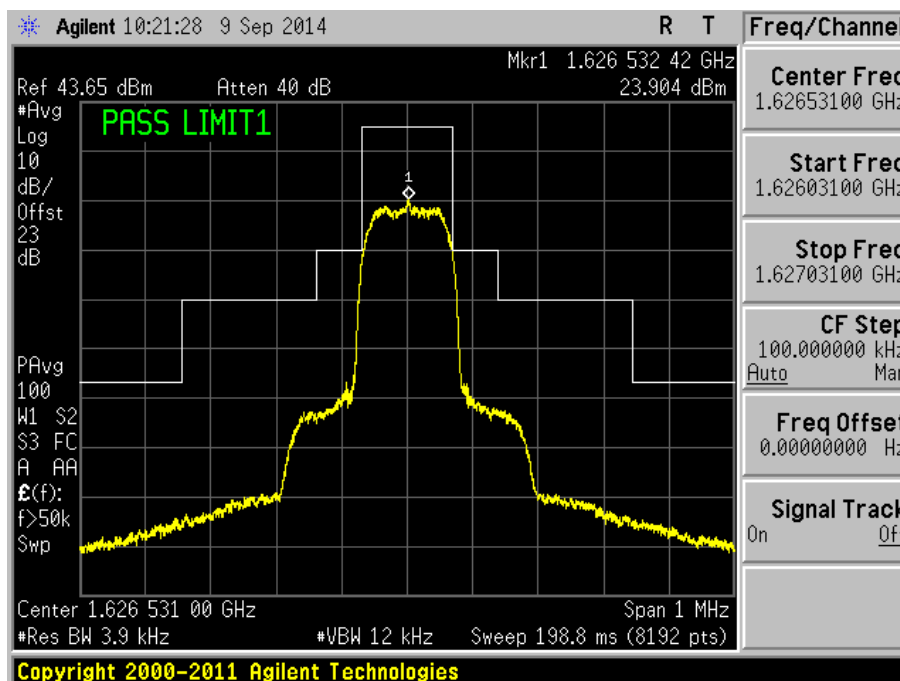
In Band Emissions Plots – PNB512\_45\_QPSK



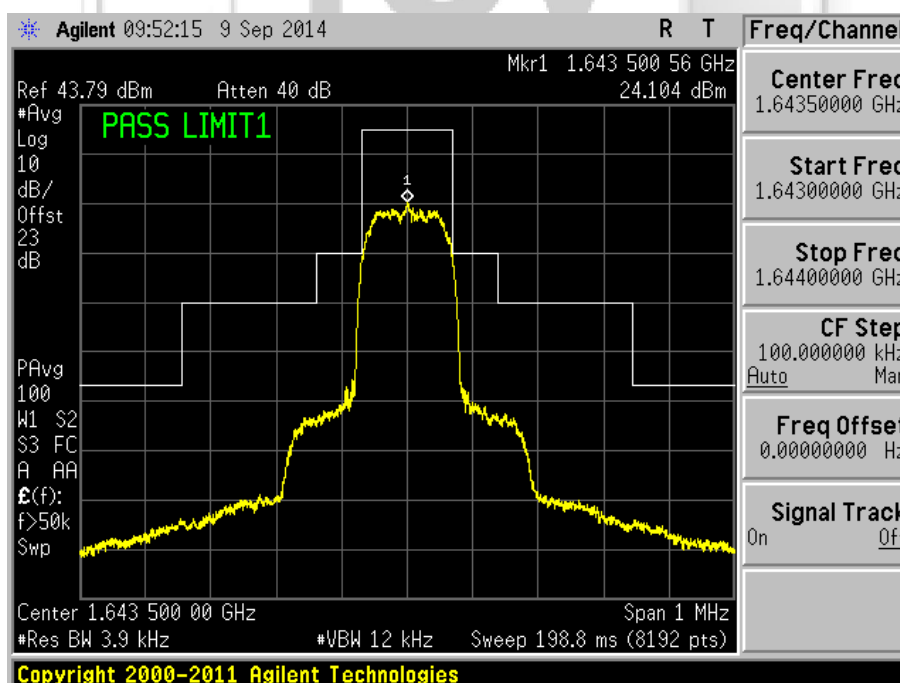
Plot 234 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB512\_910\_16APSK



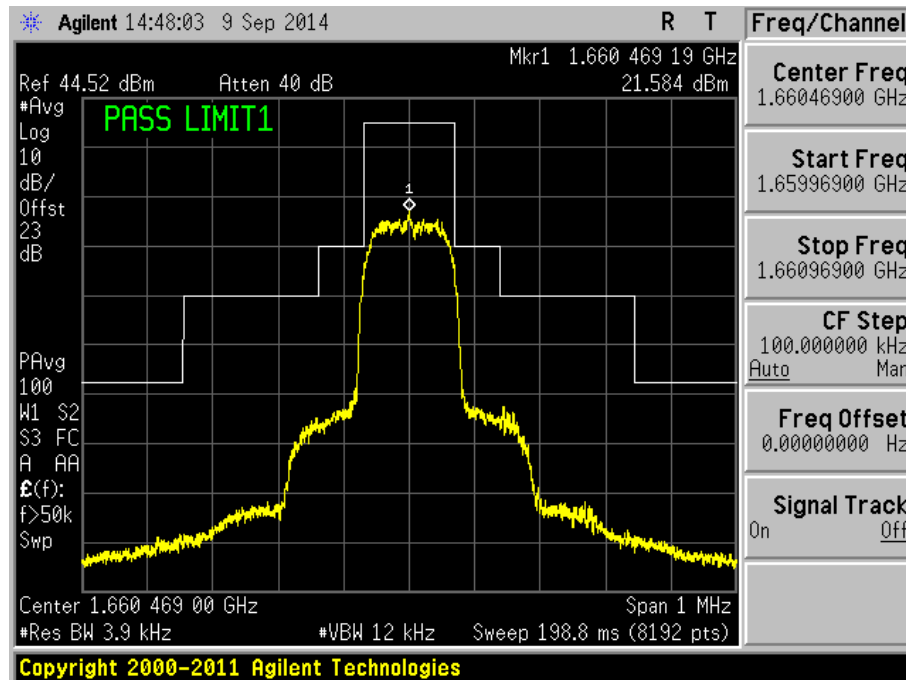
Plot 235 – Lower Channel



Plot 236 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

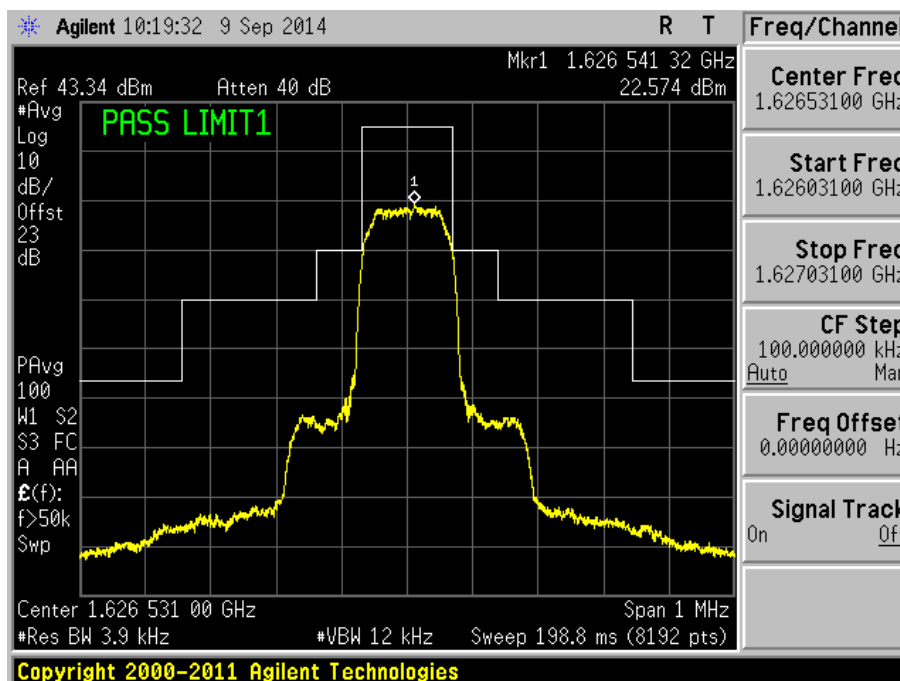
In Band Emissions Plots – PNB512\_910\_16APSK



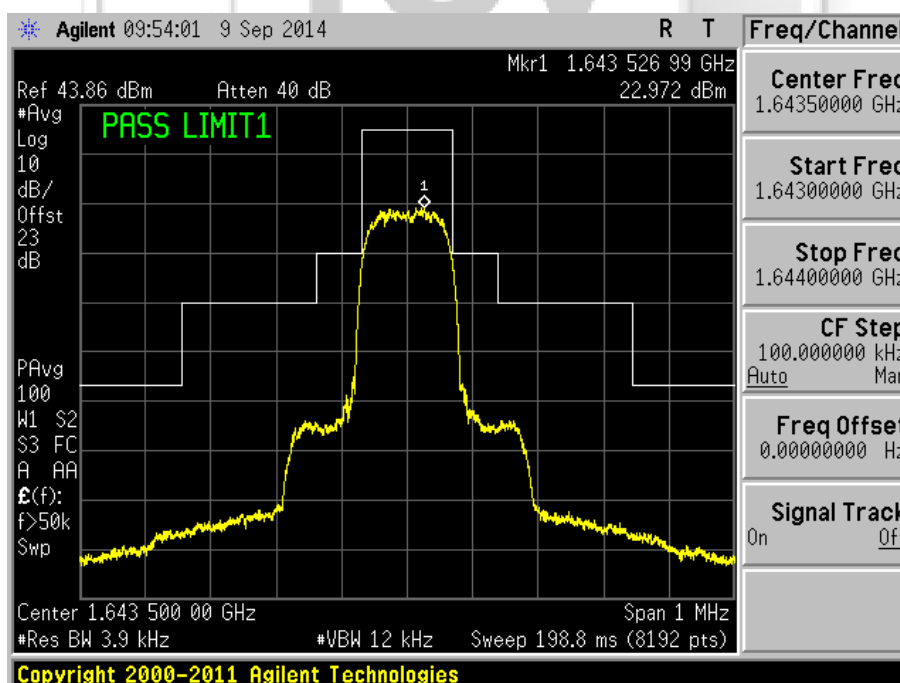
Plot 237 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB512\_910\_QPSK



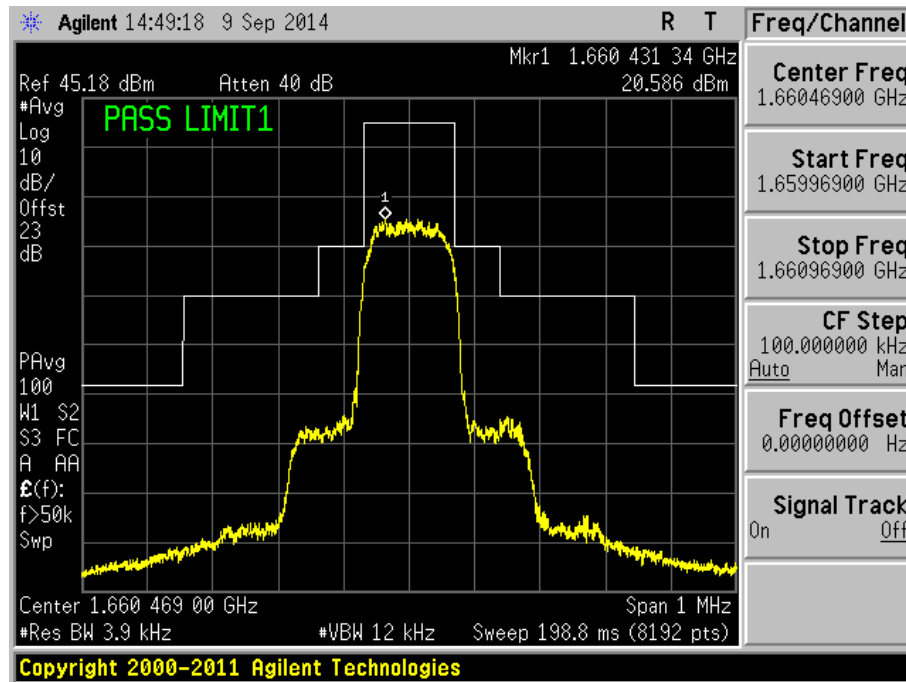
Plot 238 – Lower Channel



Plot 239 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB512\_910\_QPSK

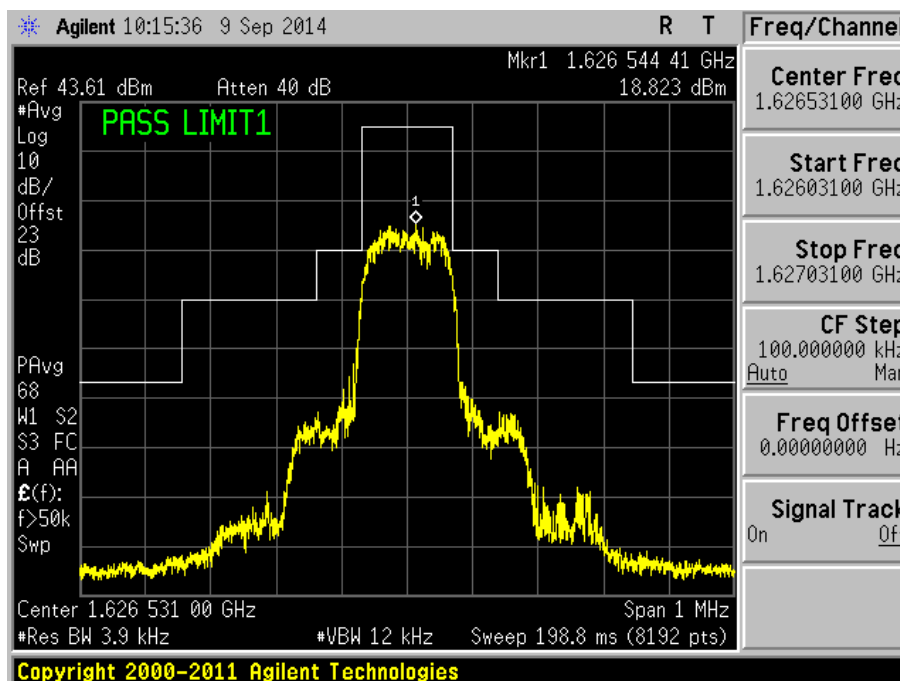


Plot 240 – Upper Channel

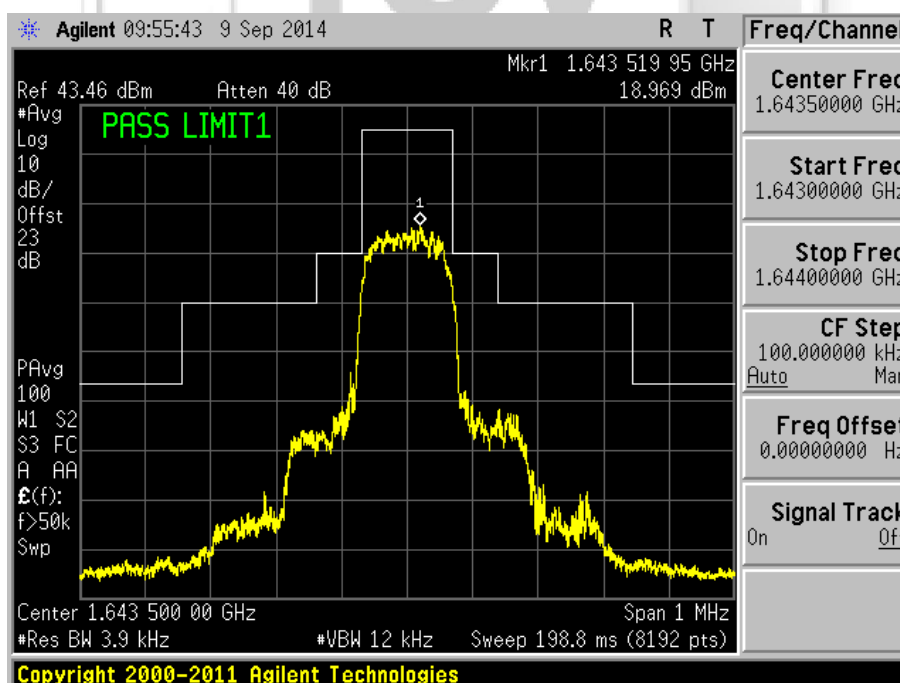


UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_12\_QPSK



Plot 241 – Lower Channel

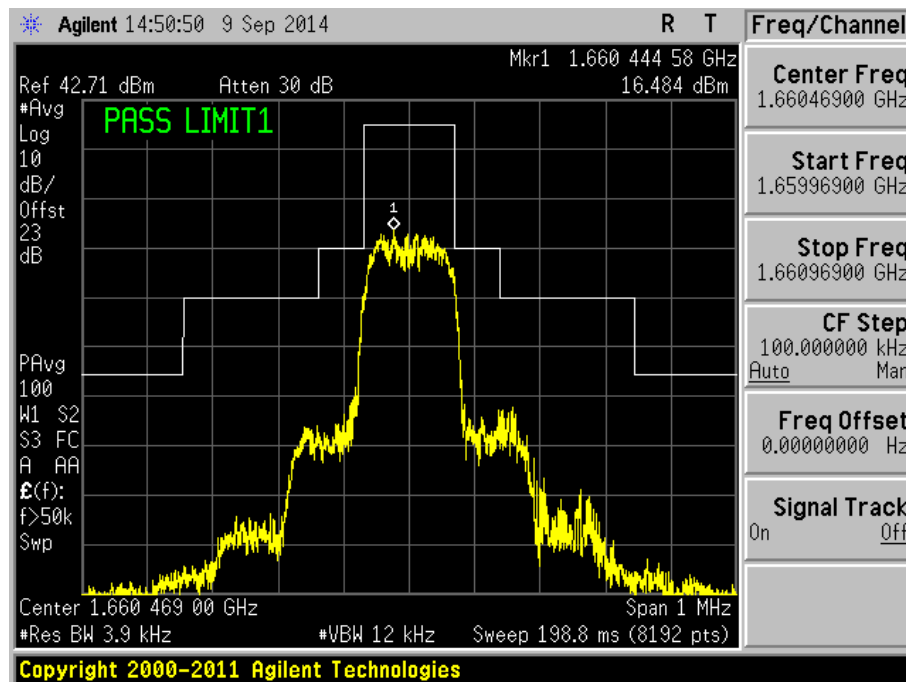


Plot 242 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

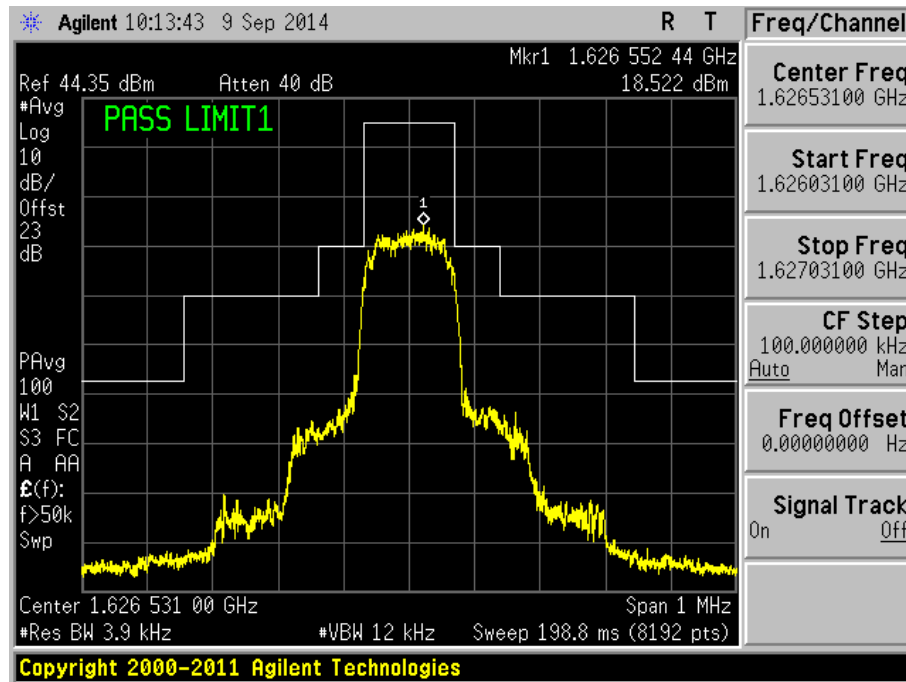
In Band Emissions Plots – PNB53\_12\_QPSK



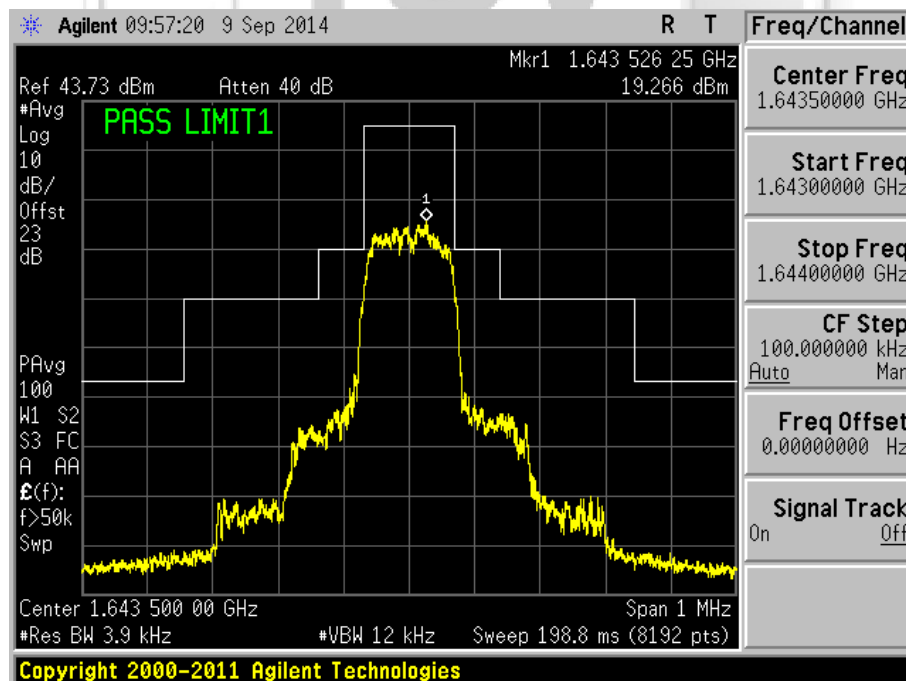
Plot 243 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_23\_16APSK



Plot 244 – Lower Channel

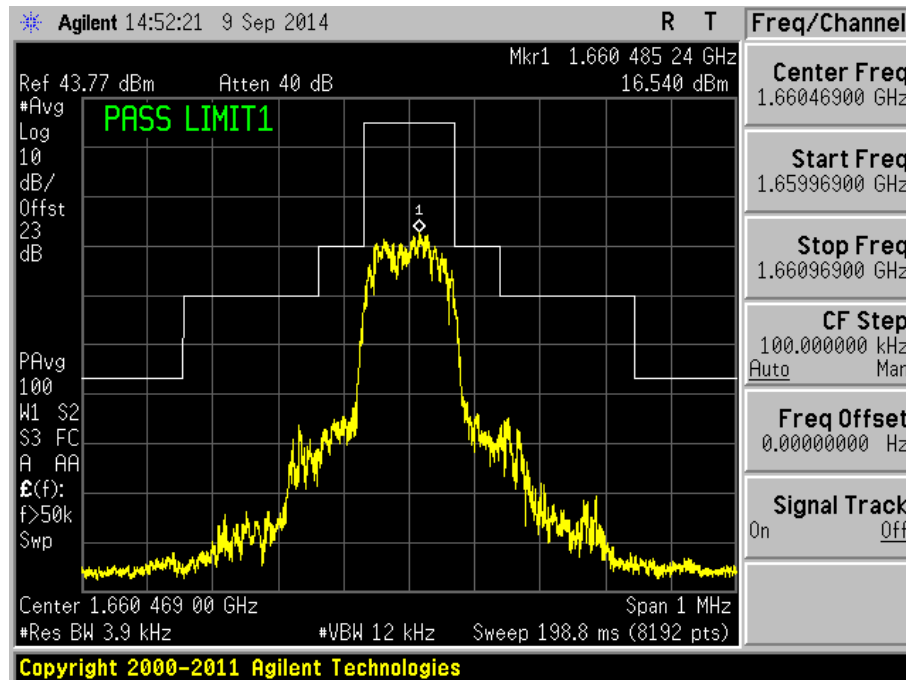


Plot 245 – Middle Channel



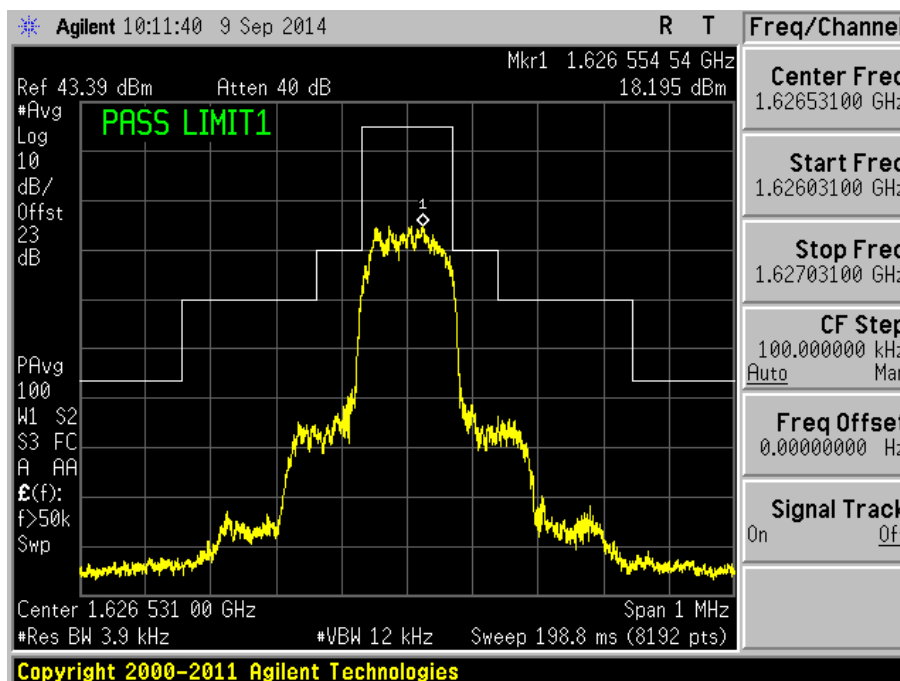
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_23\_16APSK

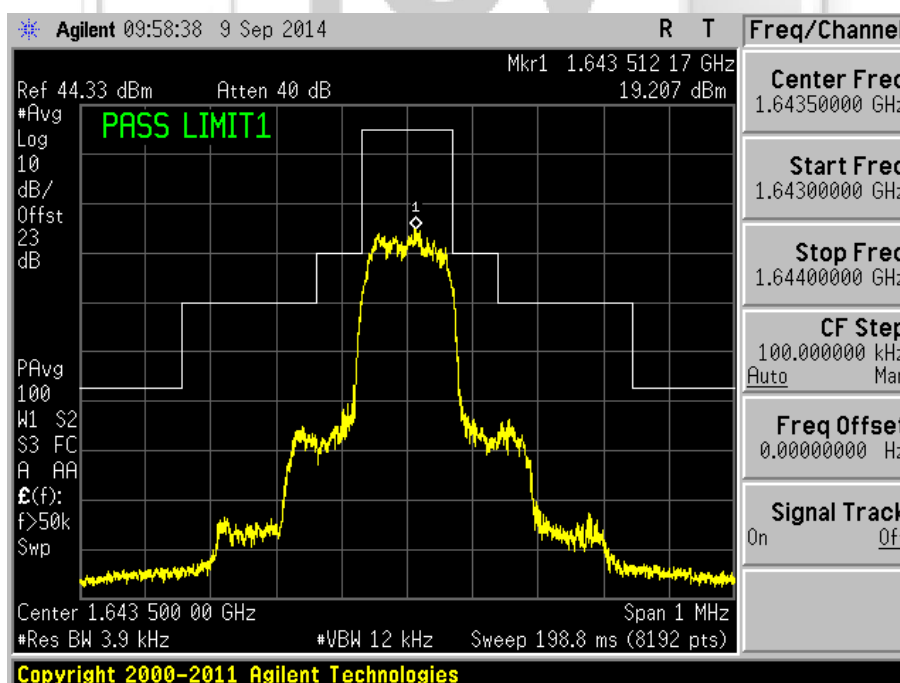


UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_23\_QPSK



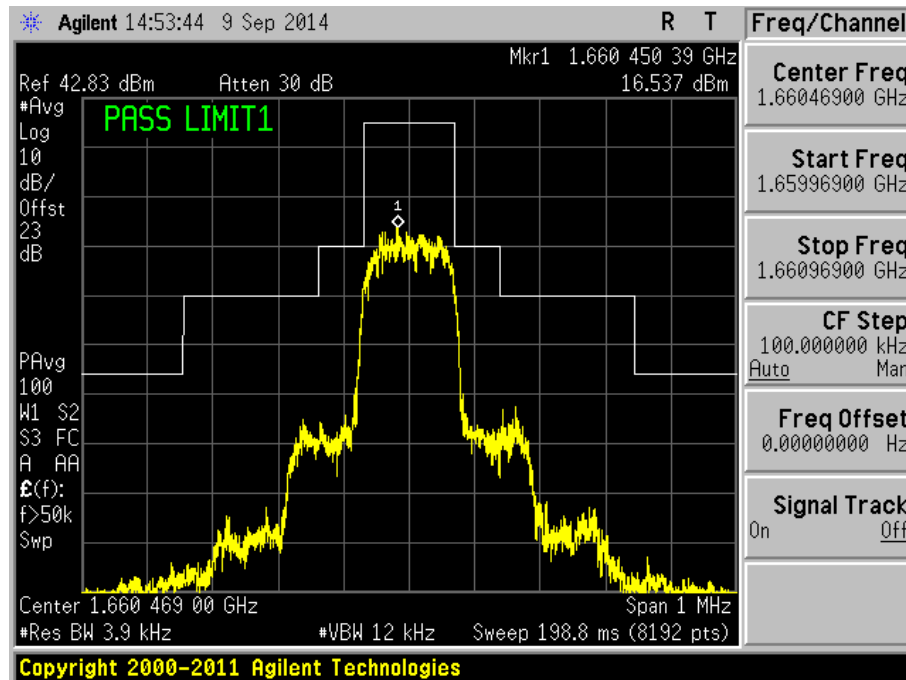
Plot 247 – Lower Channel



Plot 248 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

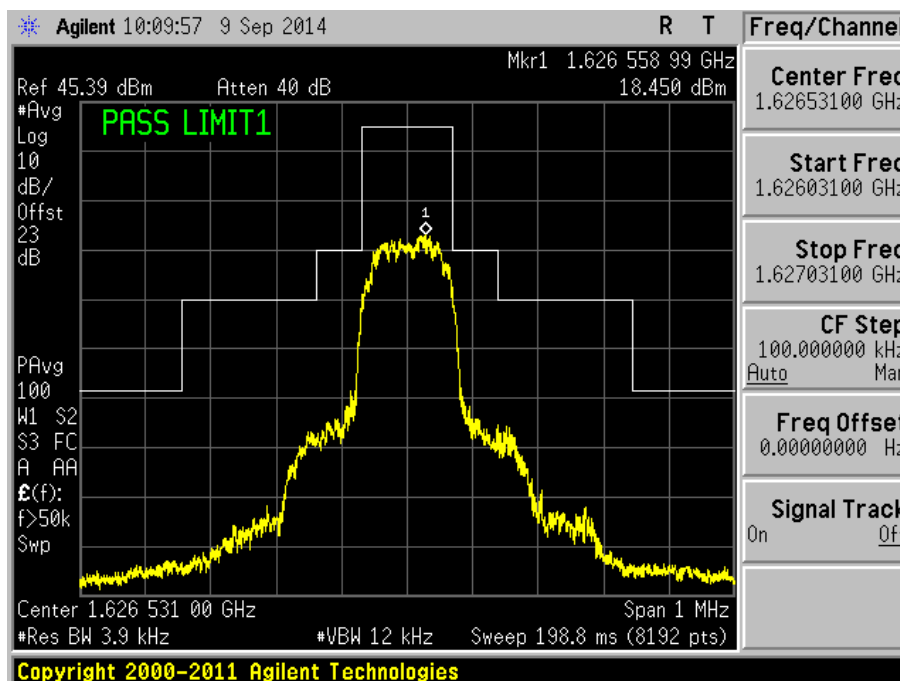
In Band Emissions Plots – PNB53\_23\_QPSK



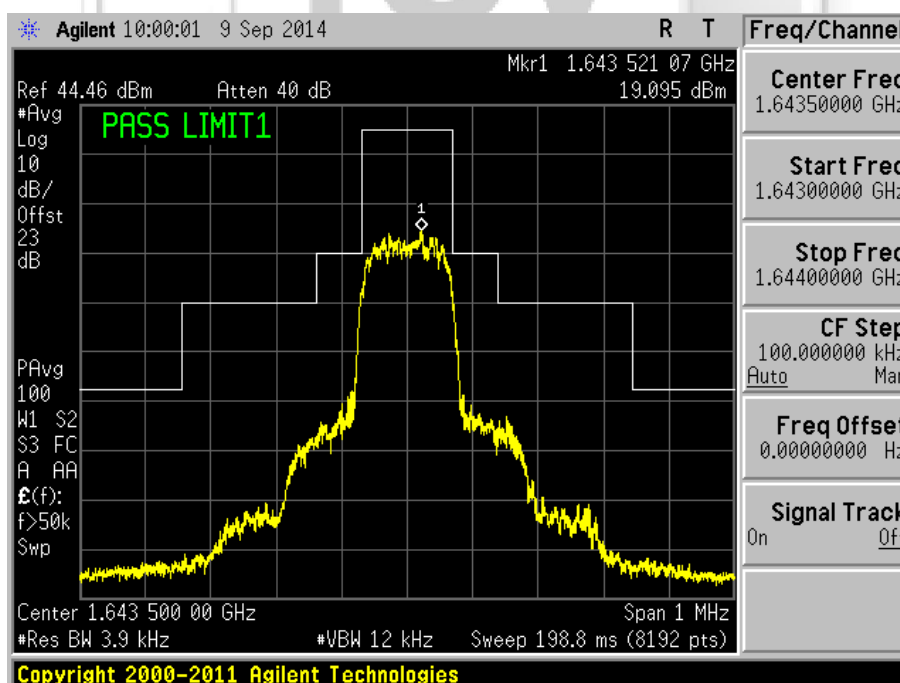
Plot 249 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

In Band Emissions Plots – PNB53\_45\_16APSK



Plot 250 – Lower Channel



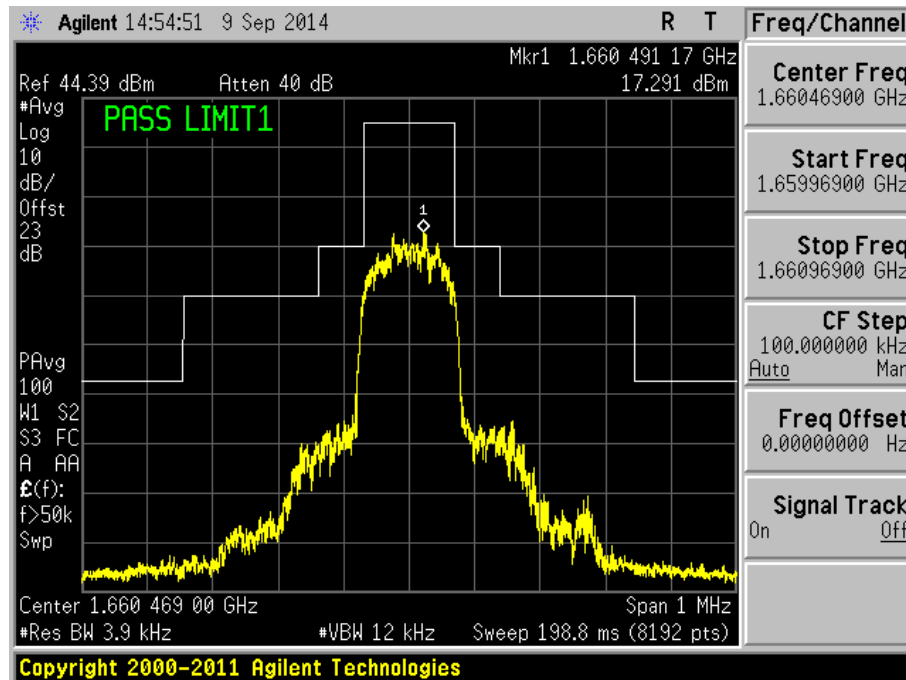
Plot 251 – Middle Channel





UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

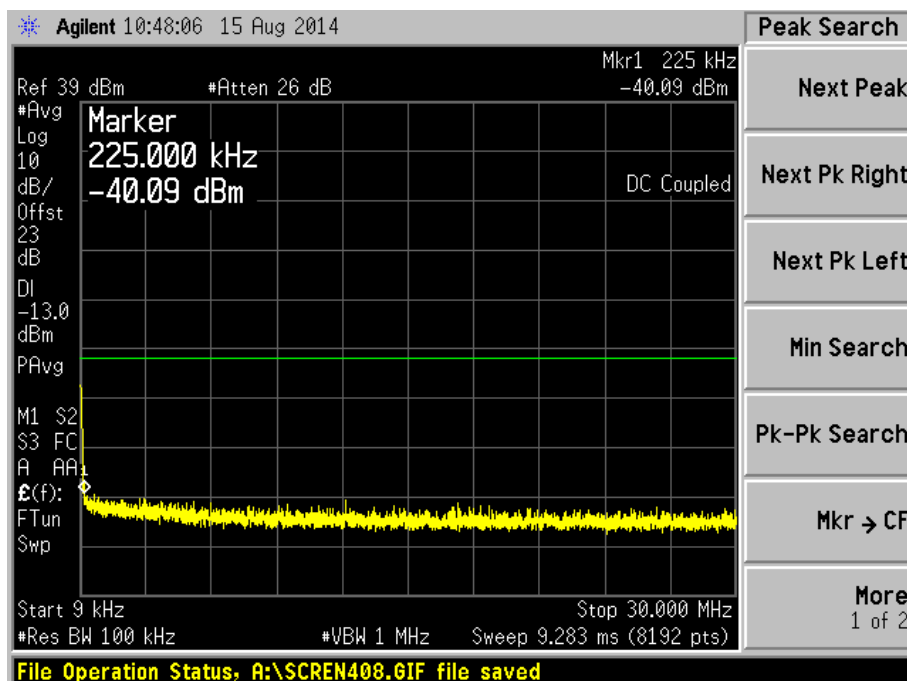
In Band Emissions Plots – PNB53\_45\_16APSK



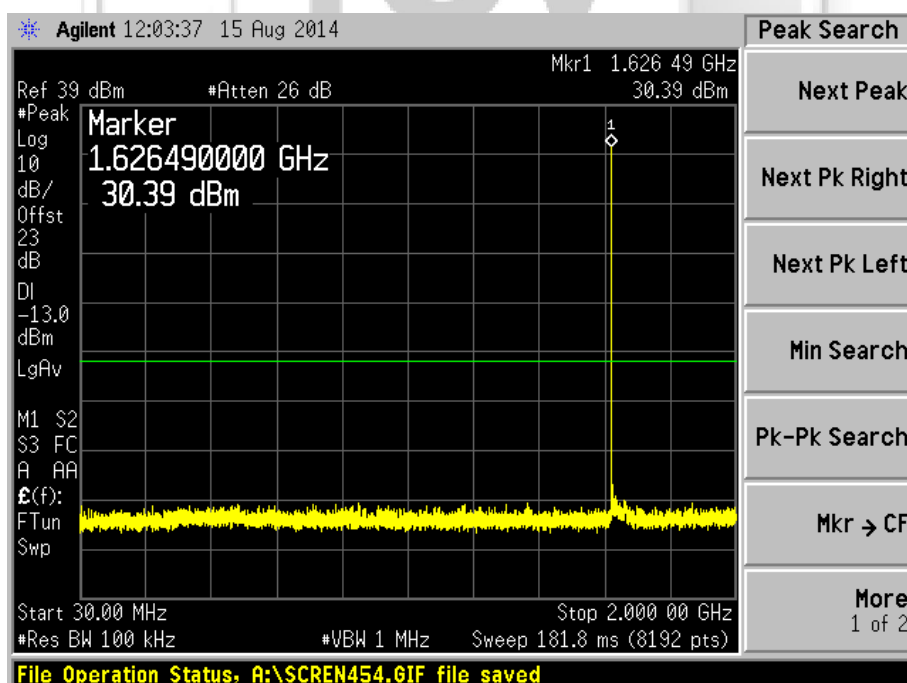
Plot 252 – Upper Channel

# UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

## Out of Band Spurious Plots - RACH



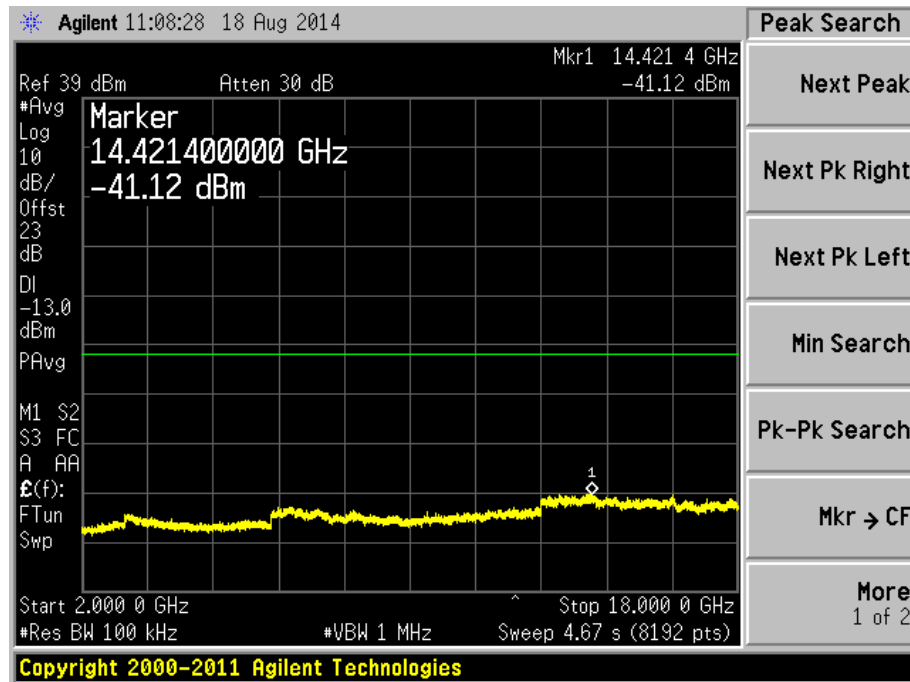
Plot 253 – Lower Channel



Plot 254 – Lower Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

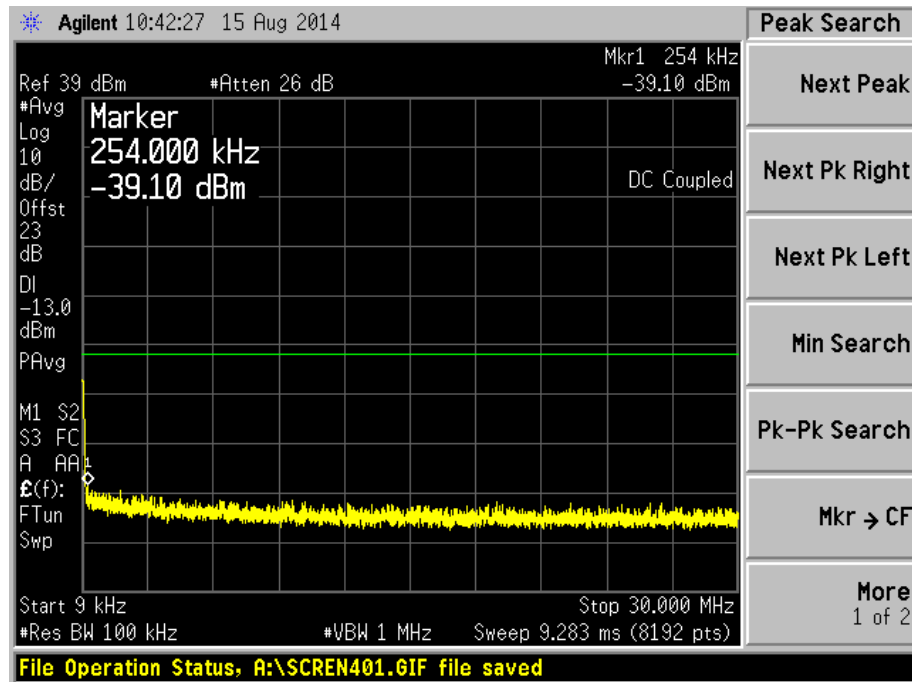
### Out of Band Spurious Plots - RACH



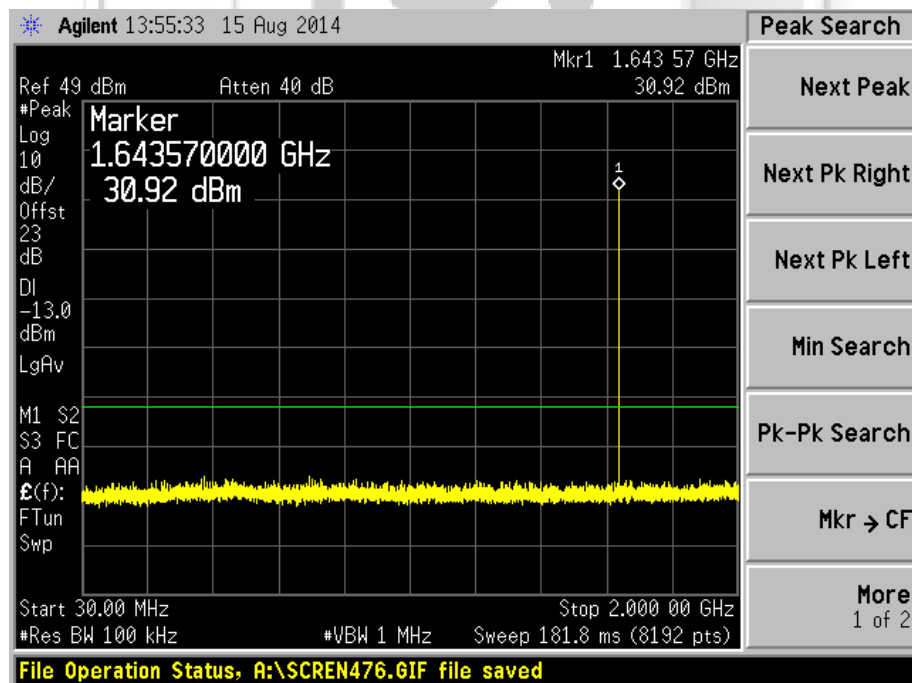
Plot 255 – Lower Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - RACH



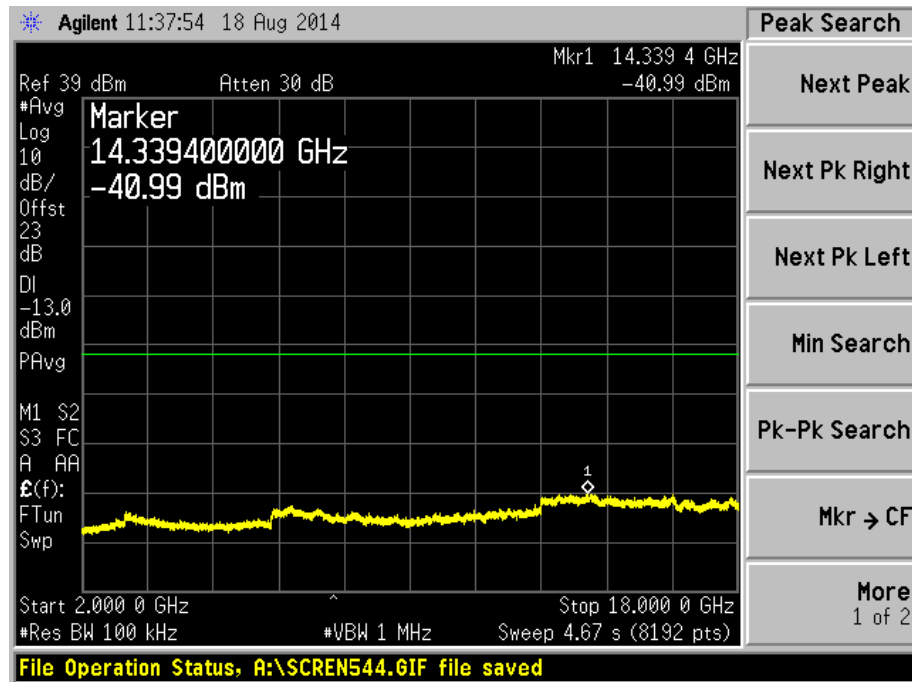
Plot 256 – Middle Channel



Plot 257 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

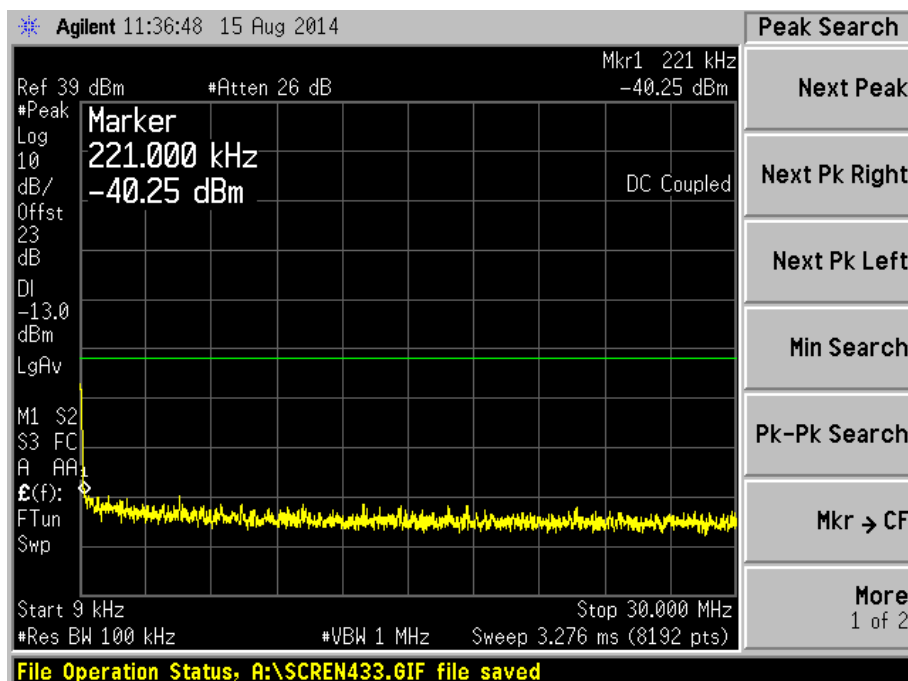
Out of Band Spurious Plots - RACH



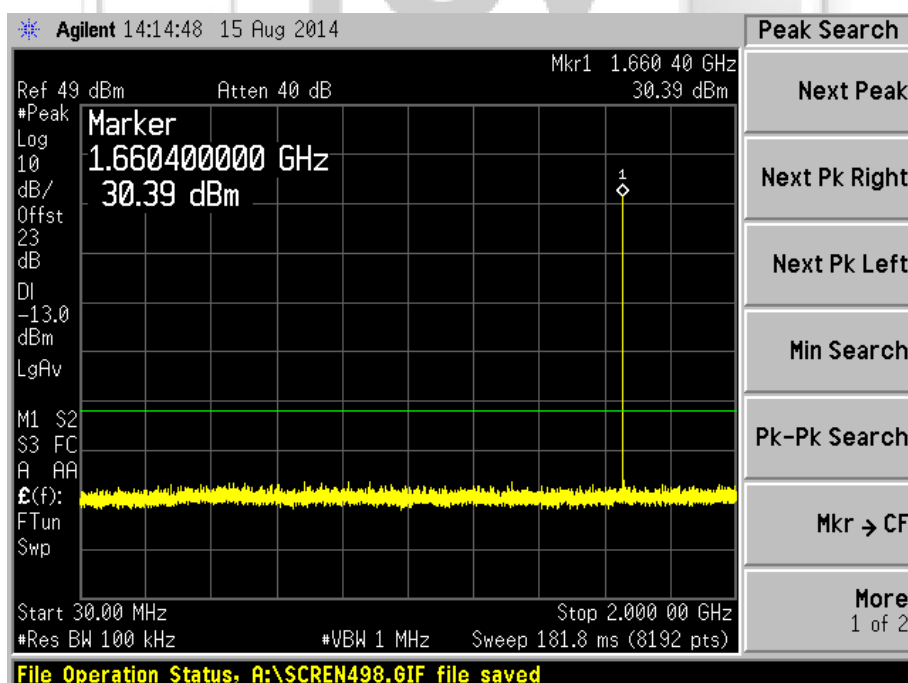
Plot 258 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - RACH



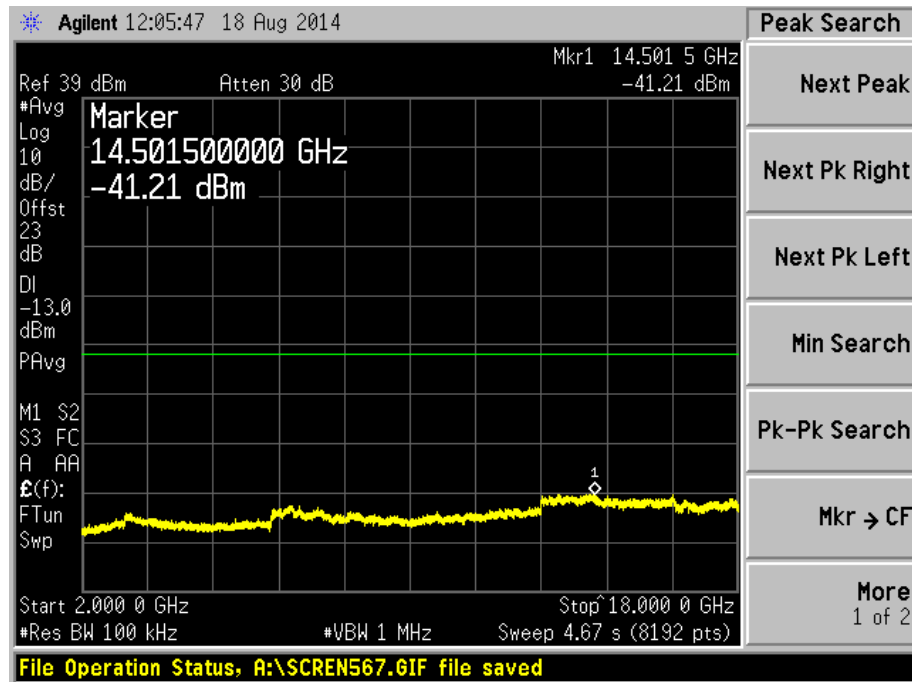
Plot 259 – Upper Channel



Plot 260 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

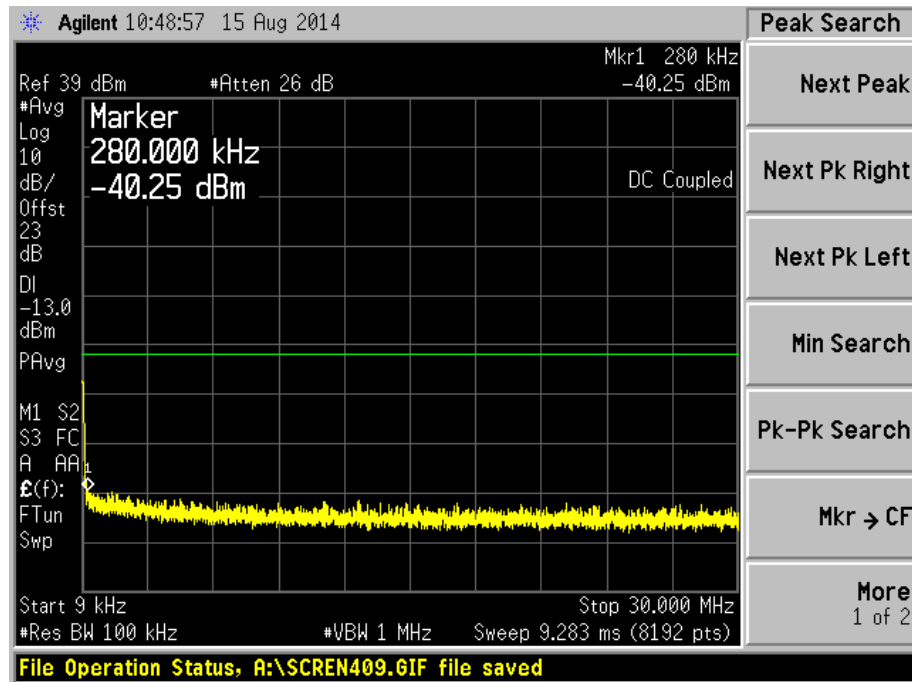
Out of Band Spurious Plots - RACH



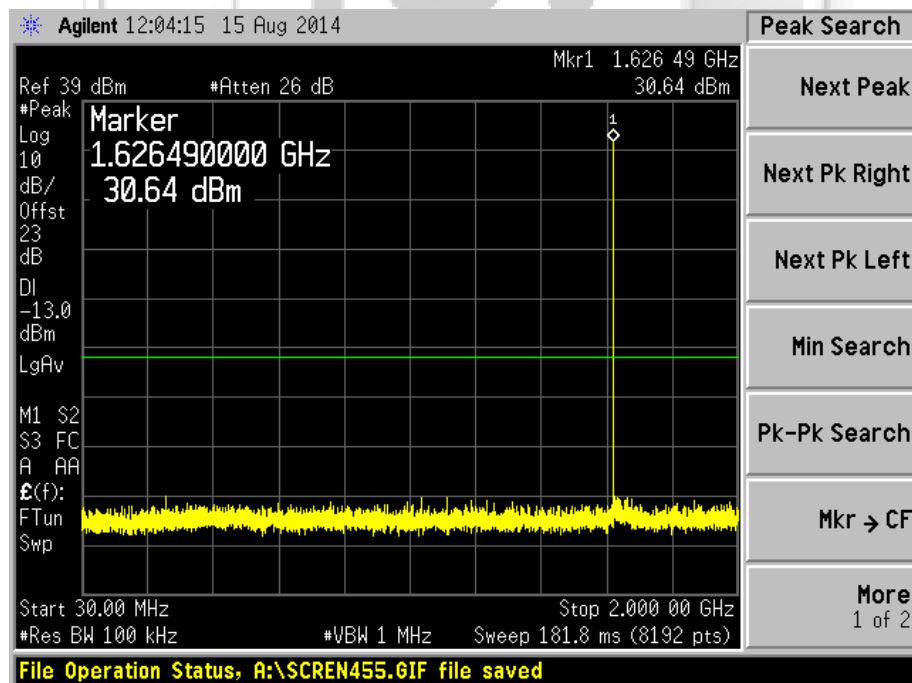
Plot 261 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - AGCH



Plot 262 – Lower Channel

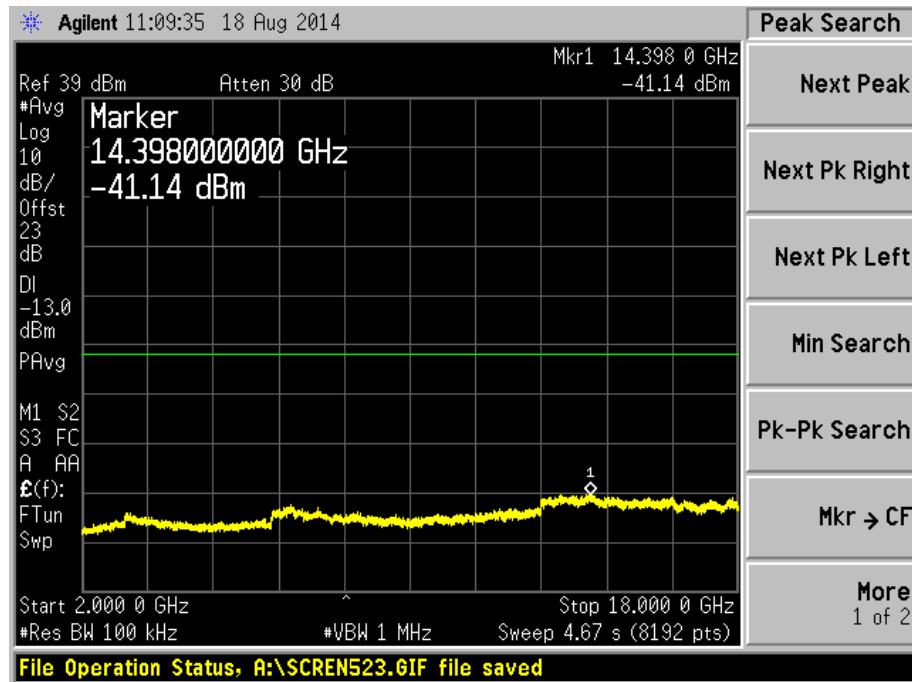


Plot 263 – Lower Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

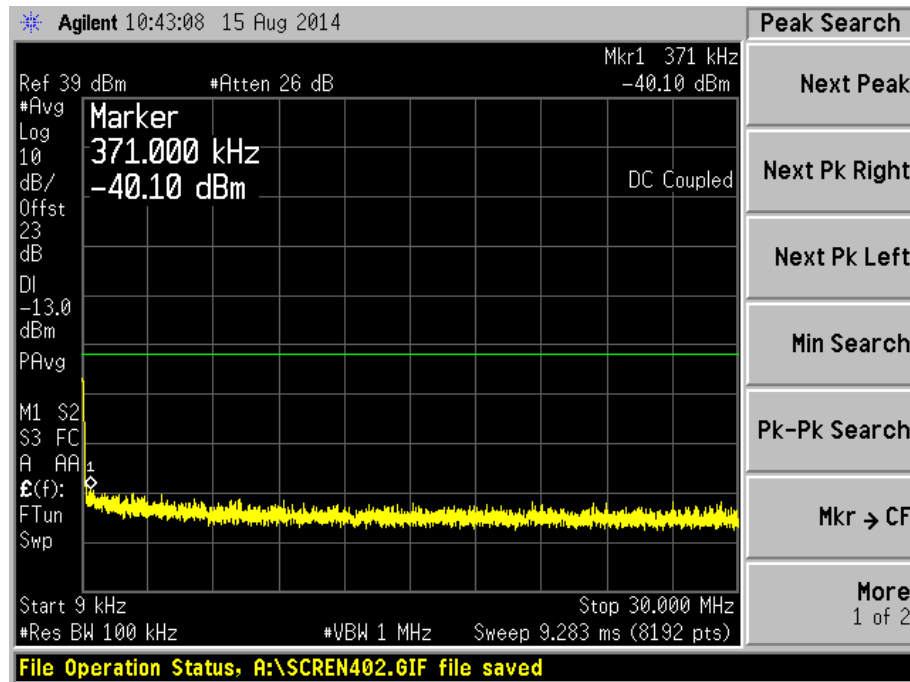
Out of Band Spurious Plots - AGCH



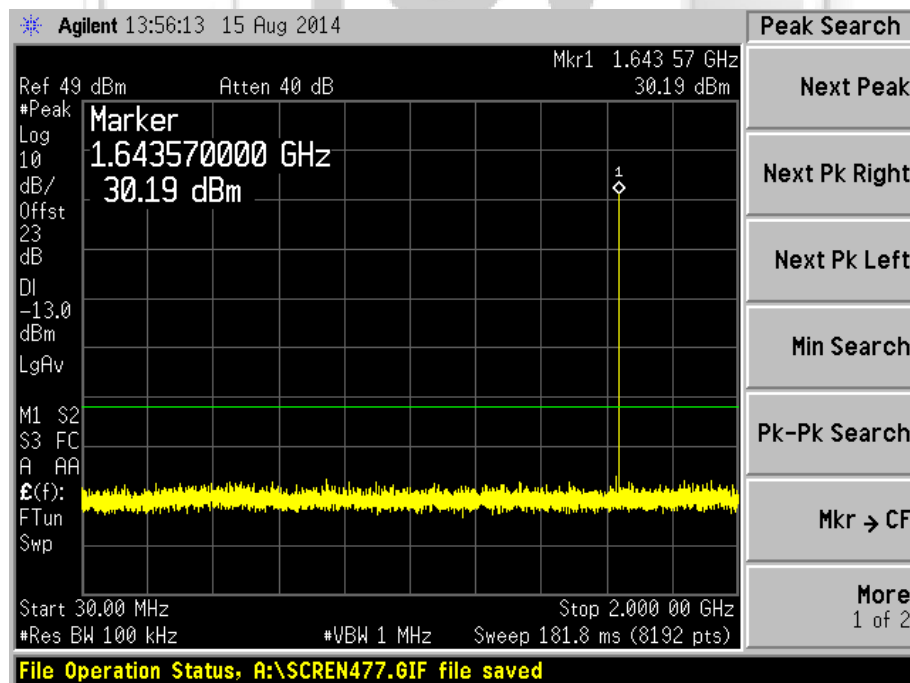
Plot 264 – Lower Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - AGCH



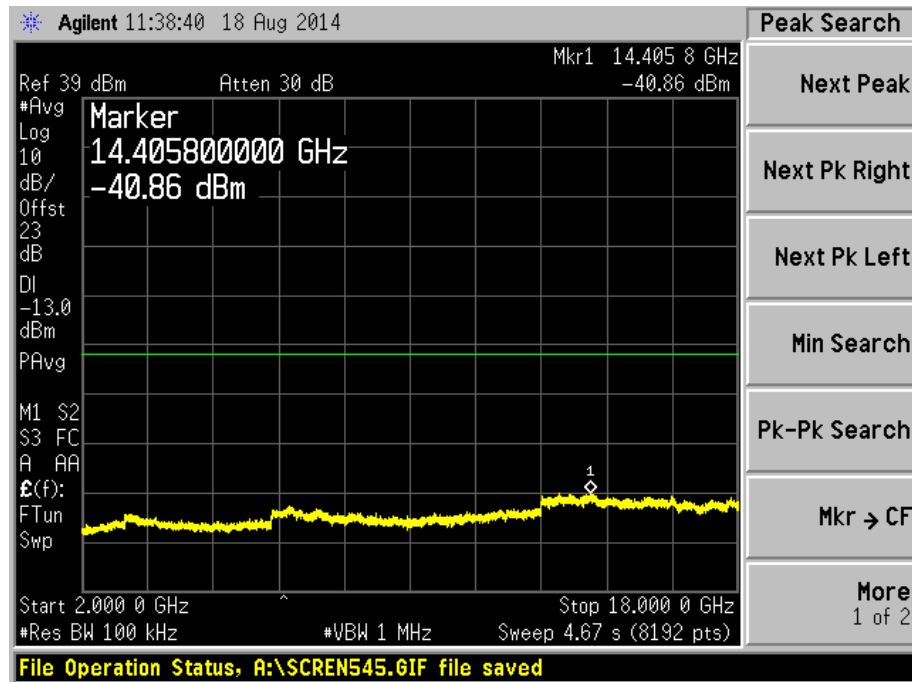
Plot 265 – Middle Channel



Plot 266 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

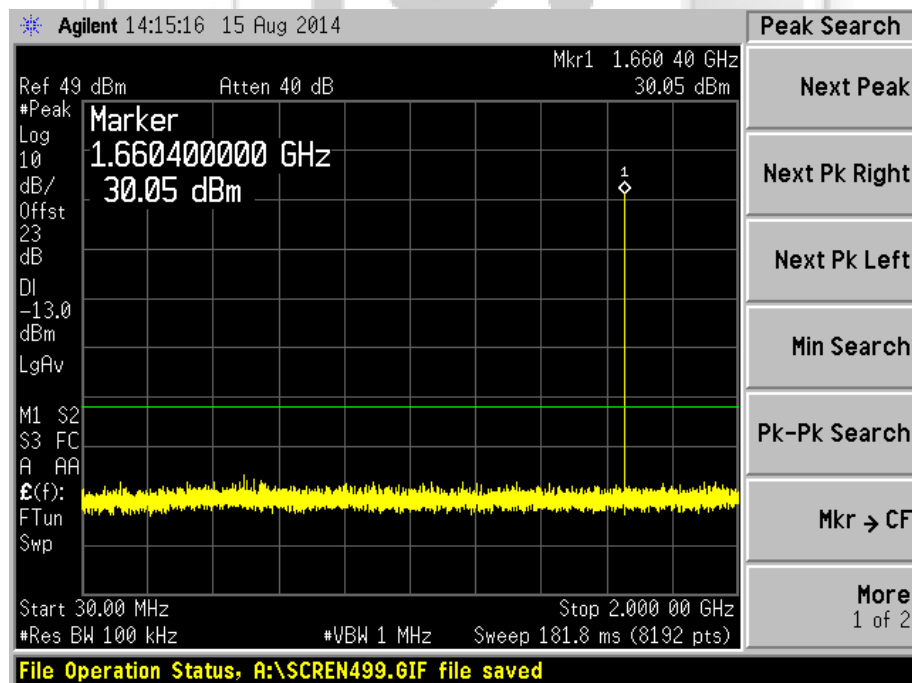
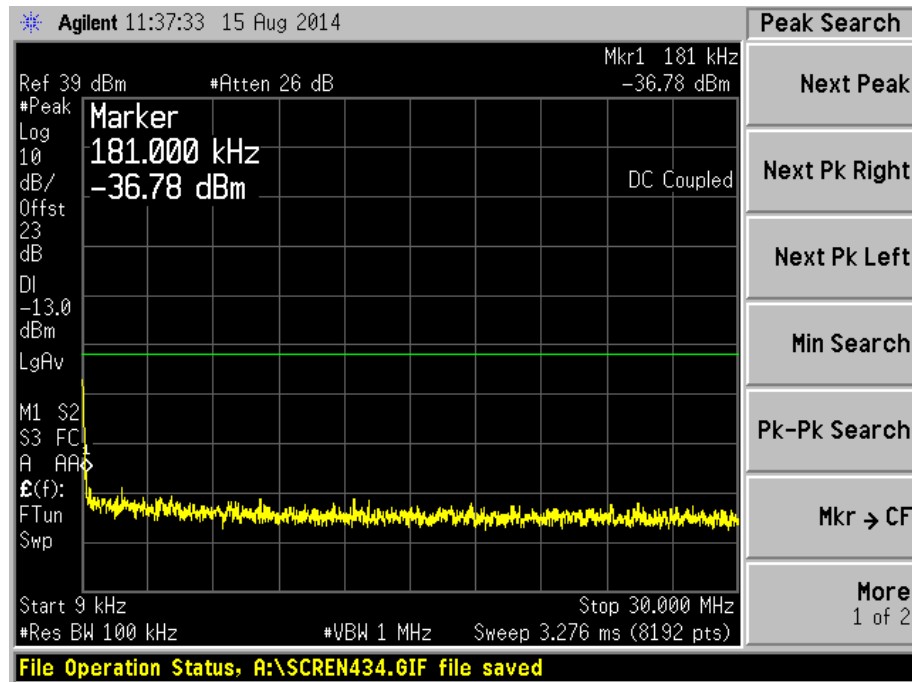
Out of Band Spurious Plots - AGCH



Plot 267 – Middle Channel

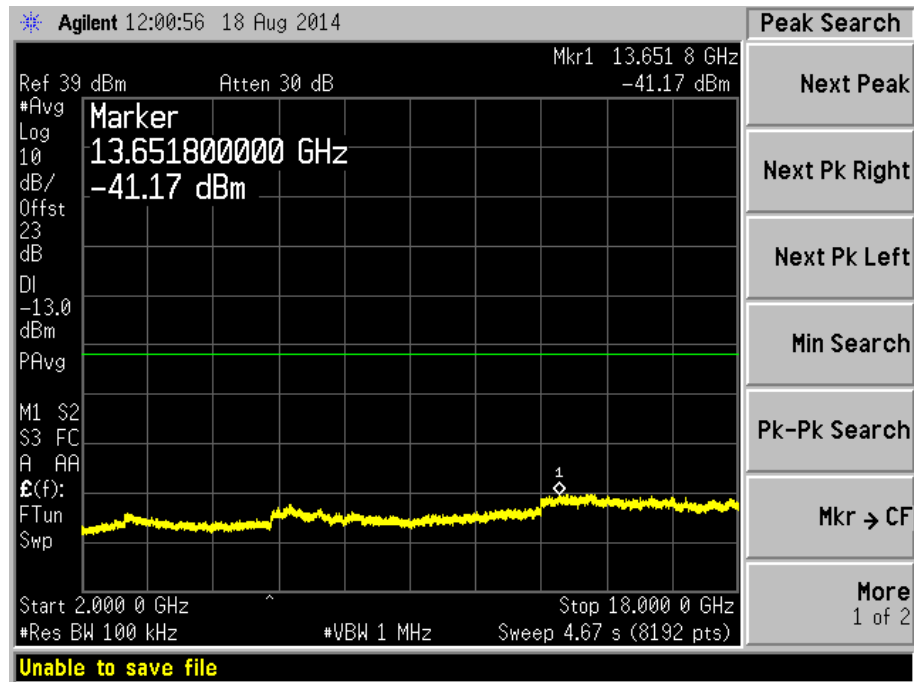
## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - AGCH



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

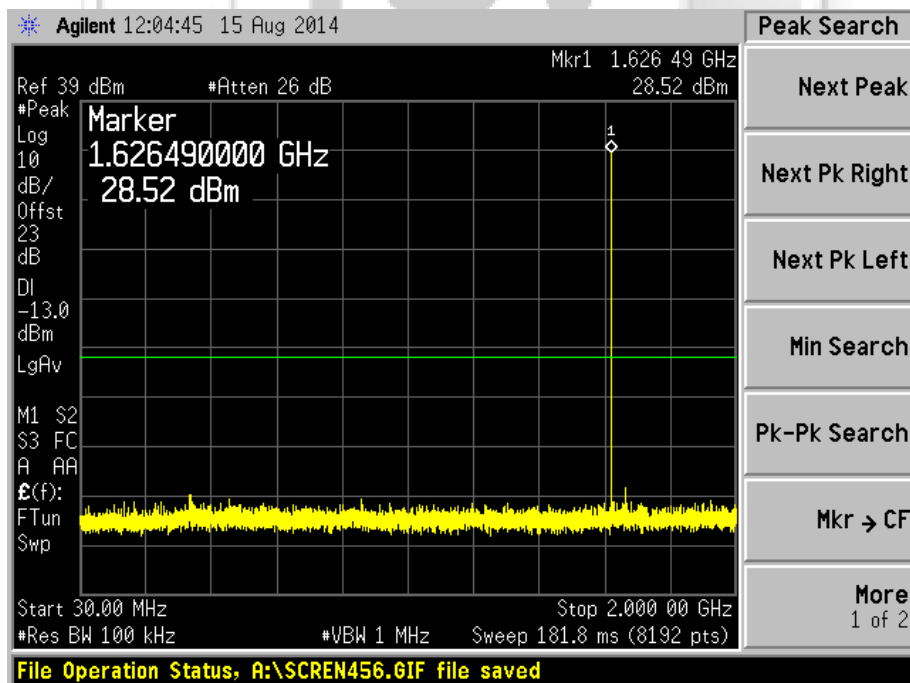
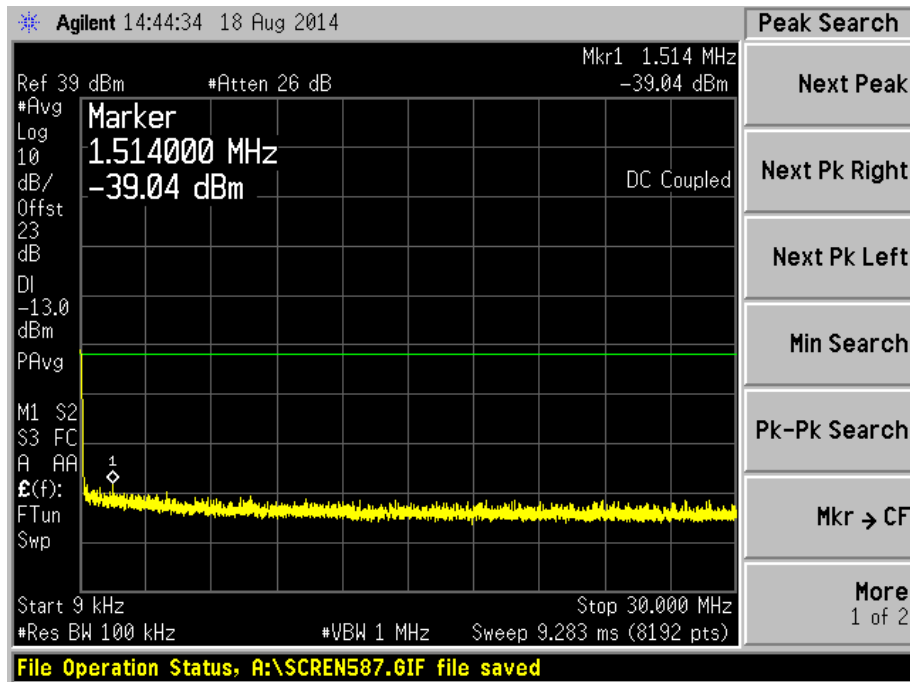
### Out of Band Spurious Plots - AGCH



Plot 270 – Upper Channel

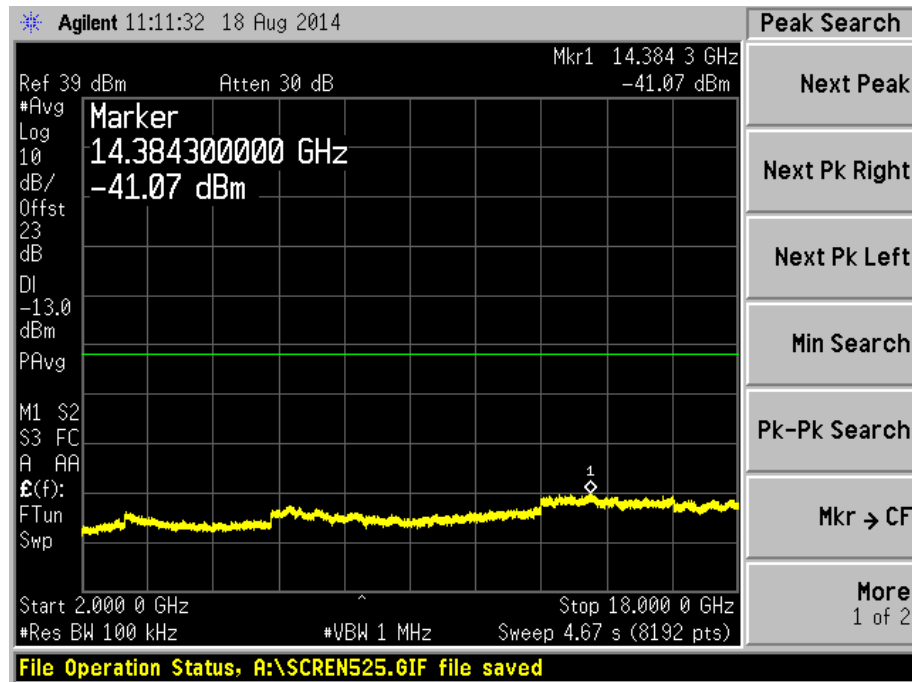
## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - FACCH



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

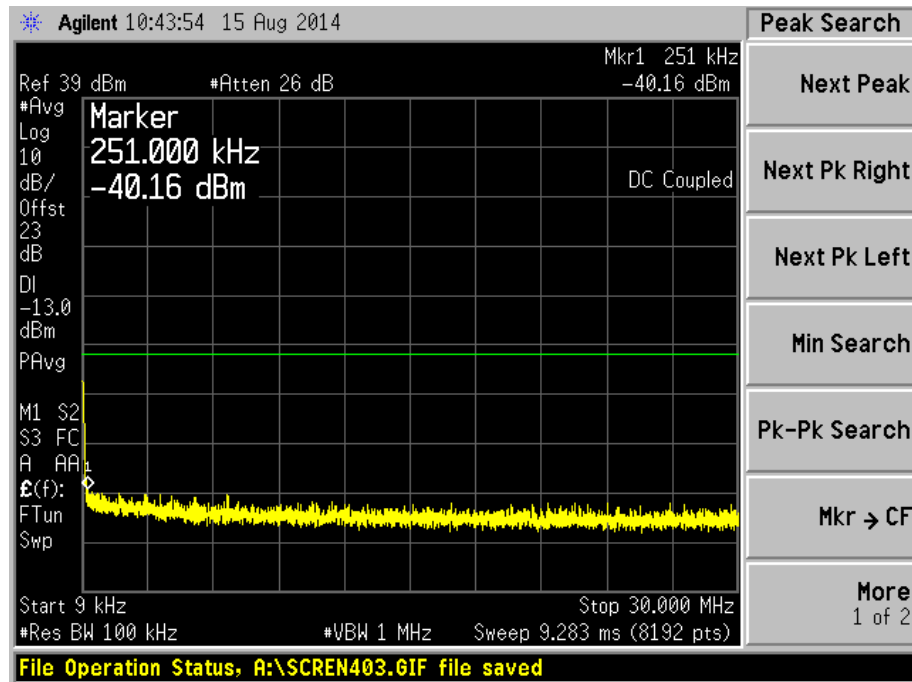
Out of Band Spurious Plots - FACCH



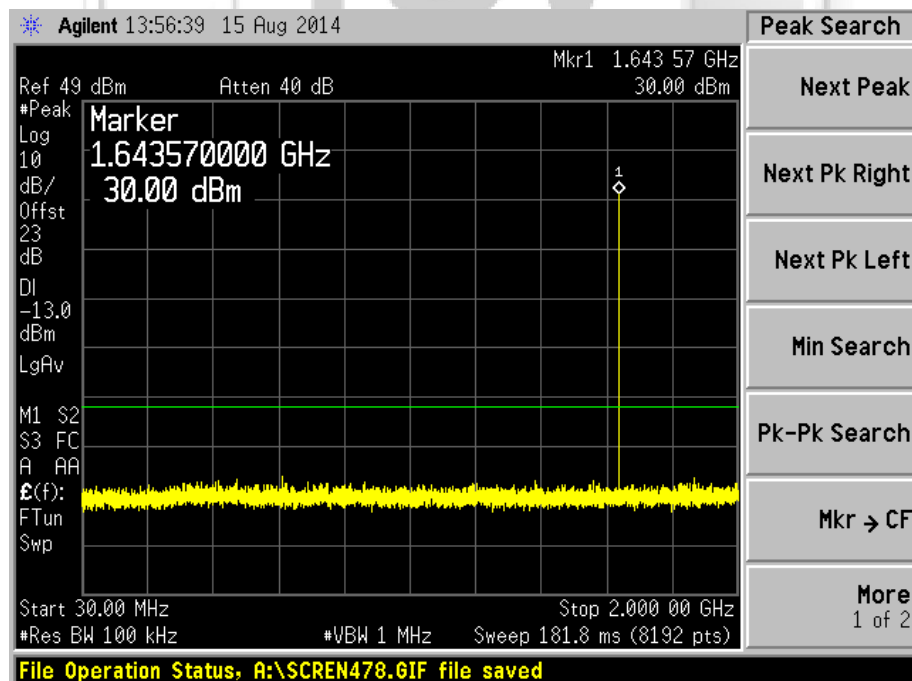
Plot 273 – Lower Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - FACCH



Plot 274 – Middle Channel

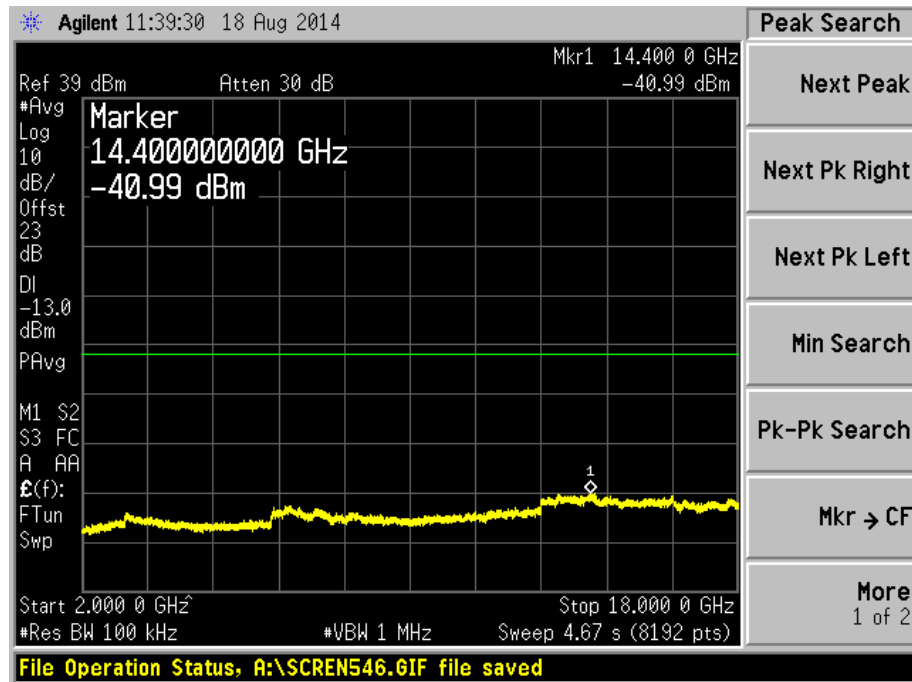


Plot 275 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

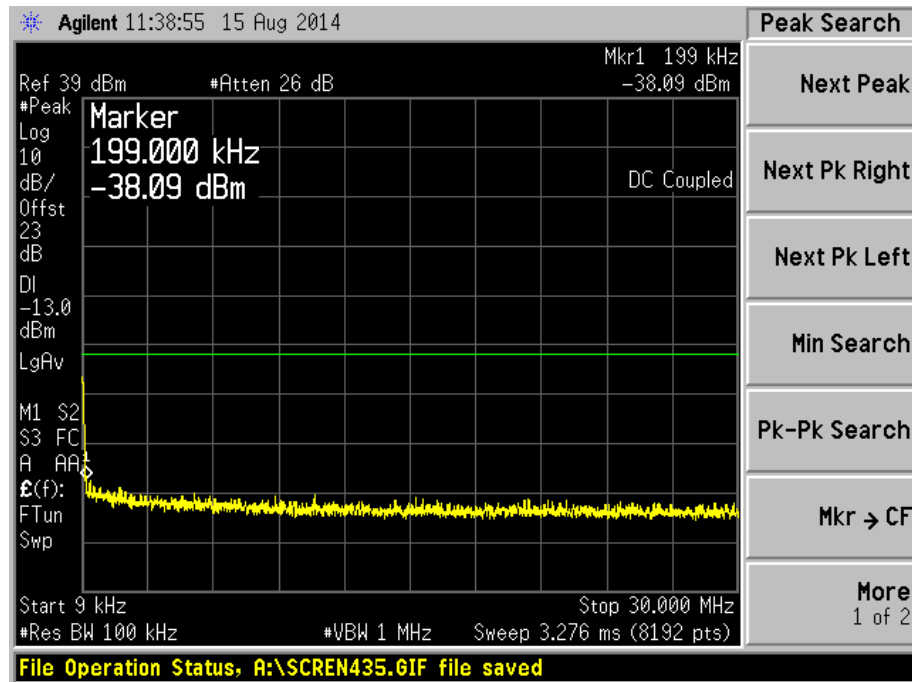
Out of Band Spurious Plots - FACCH



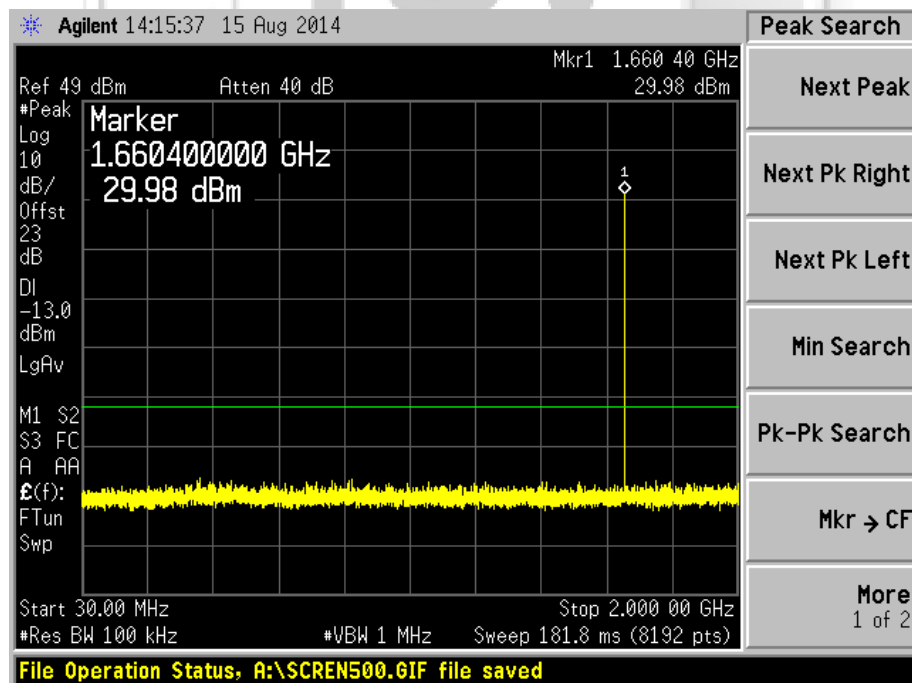
Plot 276 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - FACCH



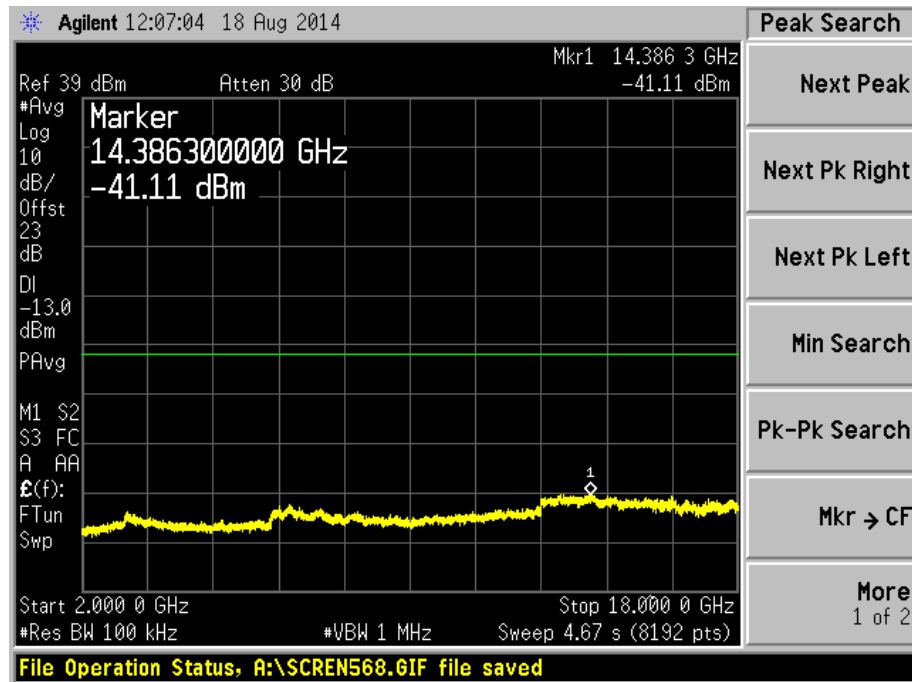
Plot 277 – Upper Channel



Plot 278 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

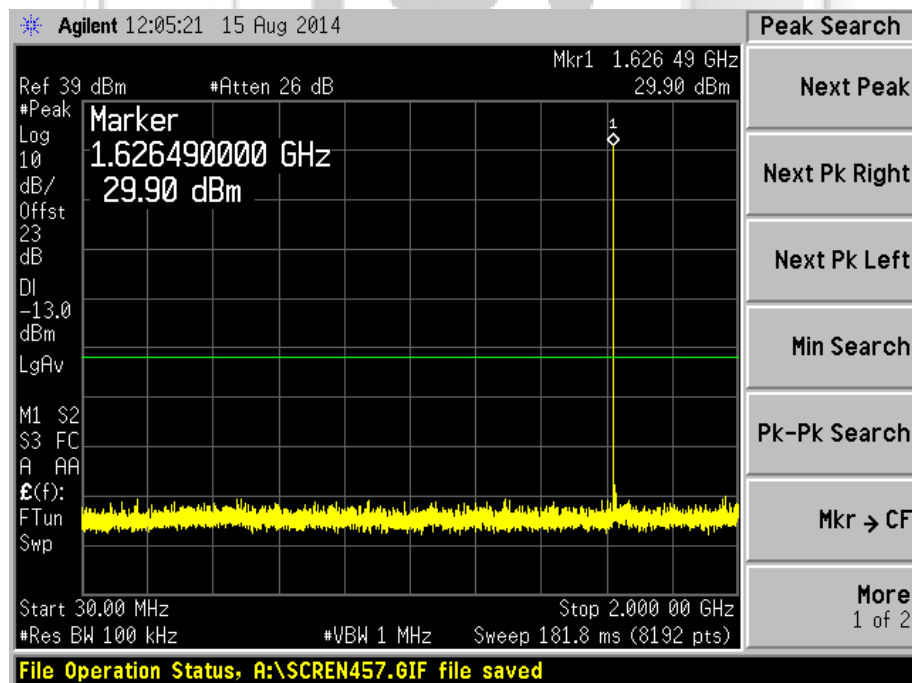
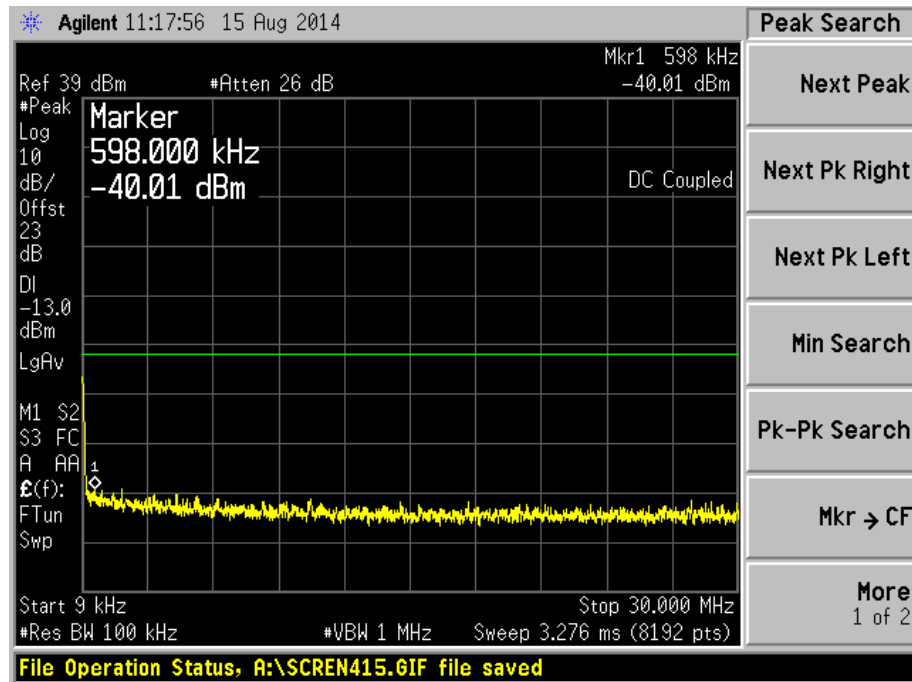
### Out of Band Spurious Plots - FACCH



Plot 279 – Upper Channel

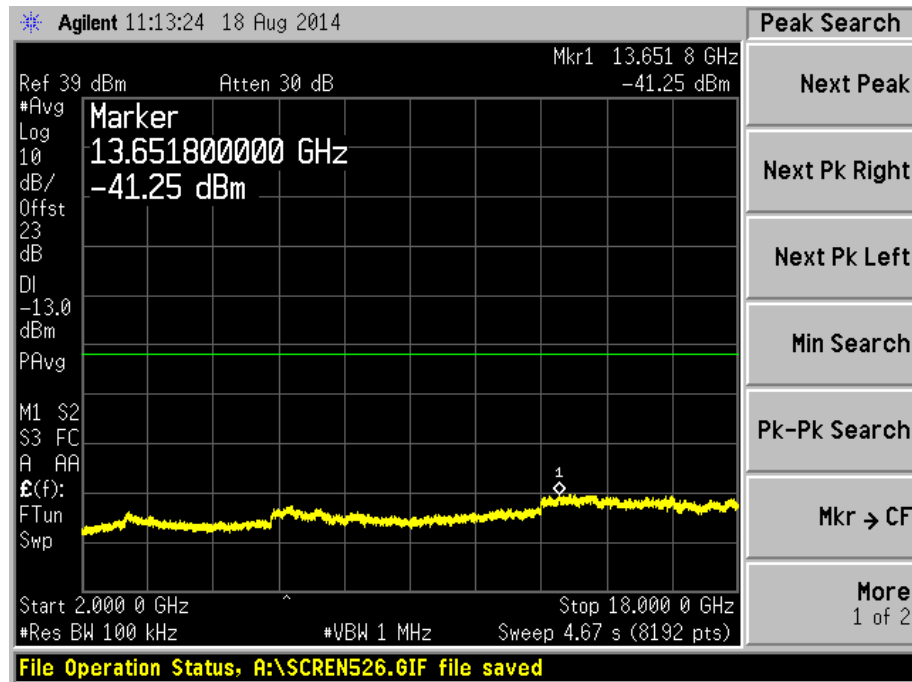
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots – TCH3



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

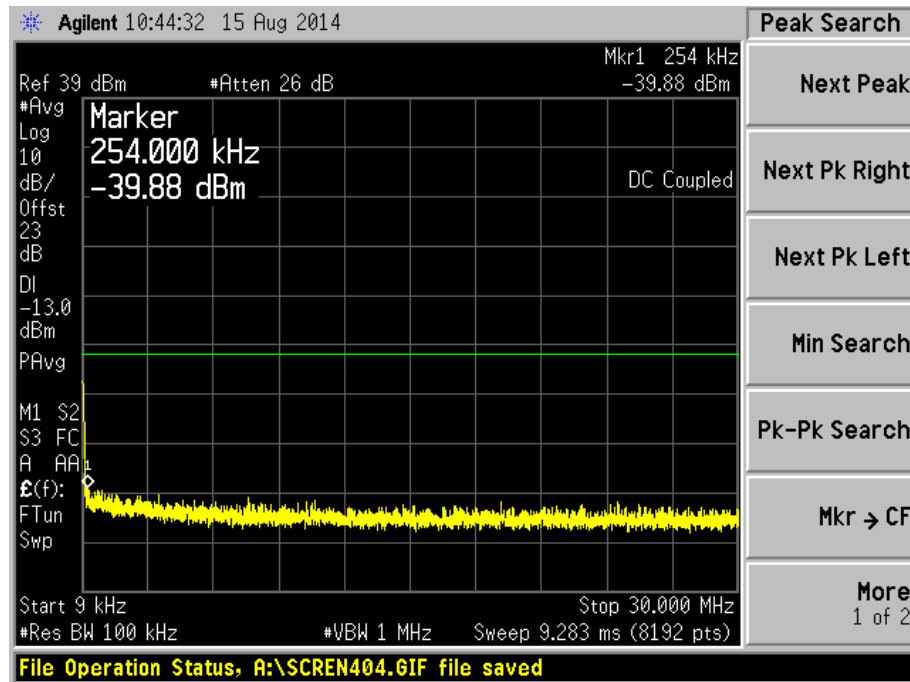
Out of Band Spurious Plots – TCH3



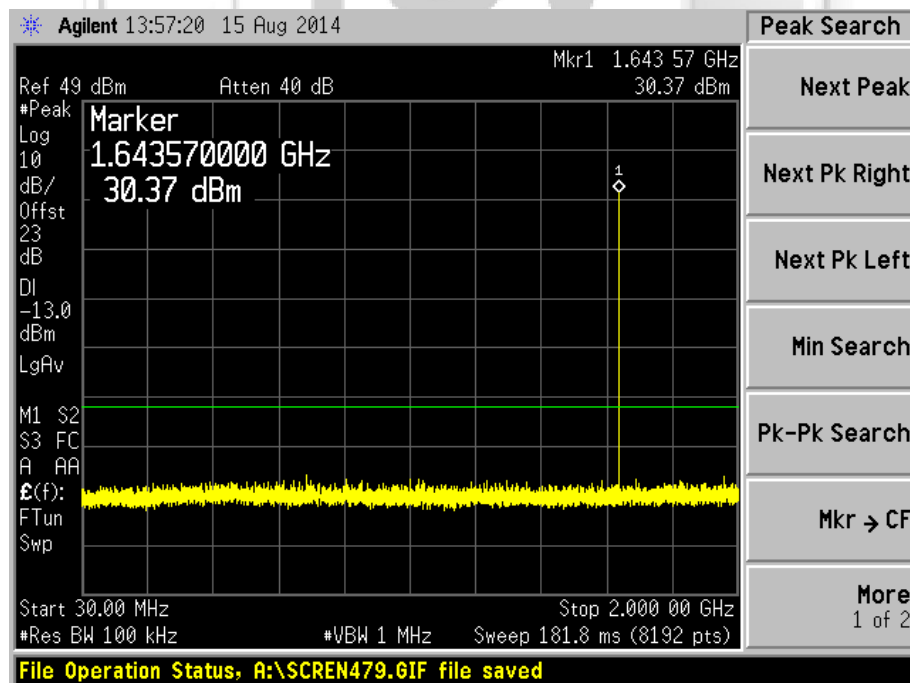
Plot 282 – Lower Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - TCH3



Plot 283 – Middle Channel

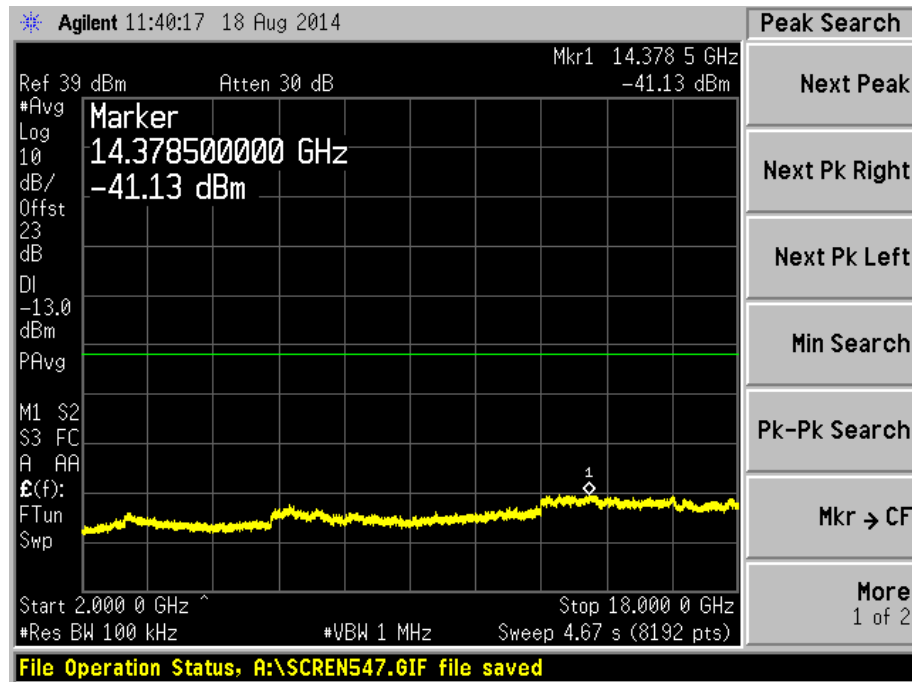


Plot 284 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

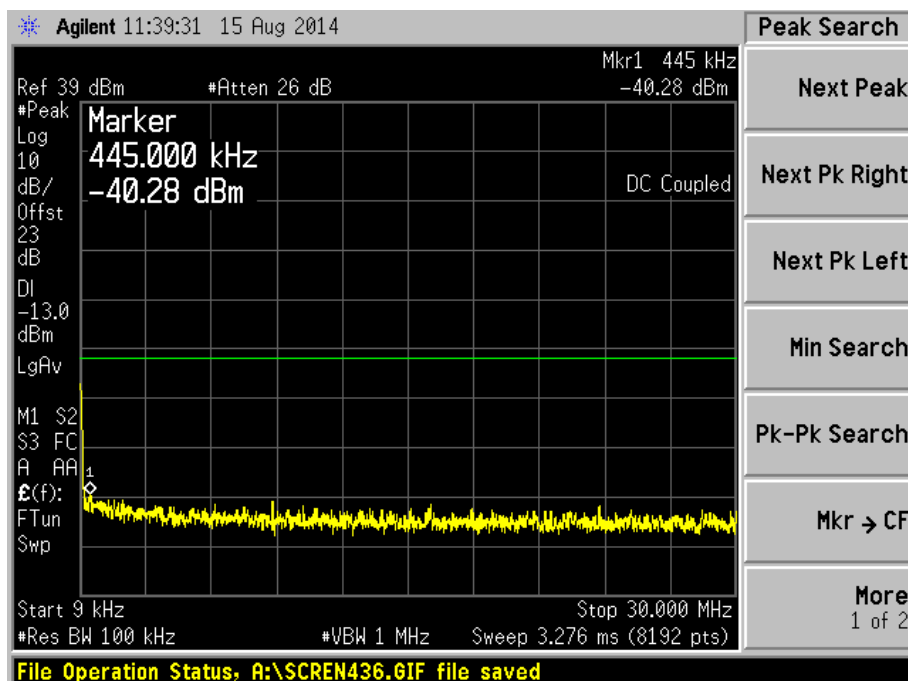
Out of Band Spurious Plots - TCH3



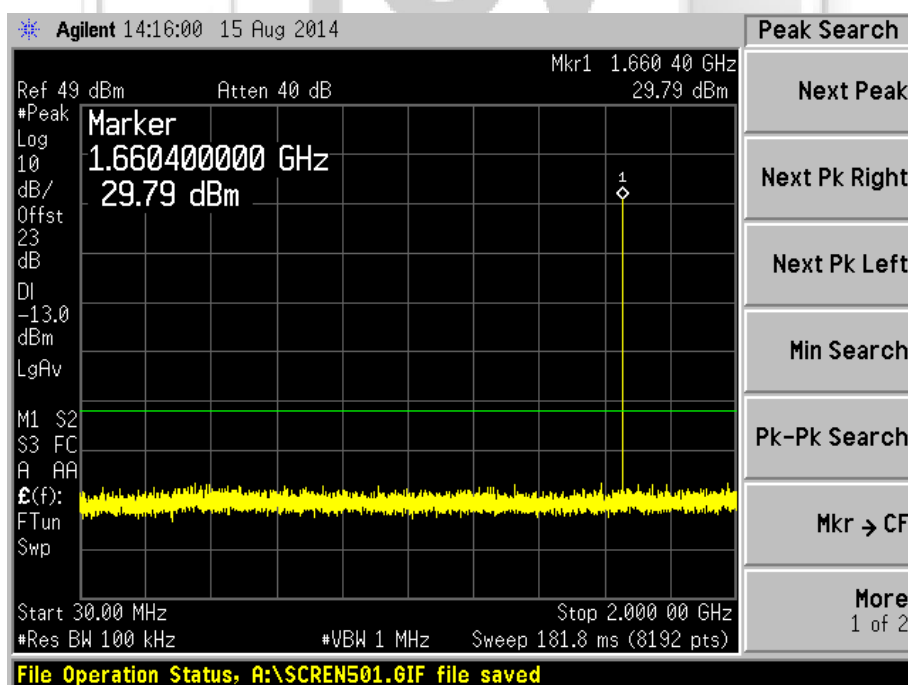
Plot 285 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - TCH3



Plot 286 – Upper Channel

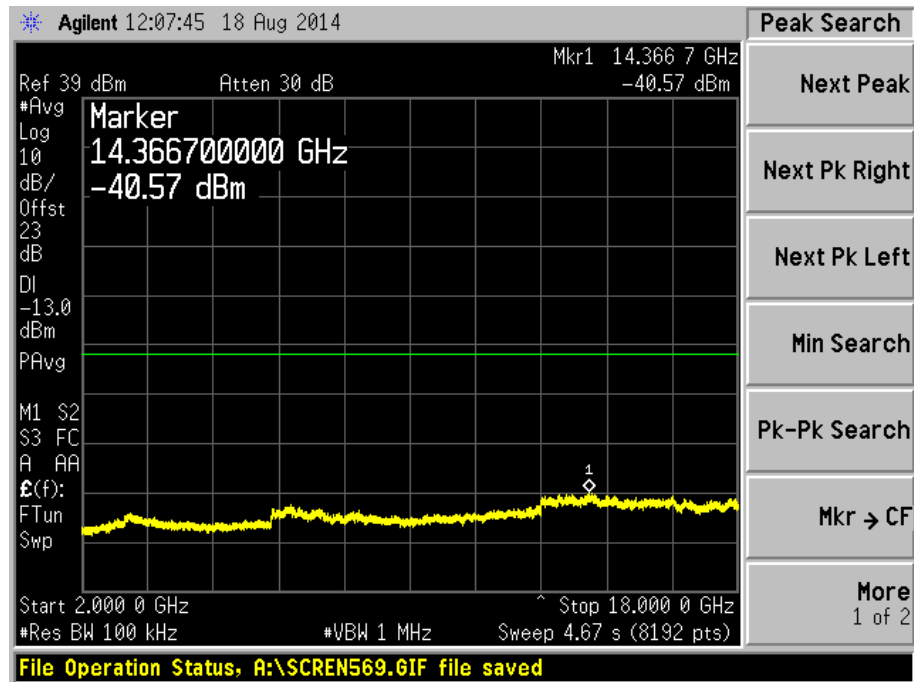


Plot 287 – Upper Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

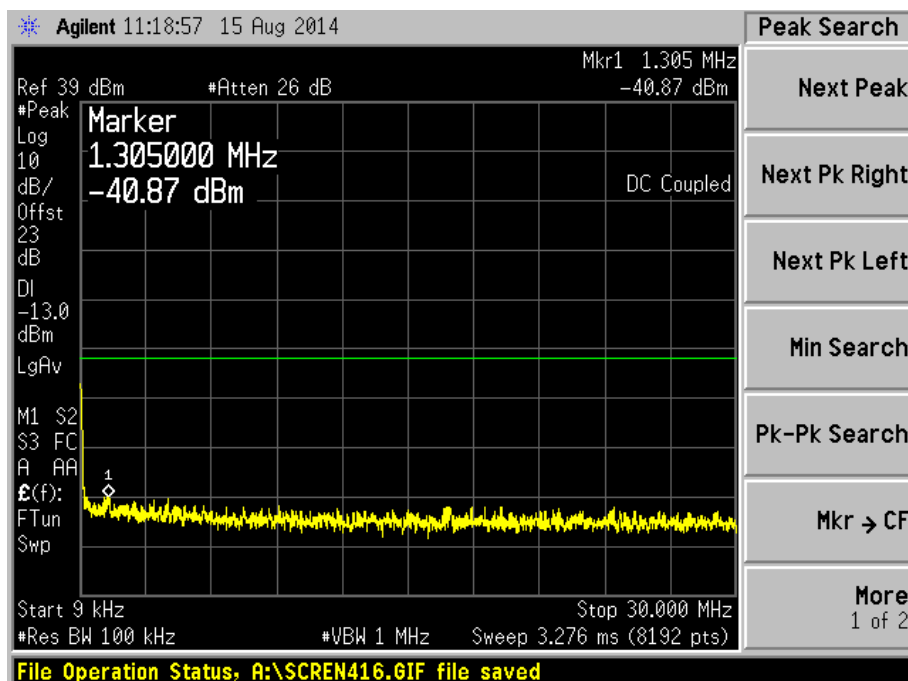
### Out of Band Spurious Plots - TCH3



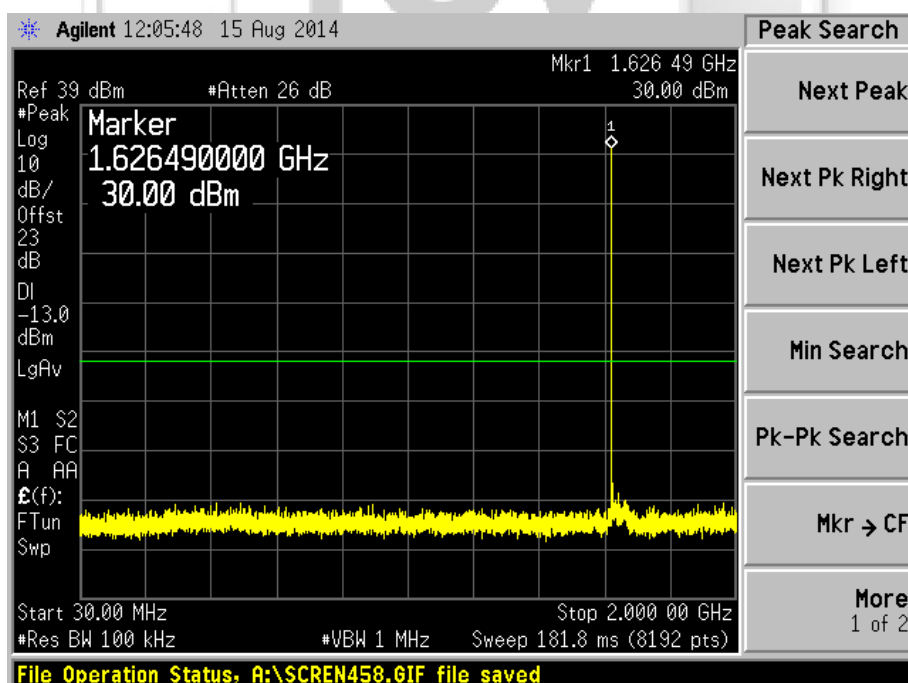
Plot 288 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots – FACCH9



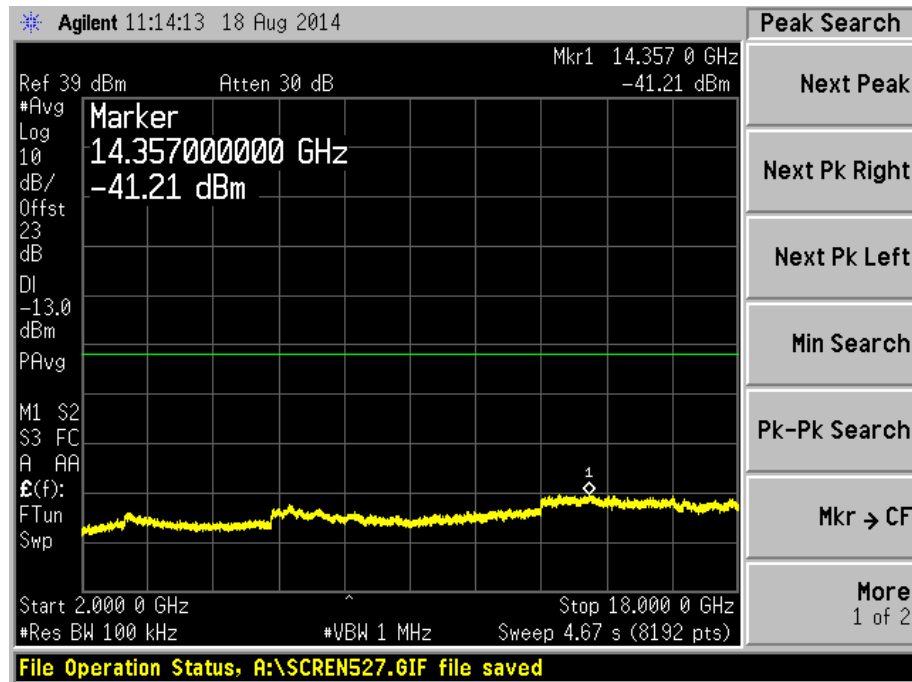
Plot 289 – Lower Channel



Plot 290 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

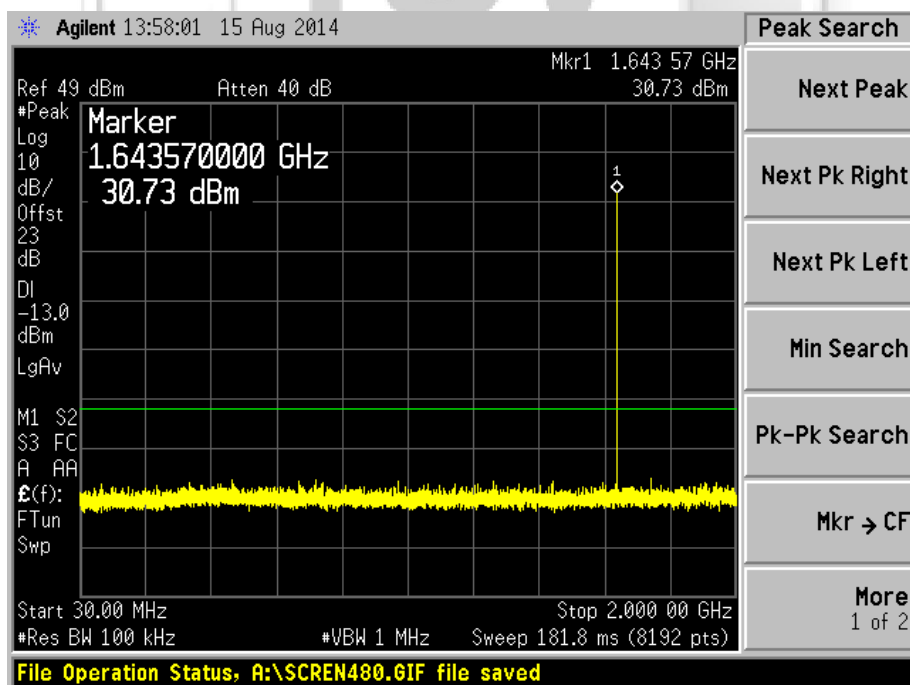
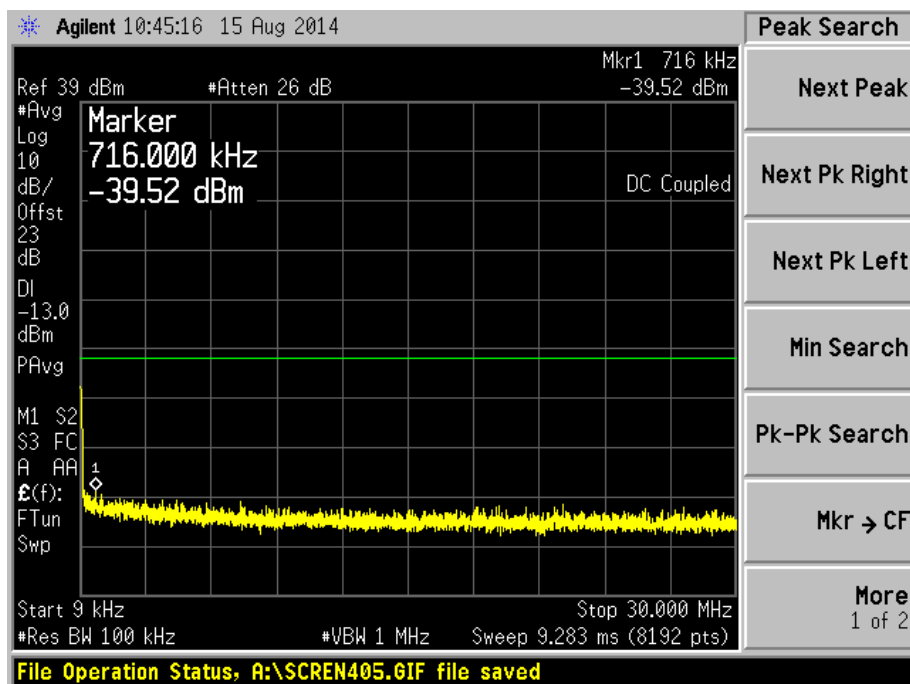
Out of Band Spurious Plots – FACCH9



Plot 291 – Lower Channel

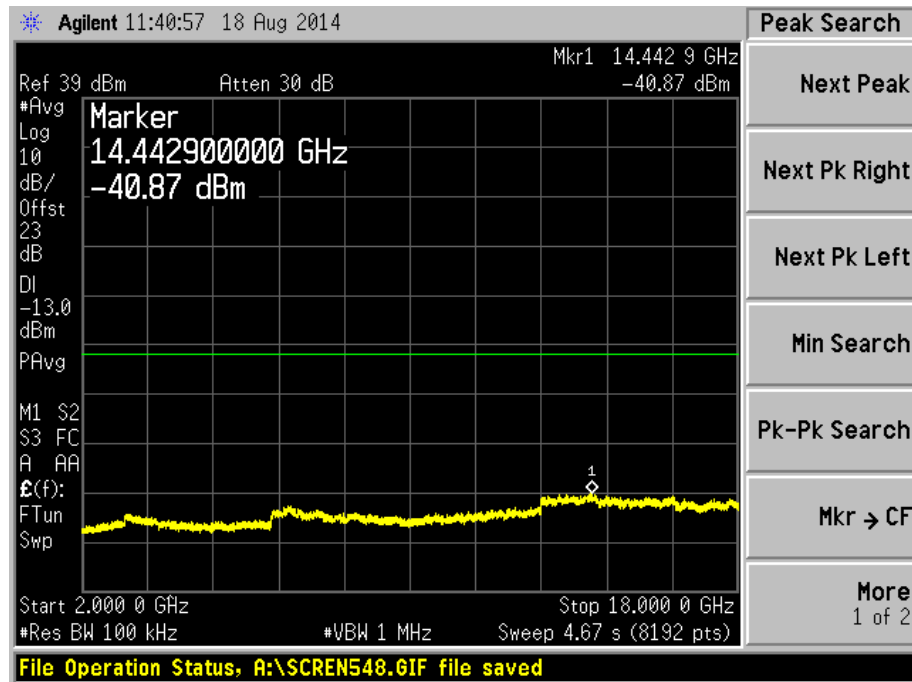
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - FACCH9



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

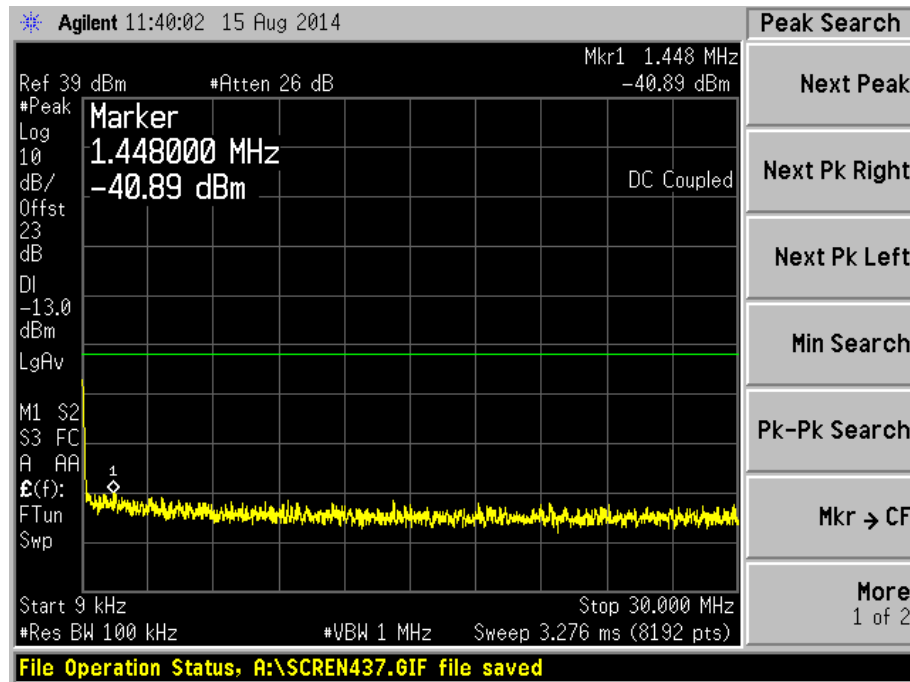
Out of Band Spurious Plots - FACCH9



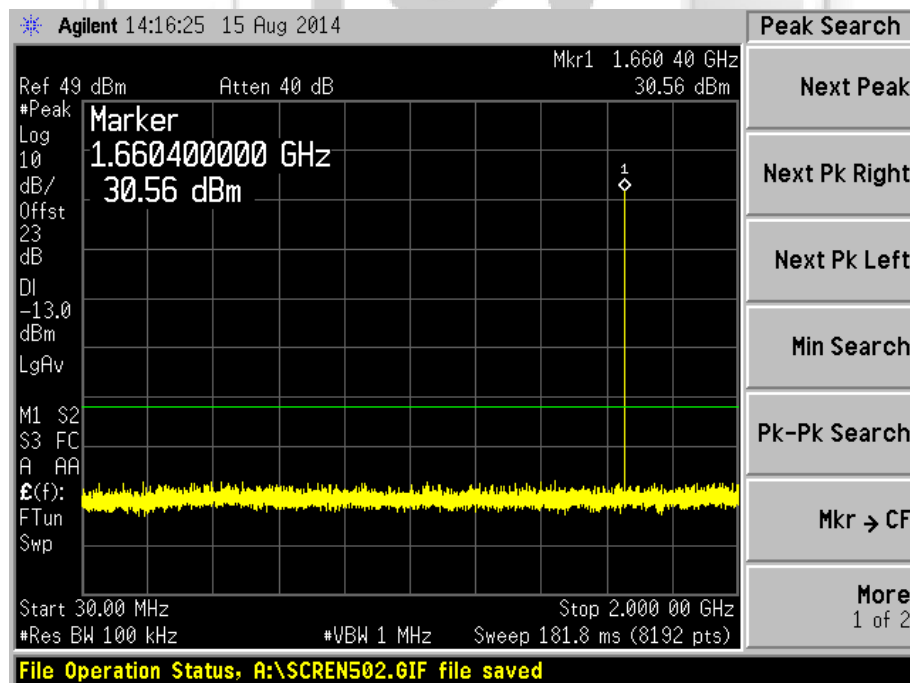
Plot 294 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - FACCH9



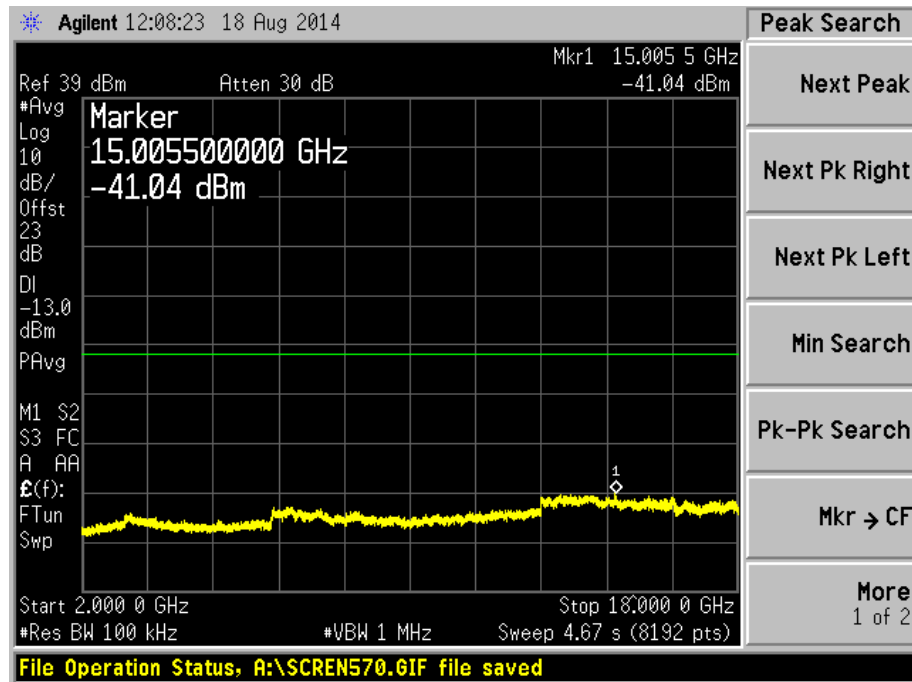
Plot 295 – Upper Channel



Plot 296 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

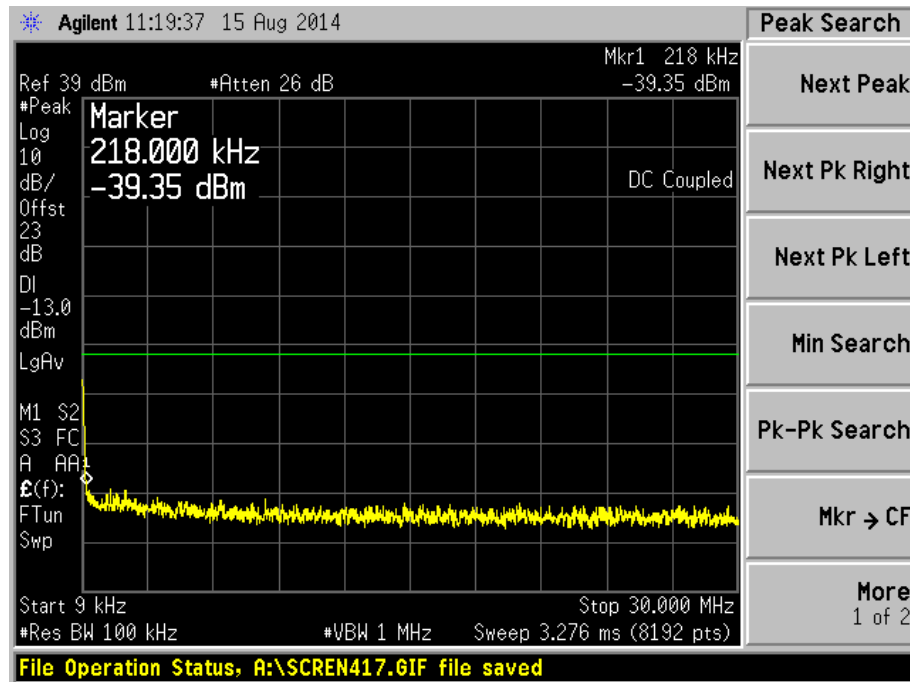
Out of Band Spurious Plots - FACCH9



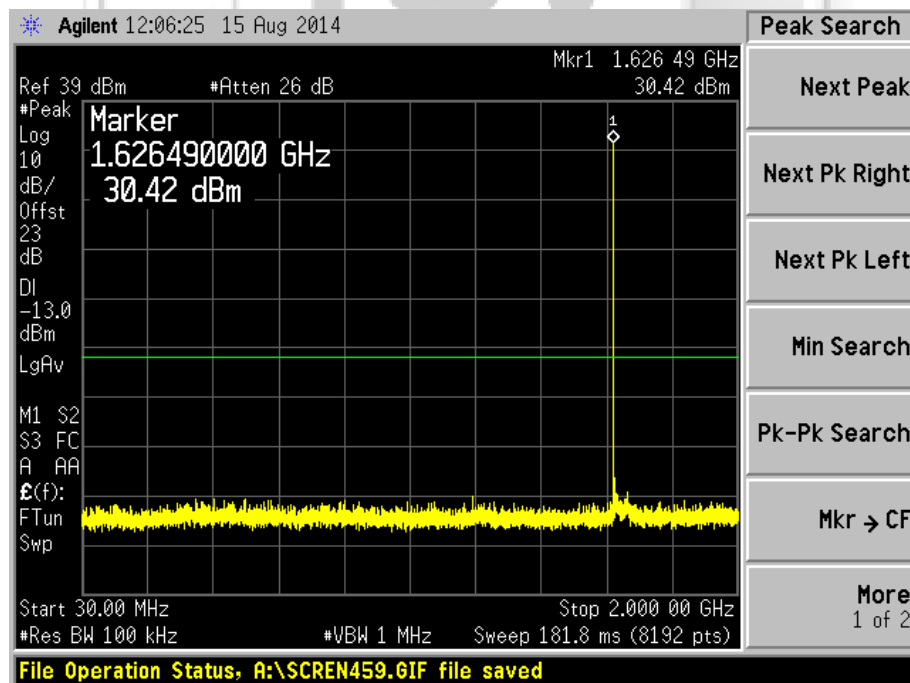
Plot 297 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots – TCH9



Plot 298 – Lower Channel

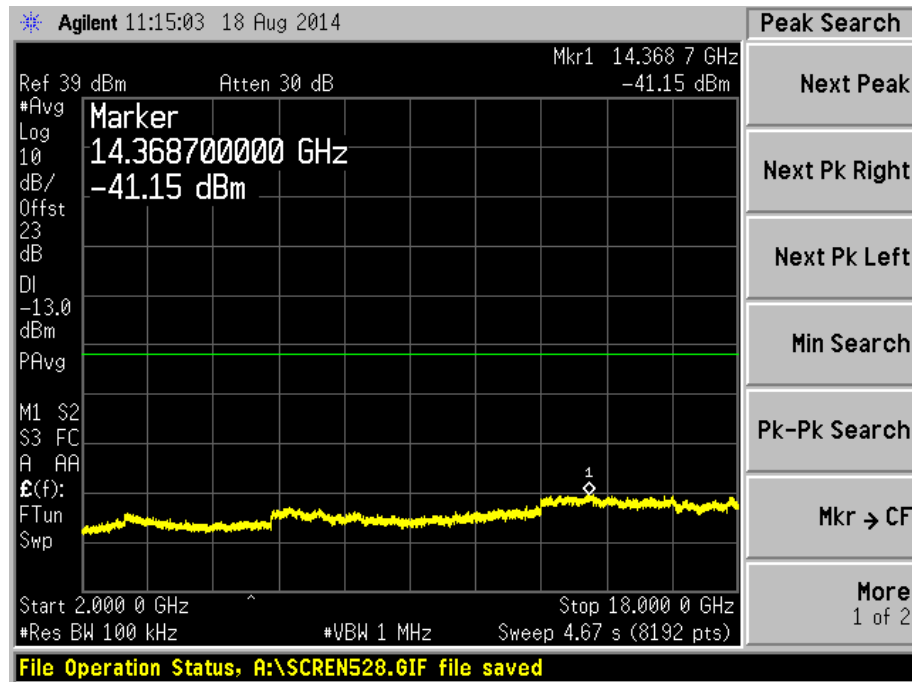


Plot 299 – Lower Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

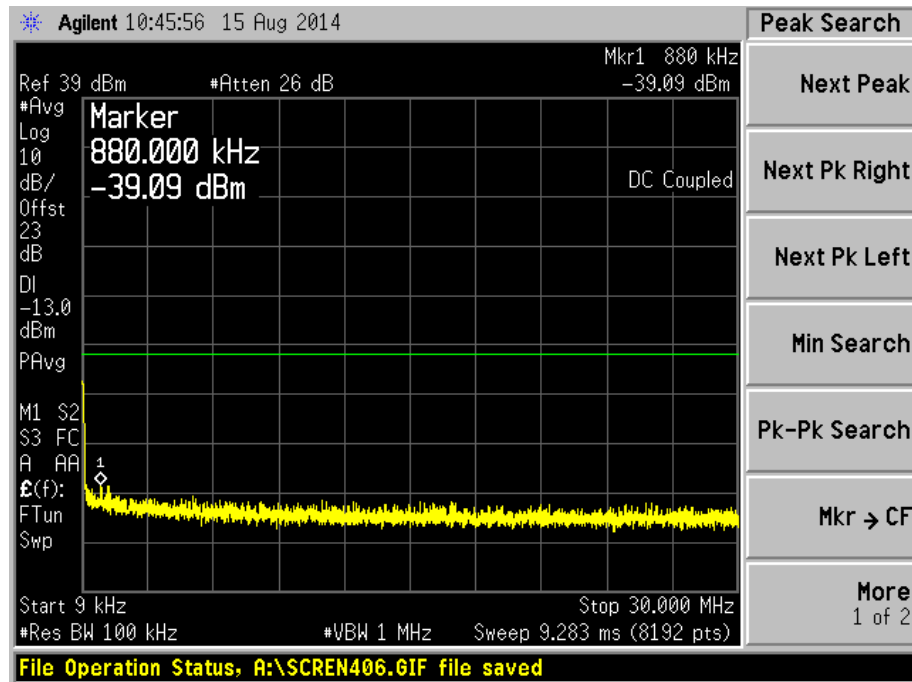
Out of Band Spurious Plots – TCH9



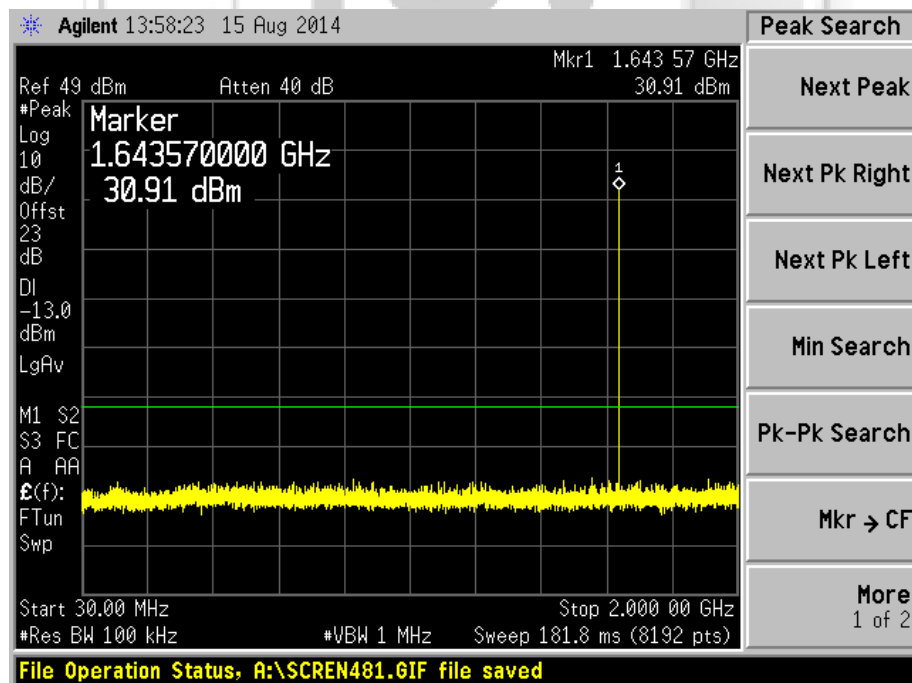
Plot 300 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - TCH9



Plot 301 – Middle Channel

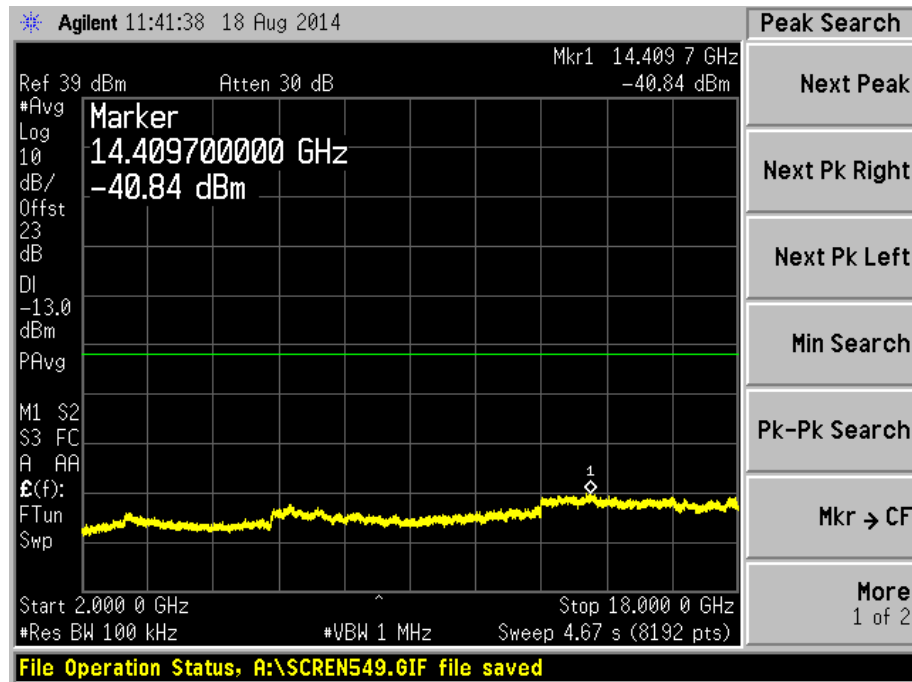


Plot 302 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

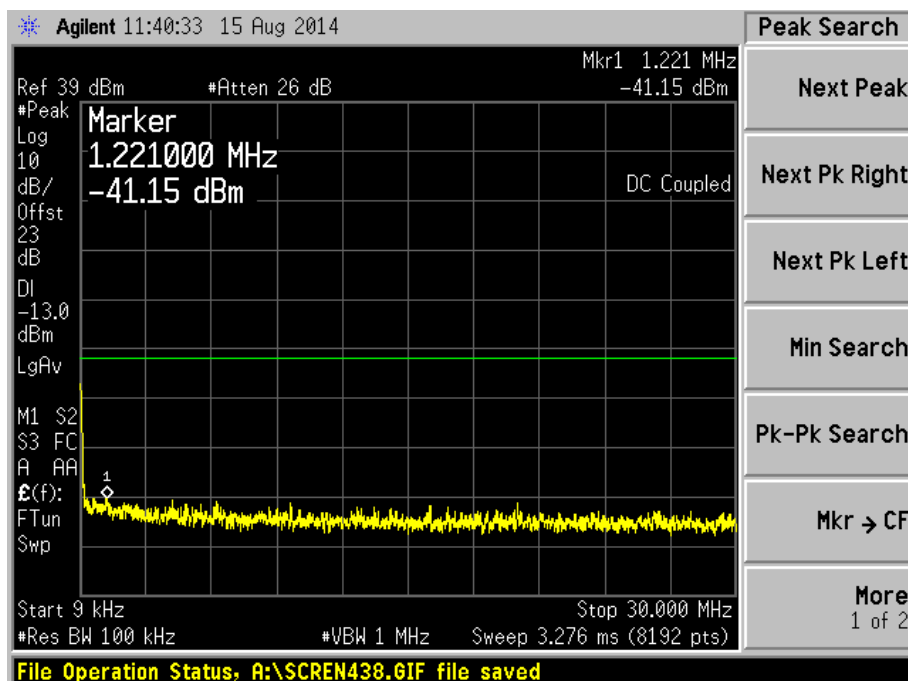
Out of Band Spurious Plots - TCH9



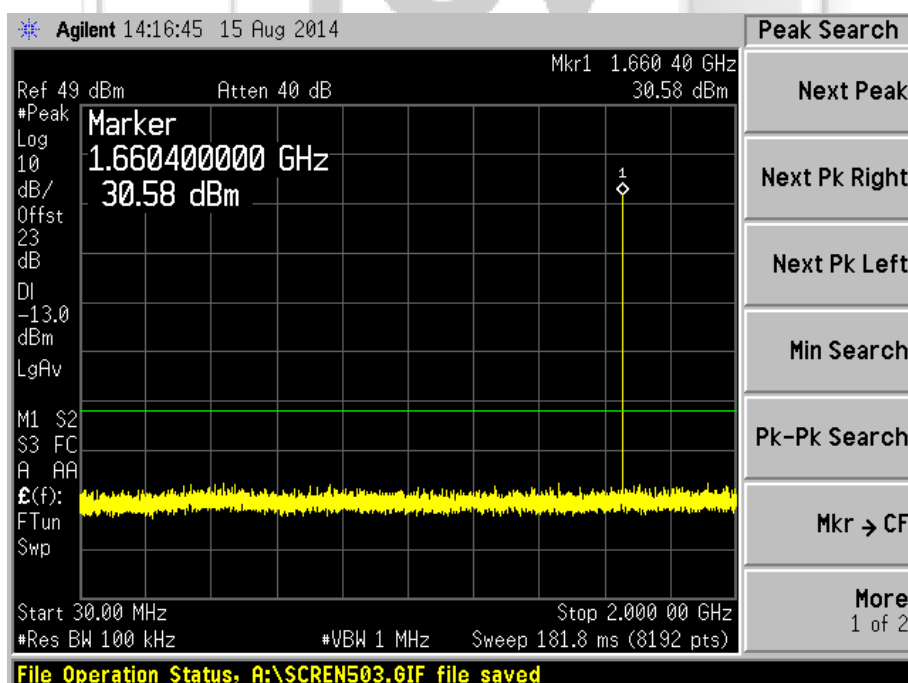
Plot 303 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - TCH9



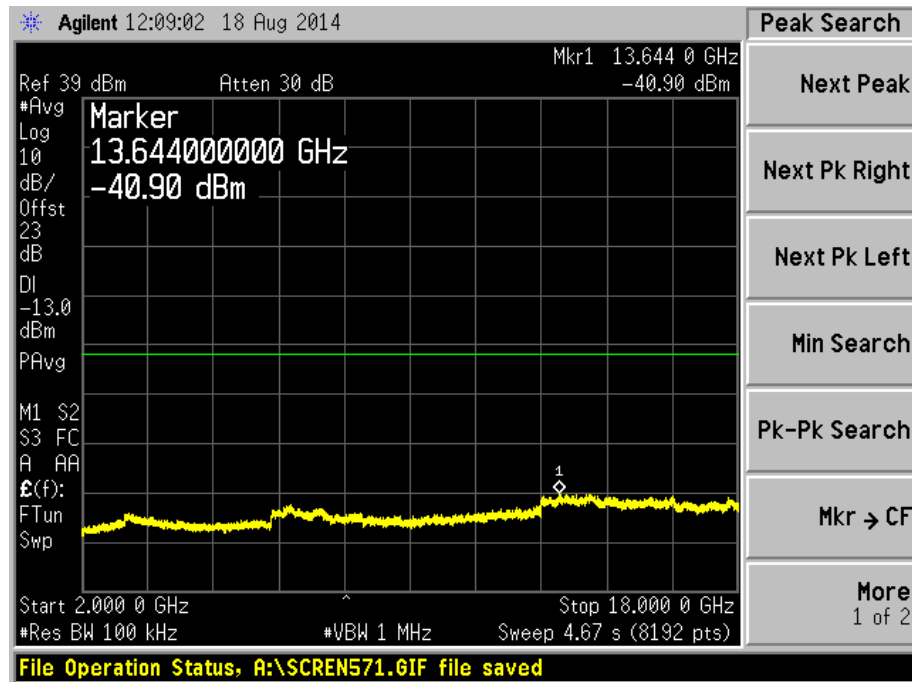
Plot 304 – Upper Channel



Plot 305 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

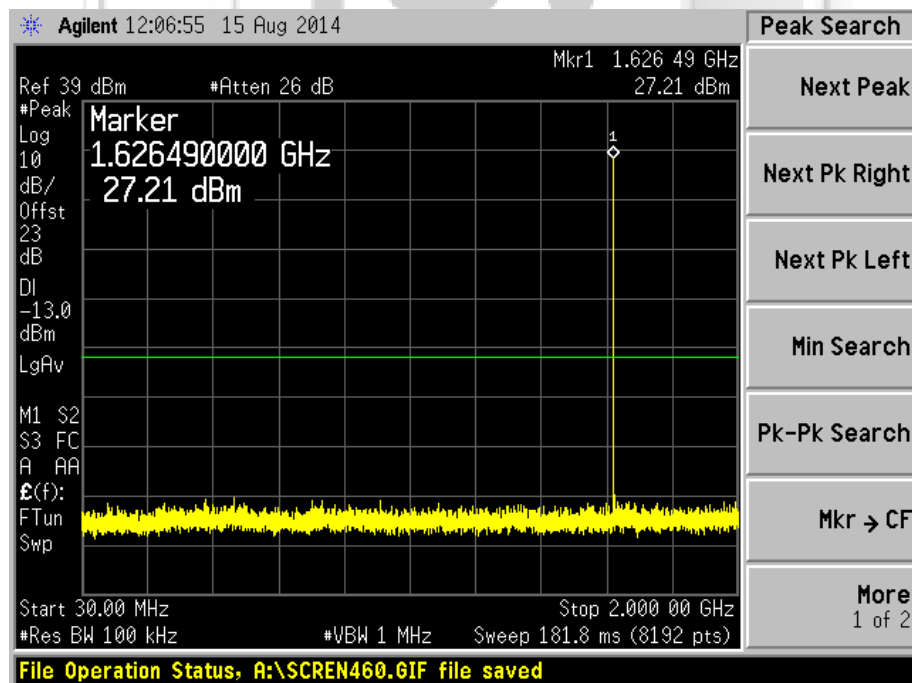
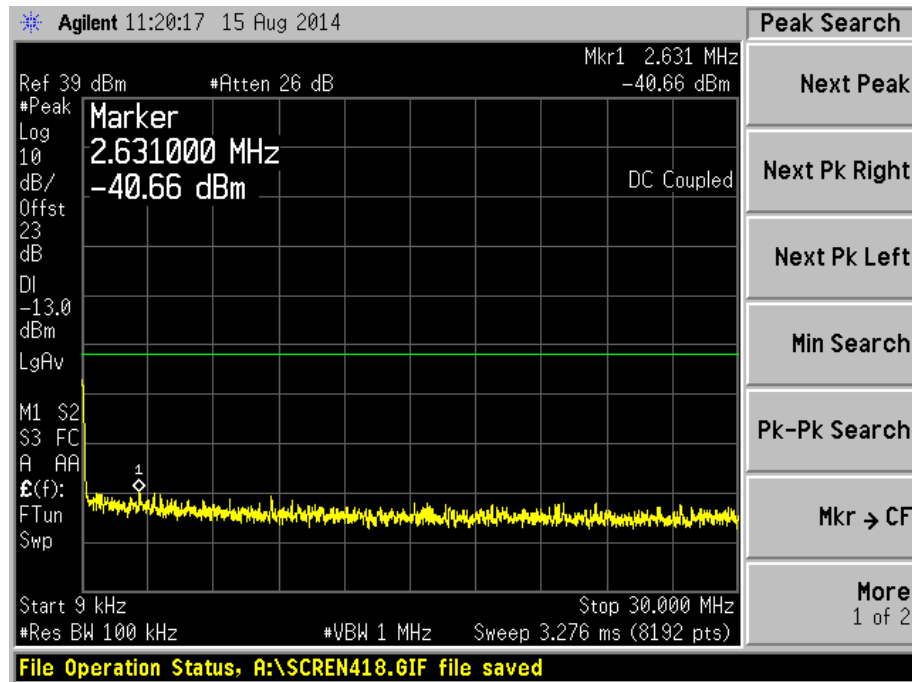
Out of Band Spurious Plots - TCH9



Plot 306 – Upper Channel

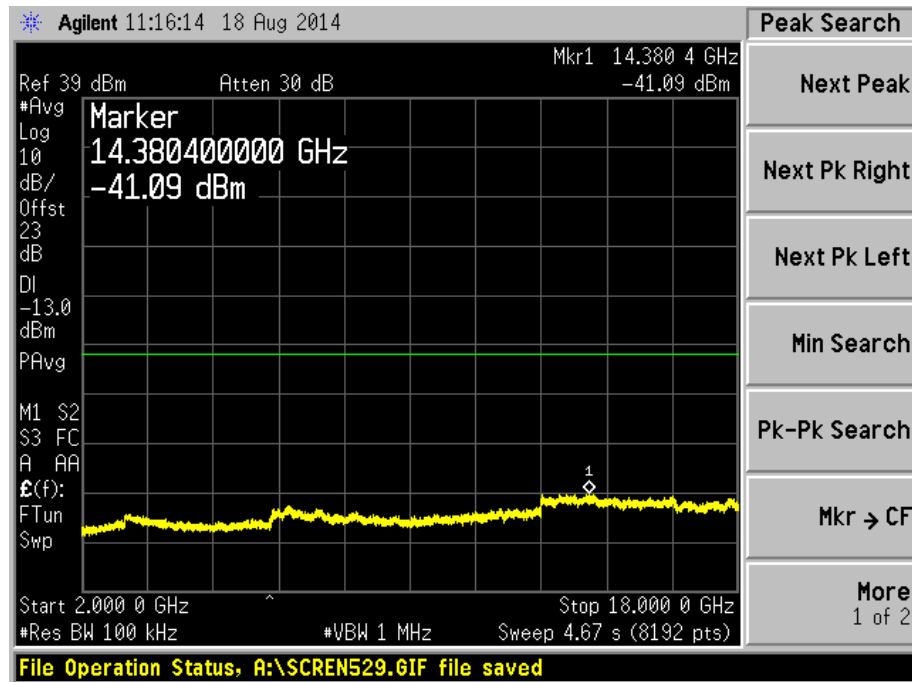
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PAB



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

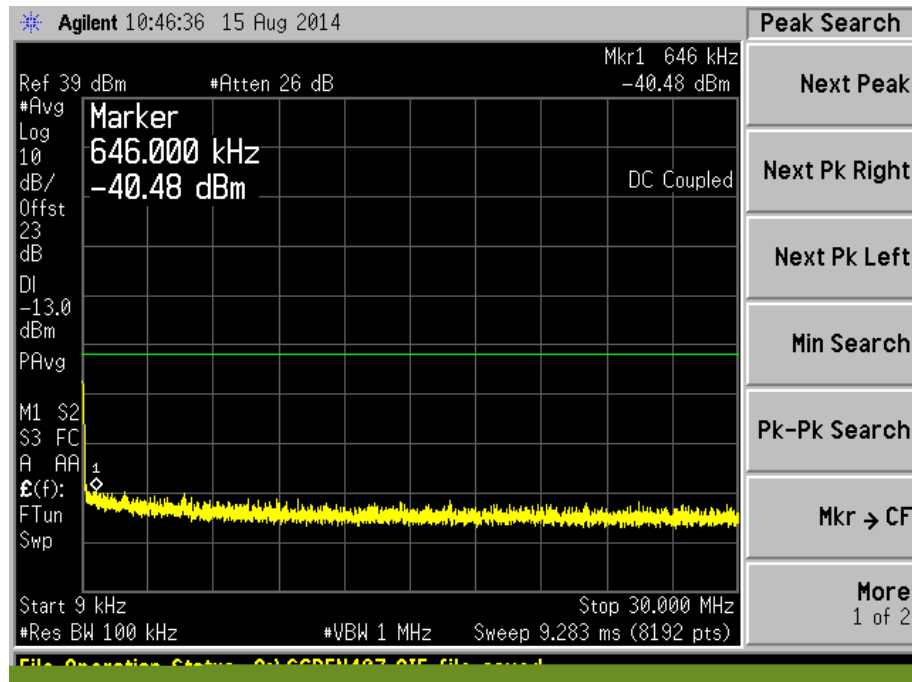
### Out of Band Spurious Plots - PAB



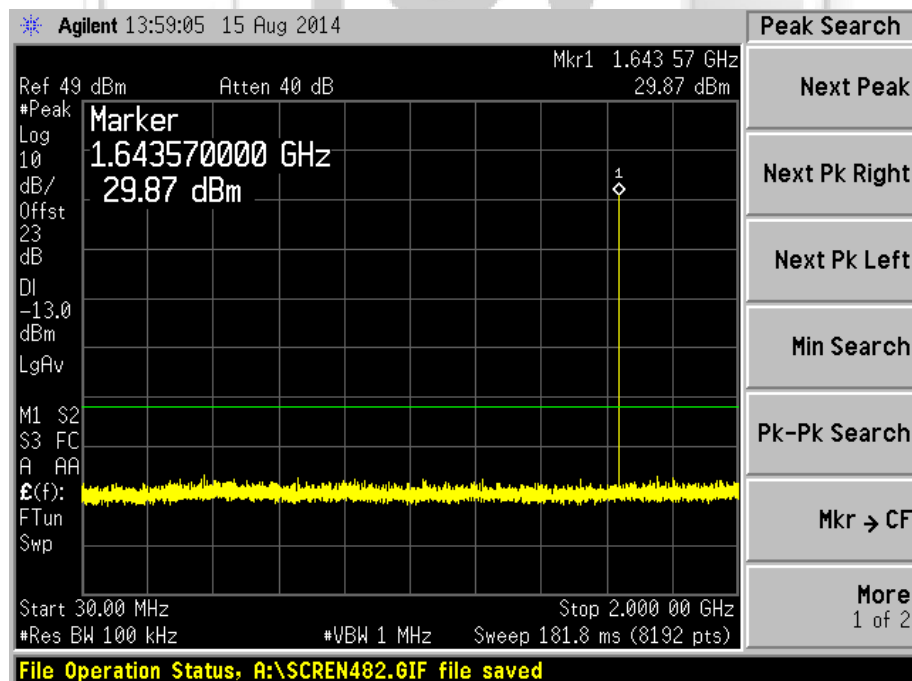
Plot 309 – Lower Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PAB



Plot 310 – Middle Channel

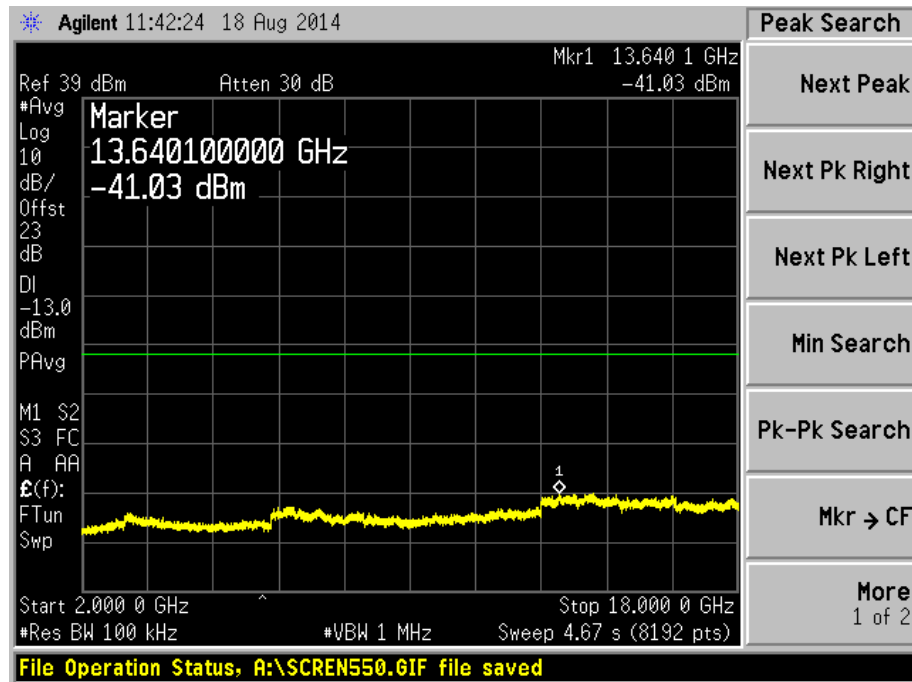


Plot 311 – Middle Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

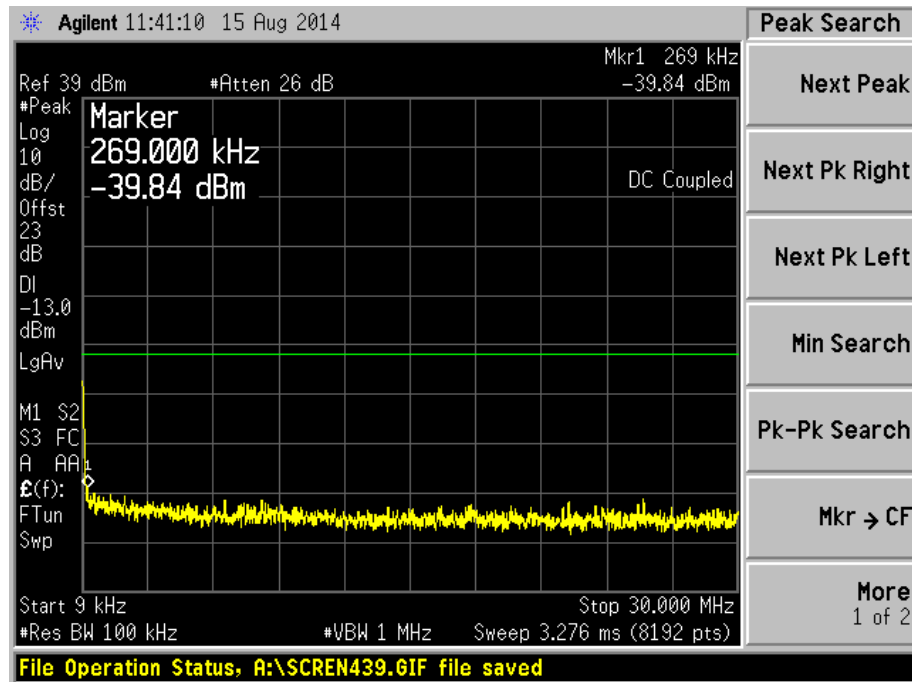
### Out of Band Spurious Plots - PAB



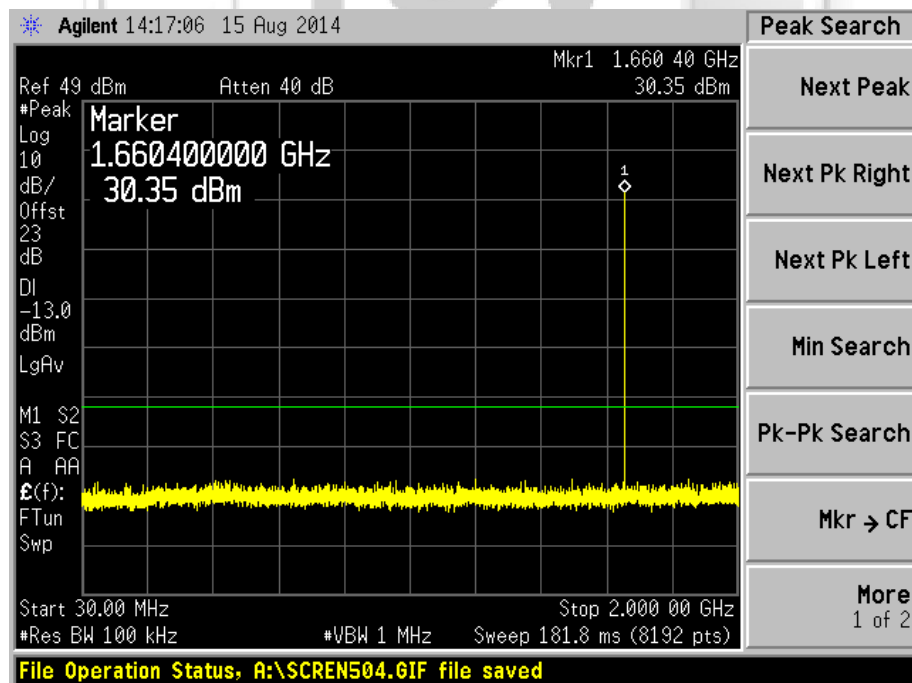
Plot 312 - Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PAB



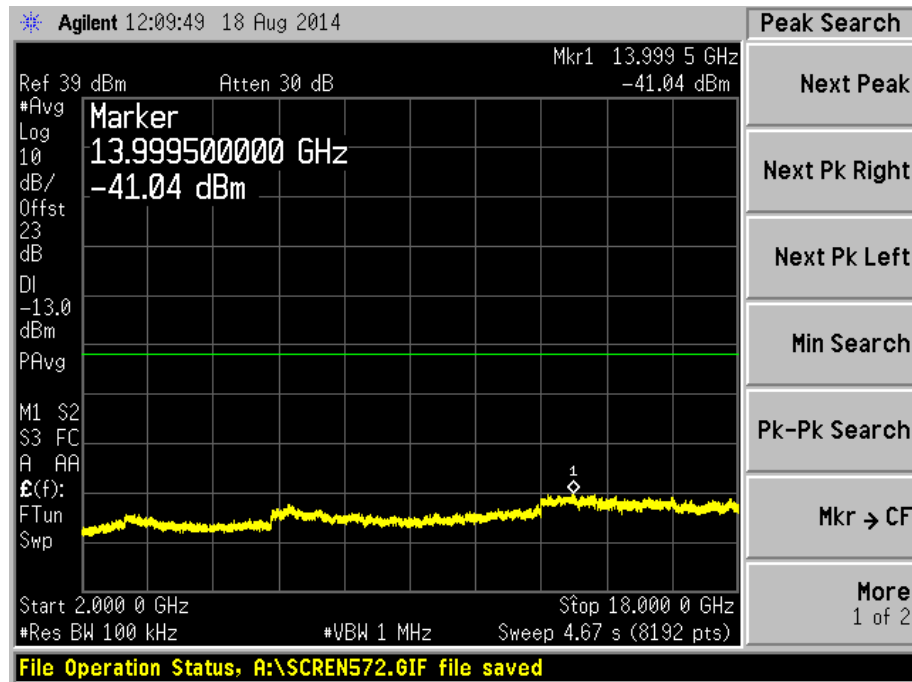
Plot 313 – Upper Channel



Plot 314 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

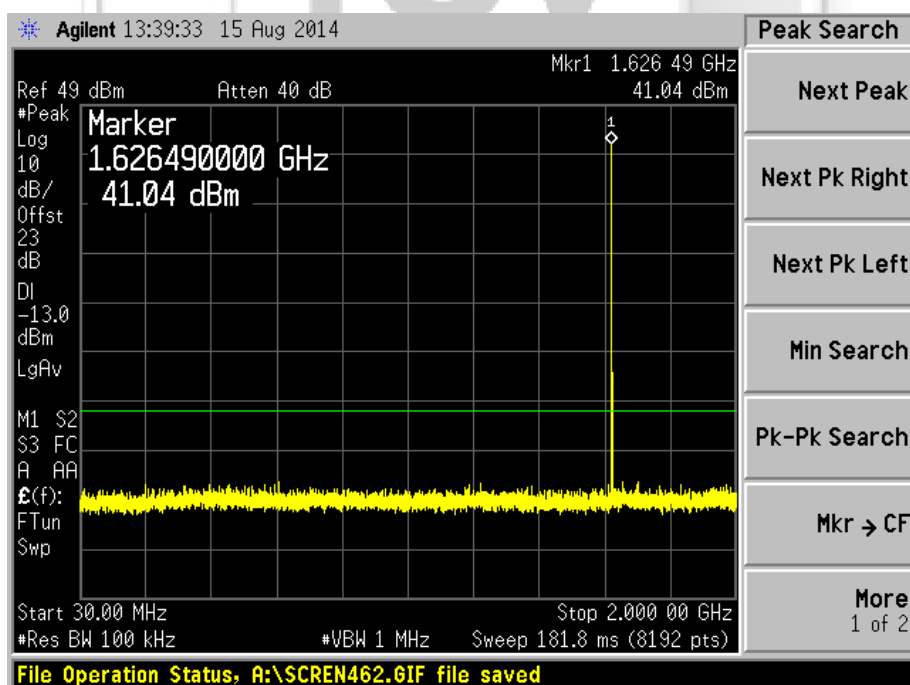
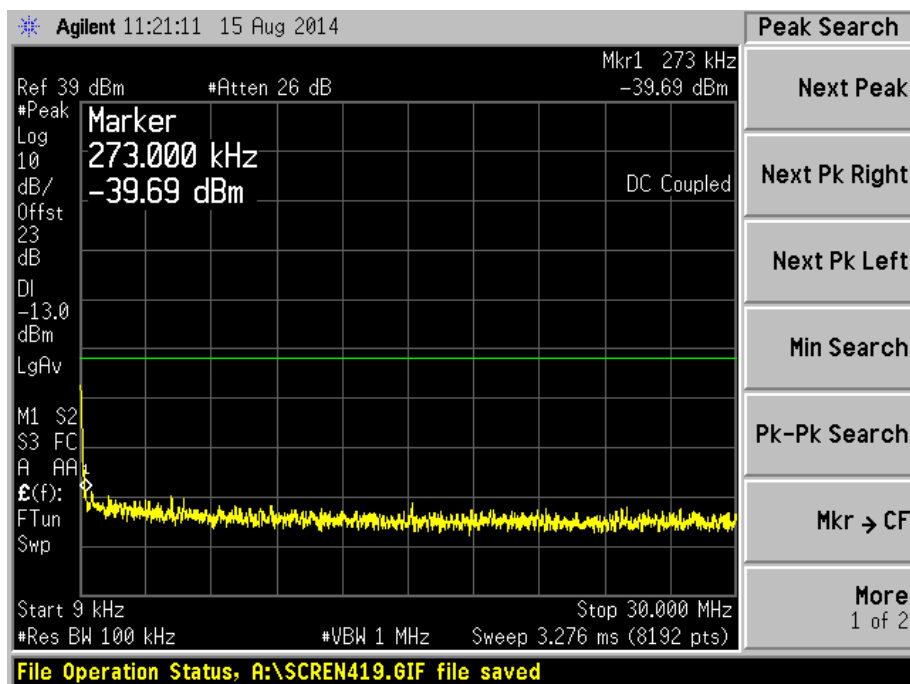
Out of Band Spurious Plots - PAB



Plot 315 – Upper Channel

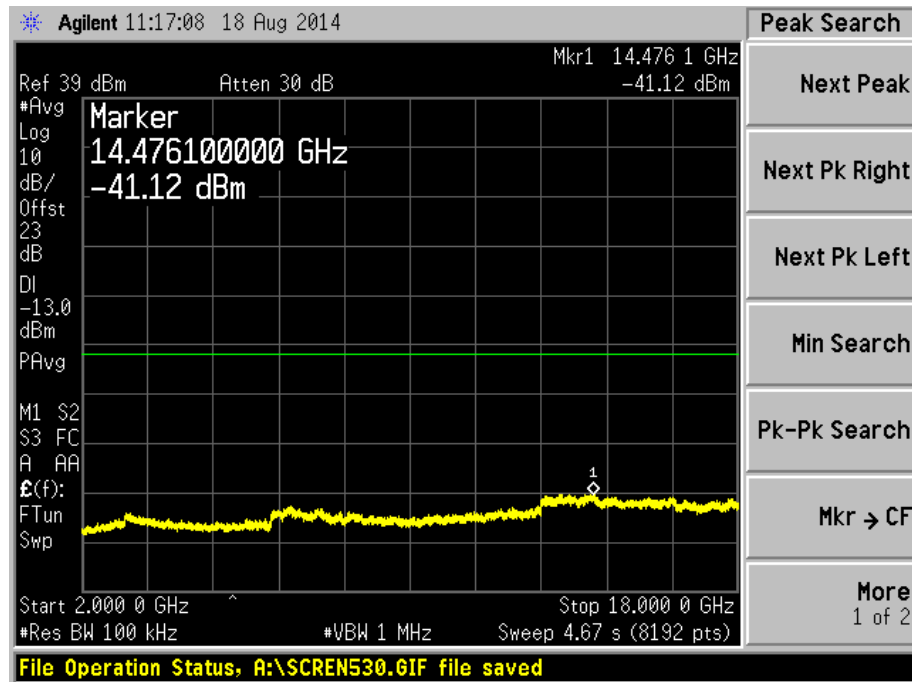
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_12\_QPSK



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

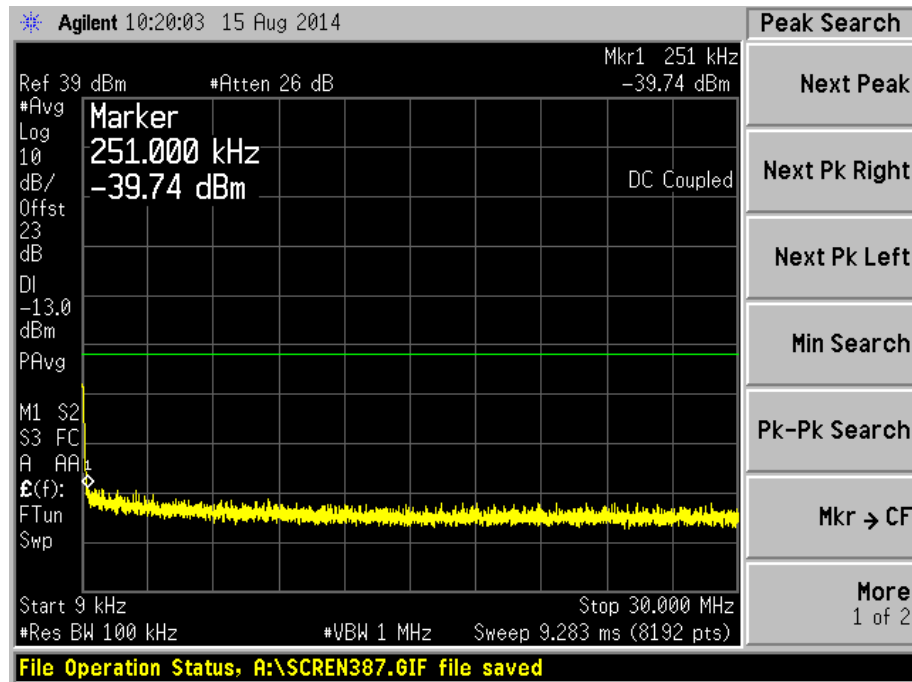
Out of Band Spurious Plots - PNB512\_12\_QPSK



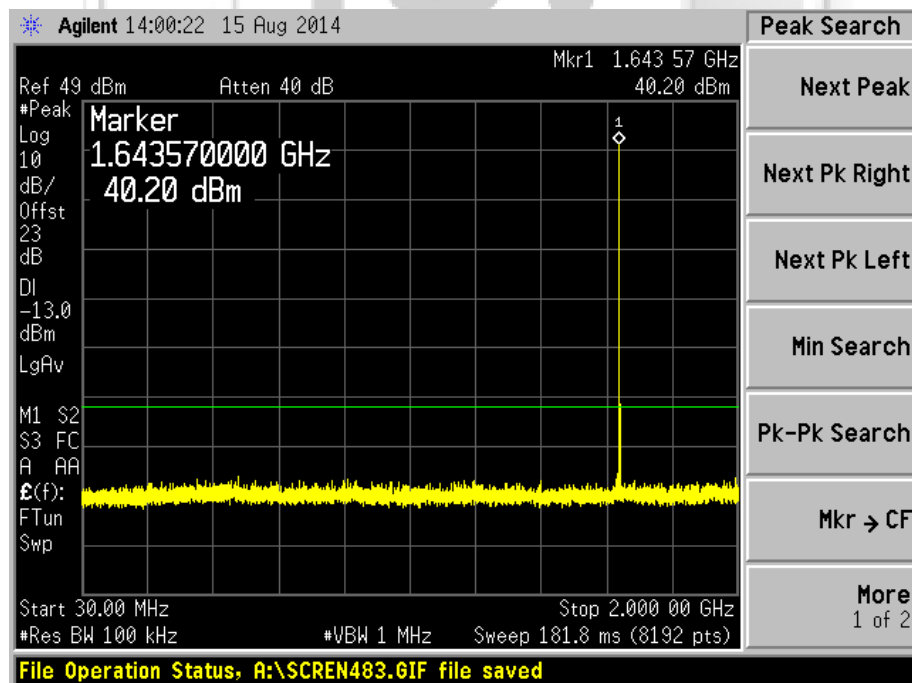
Plot 318 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_12\_QPSK



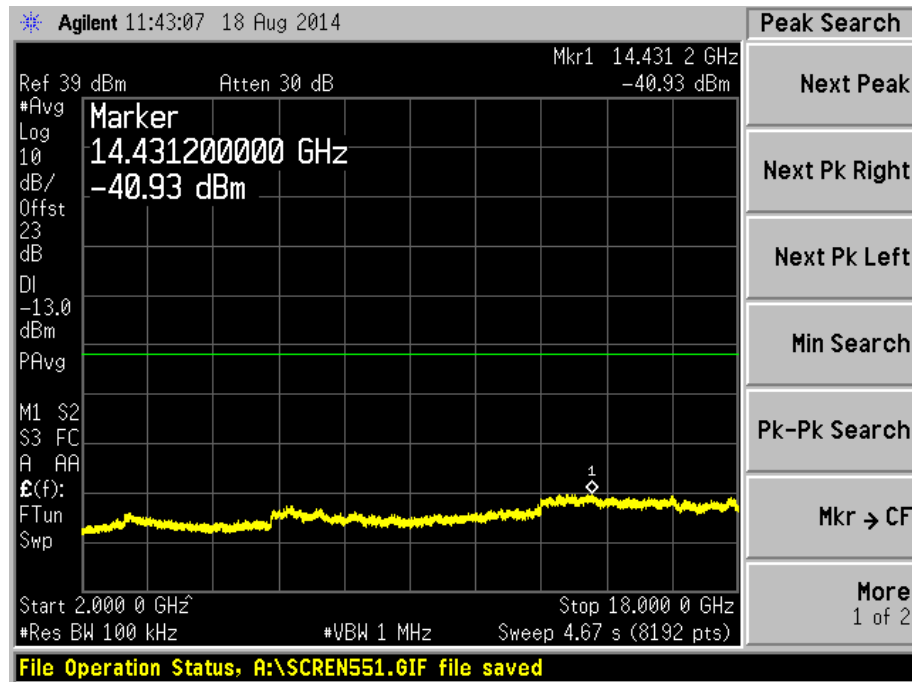
Plot 319 – Middle Channel



Plot 320 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

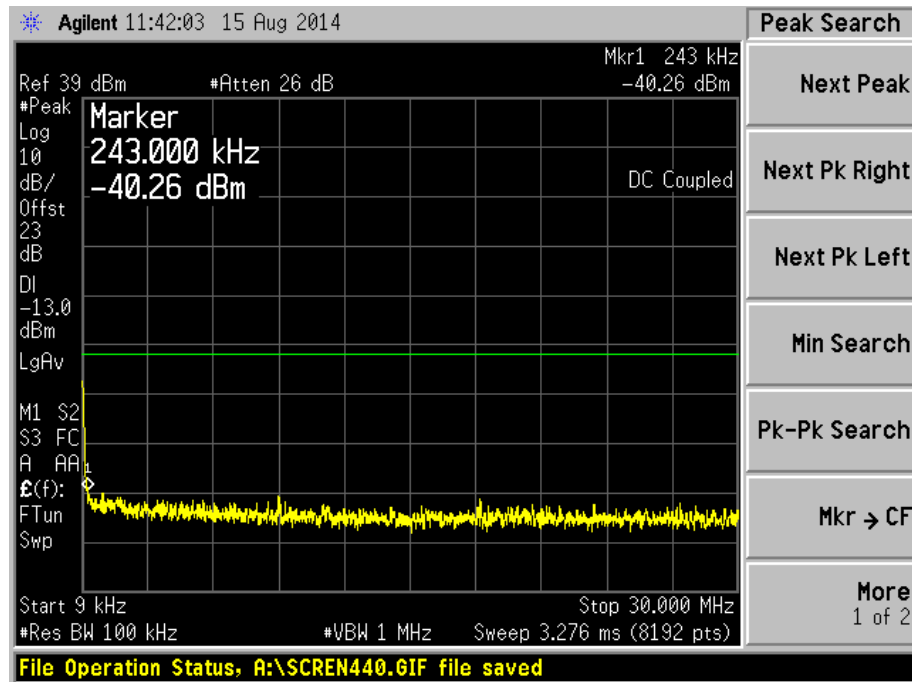
Out of Band Spurious Plots - PNB512\_12\_QPSK



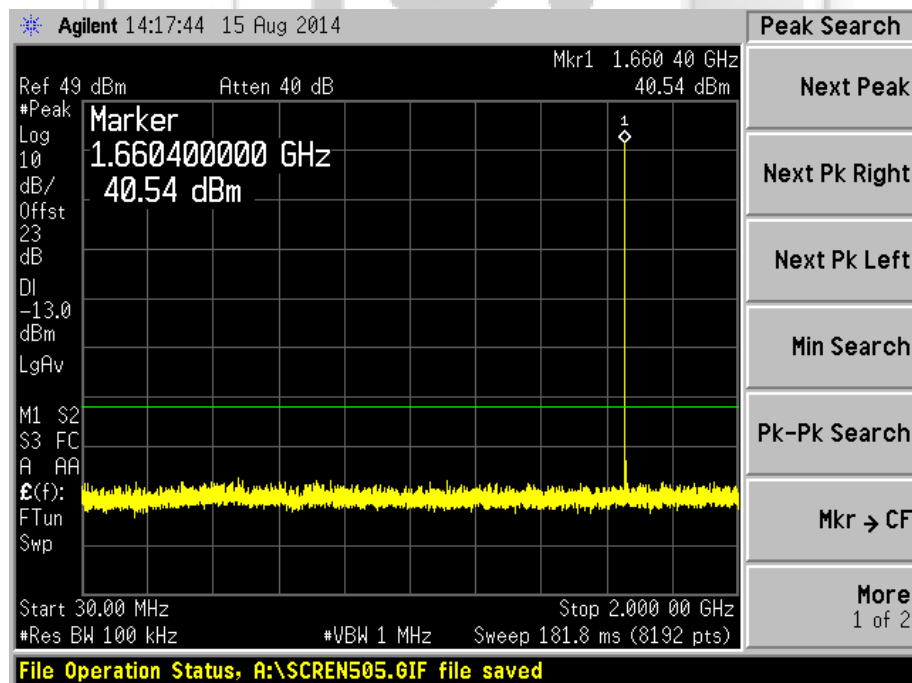
Plot 321 - Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_12\_QPSK



Plot 322 – Upper Channel

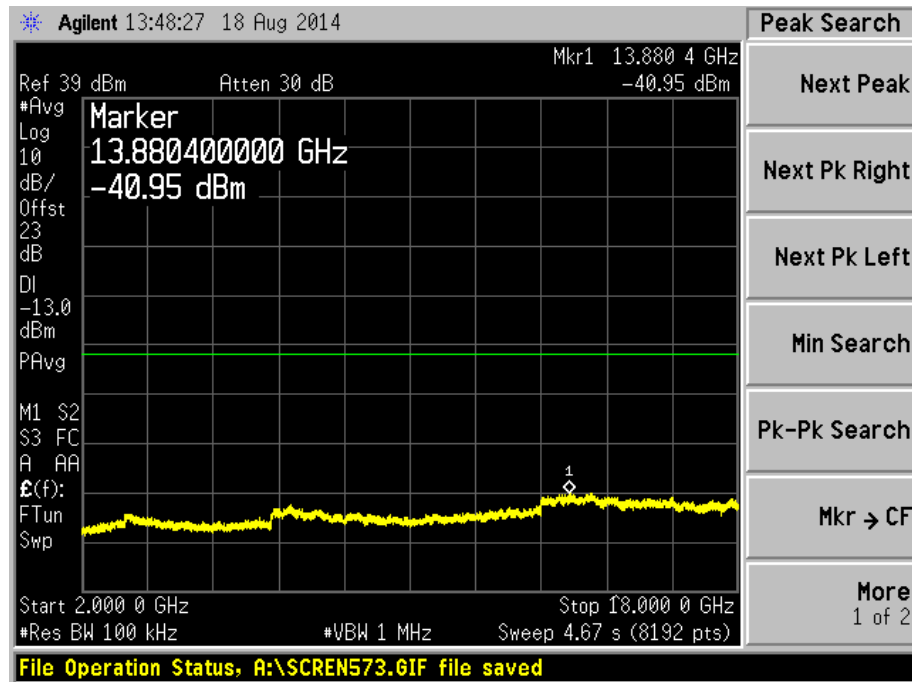


Plot 323 – Upper Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

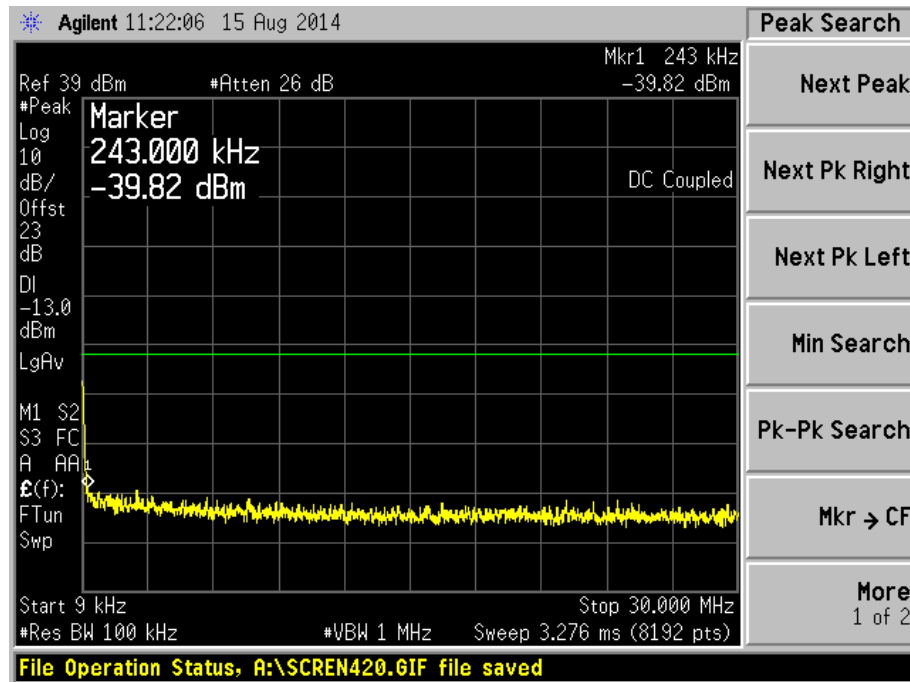
Out of Band Spurious Plots – PNB512\_12\_QPSK



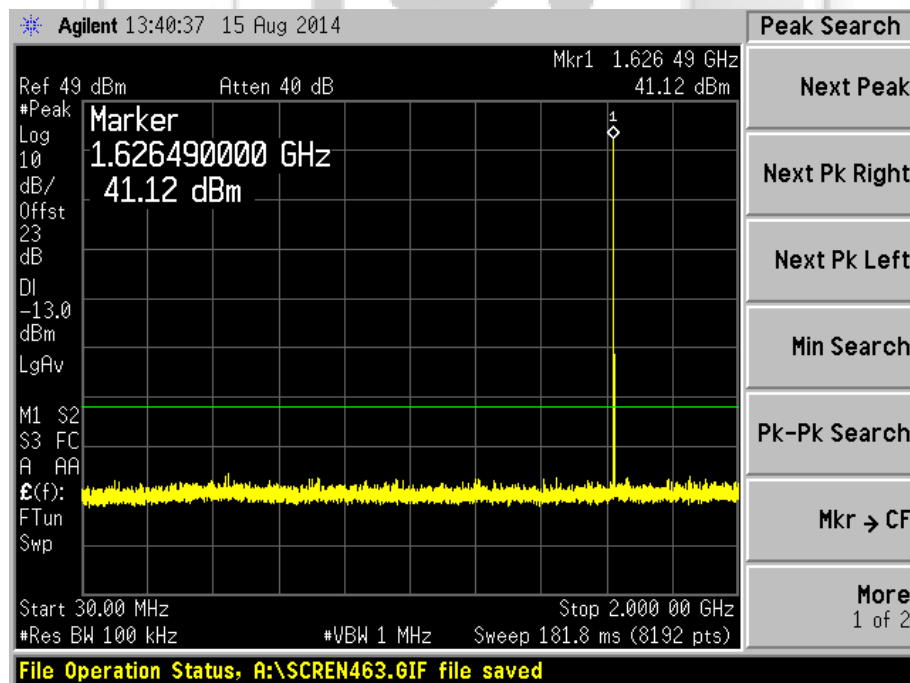
Plot 324 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_23\_16APSK



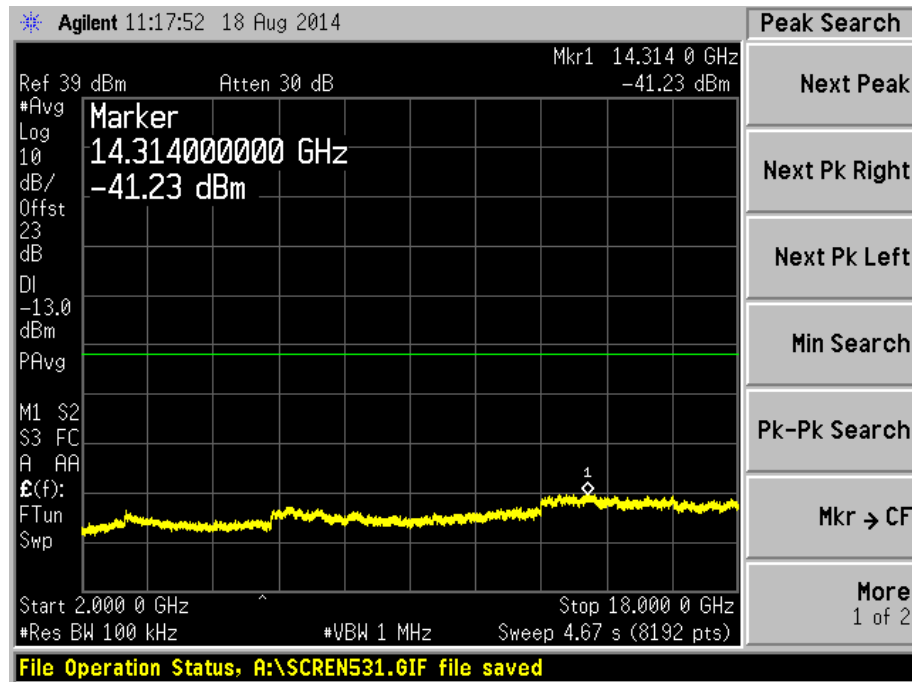
Plot 325 – Lower Channel



Plot 326 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

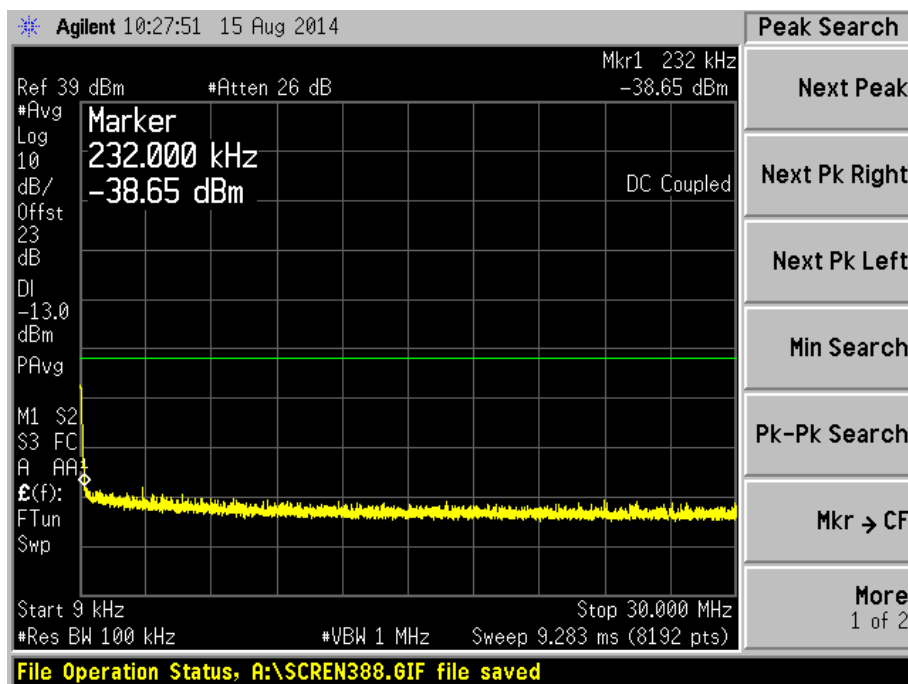
Out of Band Spurious Plots - PNB512\_23\_16APSK



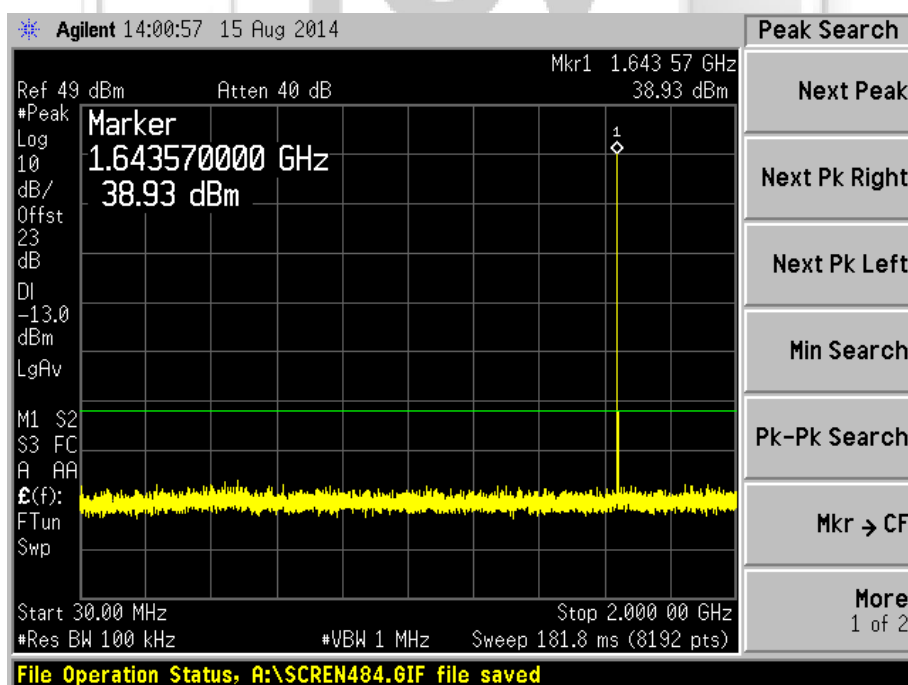
Plot 327 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_23\_16APSK



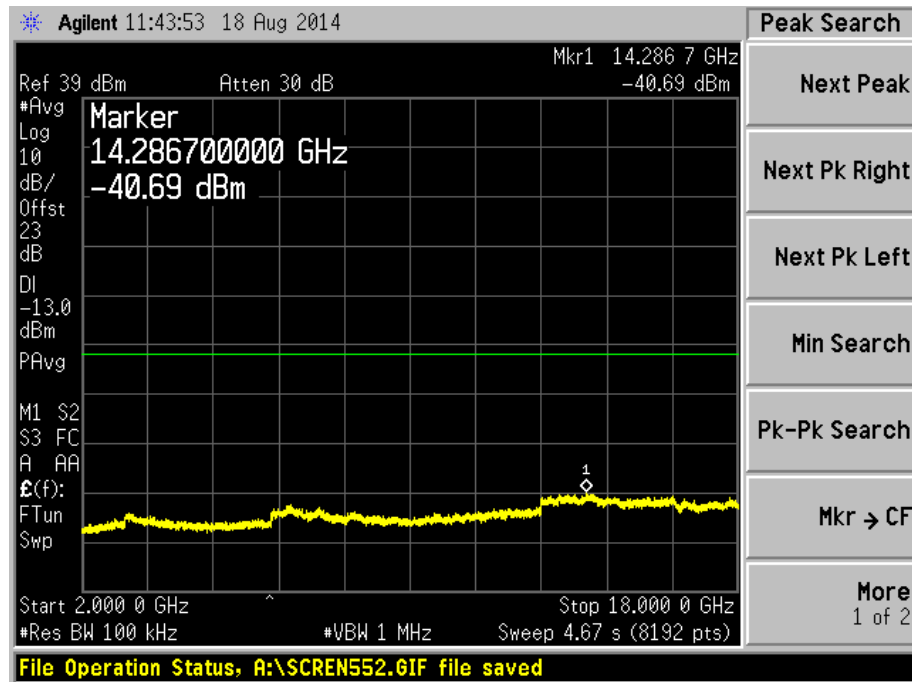
Plot 328 – Middle Channel



Plot 329 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

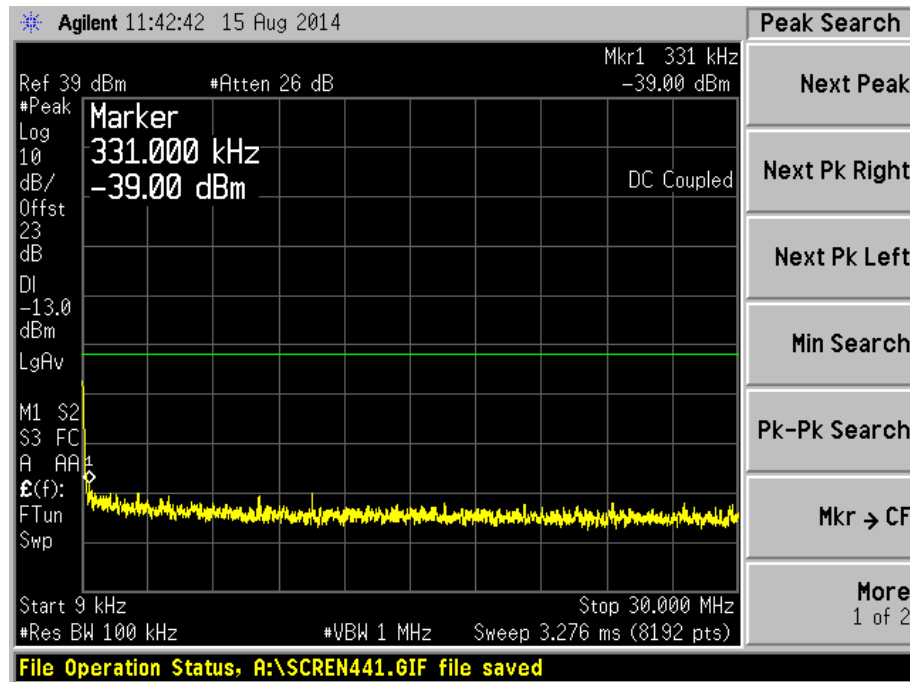
Out of Band Spurious Plots - PNB512\_23\_16APSK



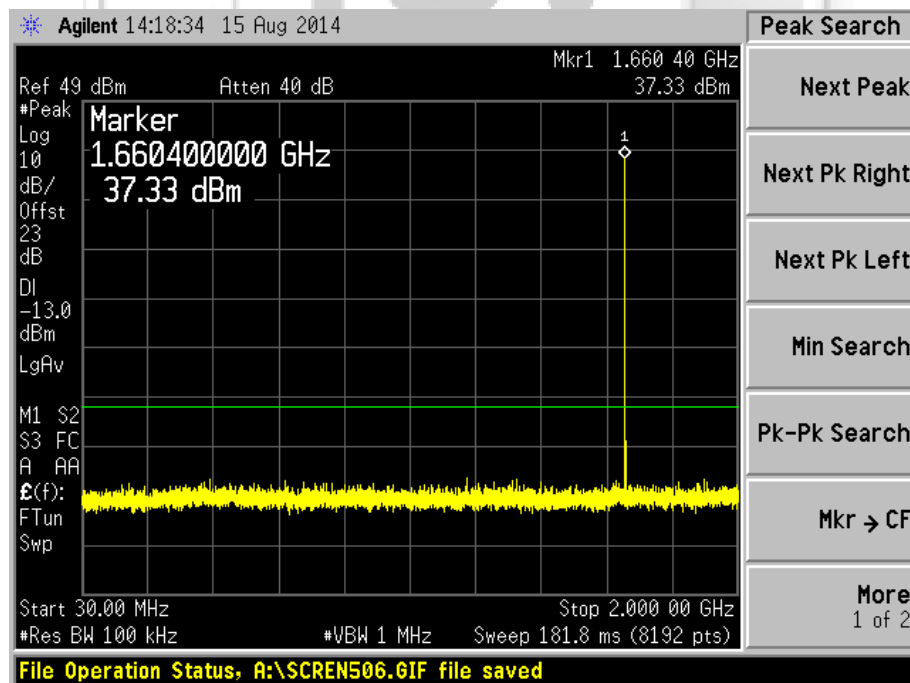
Plot 330 - Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_23\_16APSK



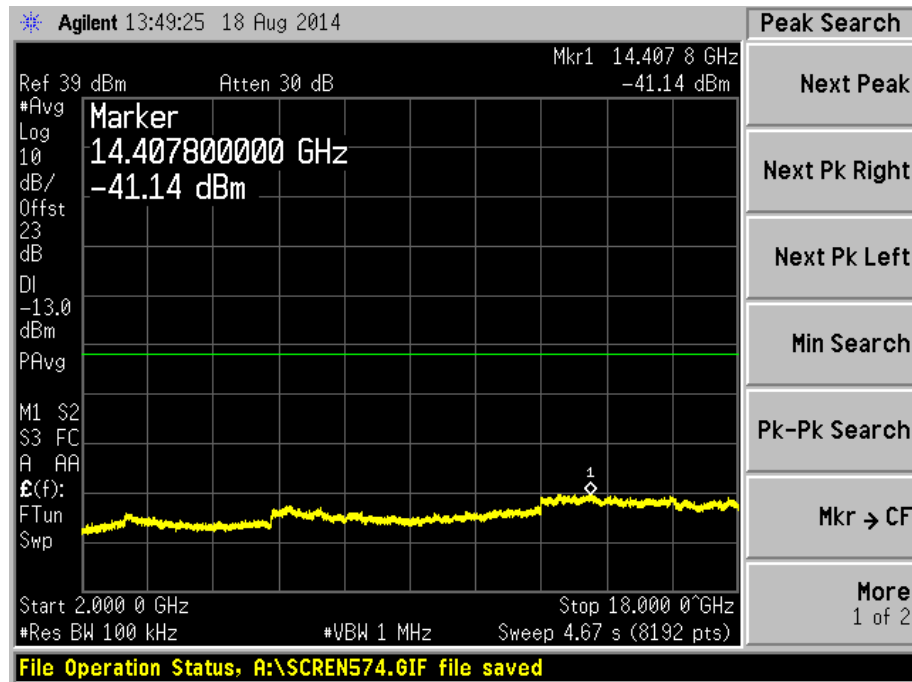
Plot 331 – Upper Channel



Plot 332 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

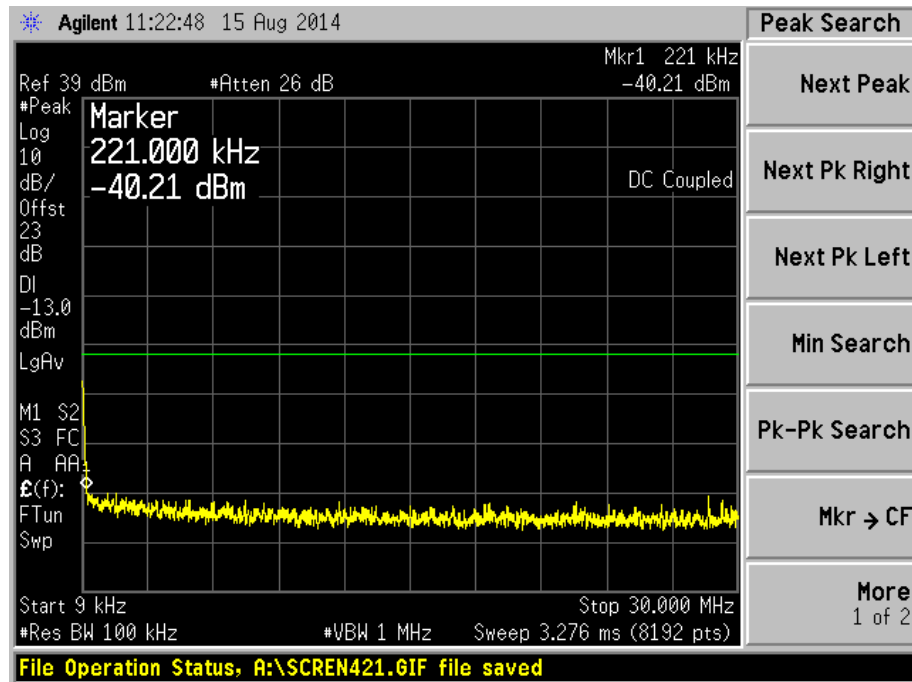
Out of Band Spurious Plots - PNB512\_23\_16APSK



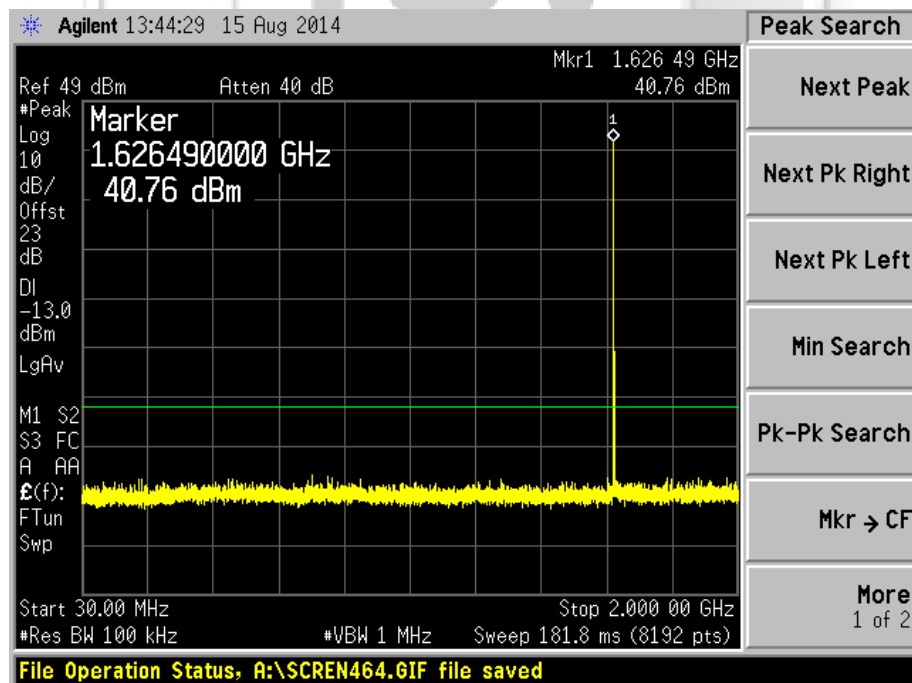
Plot 333 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_23\_QPSK



Plot 334 – Lower Channel

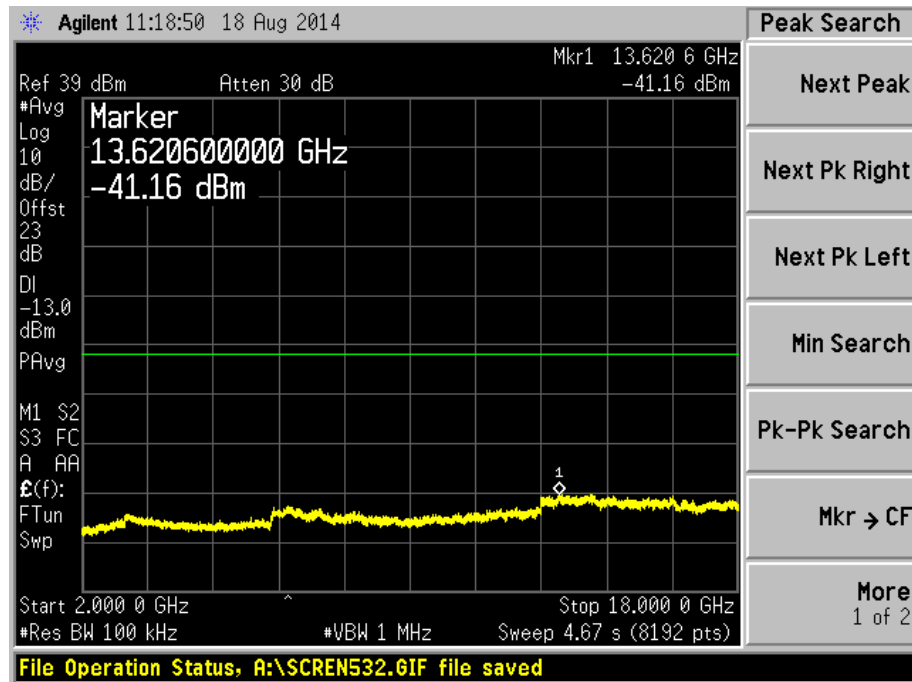


Plot 335 – Lower Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

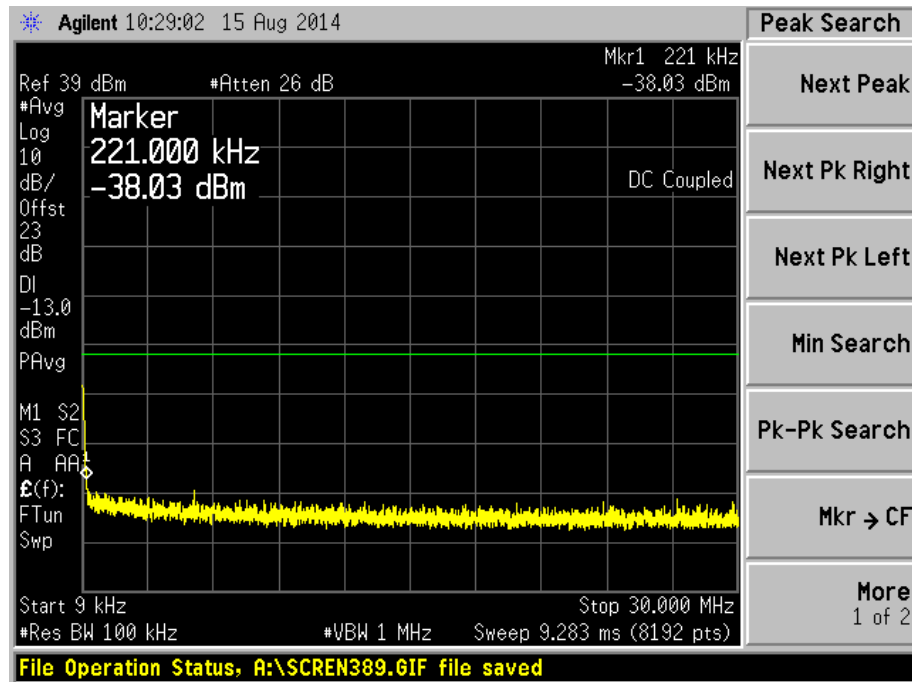
Out of Band Spurious Plots - PNB512\_23\_QPSK



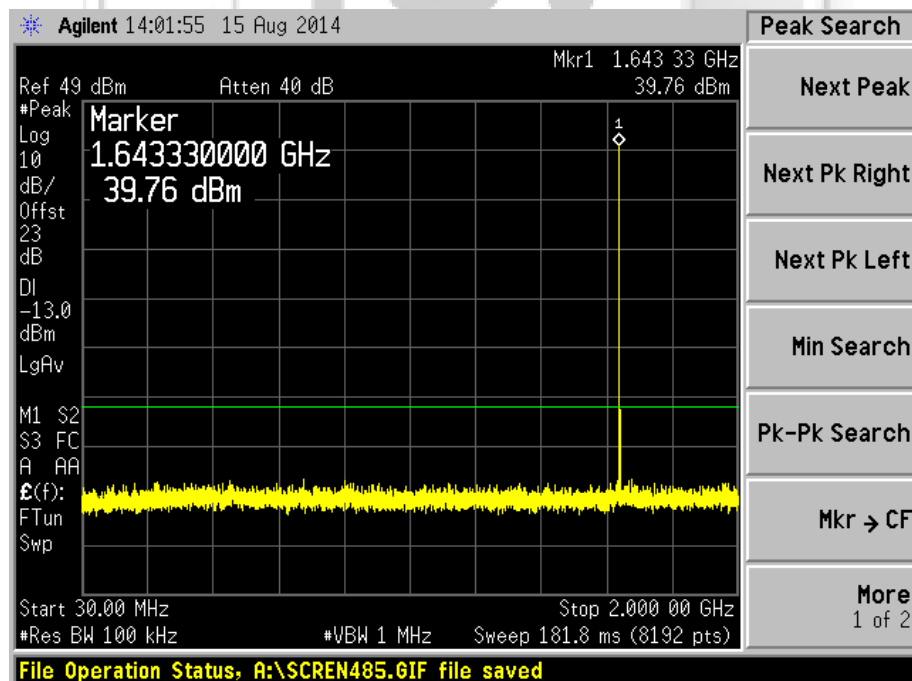
Plot 336 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_23\_QPSK



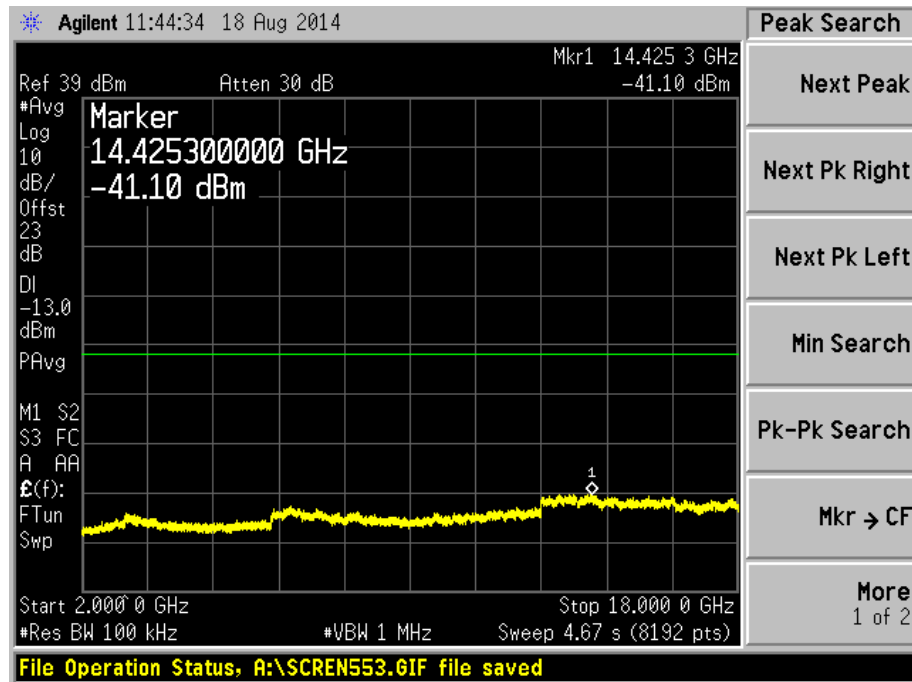
Plot 337 – Middle Channel



Plot 338 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

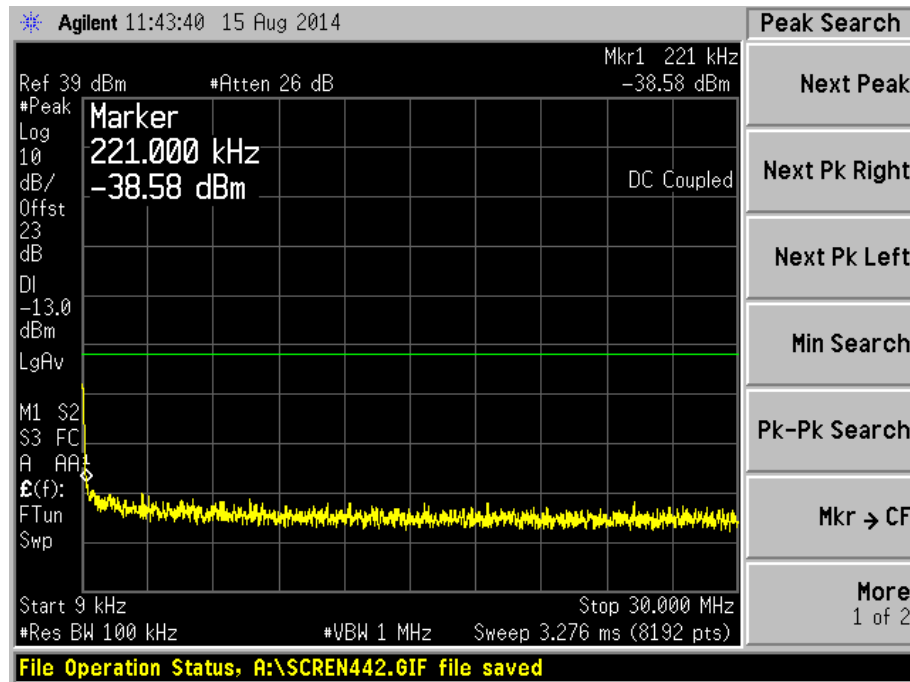
Out of Band Spurious Plots - PNB512\_23\_QPSK



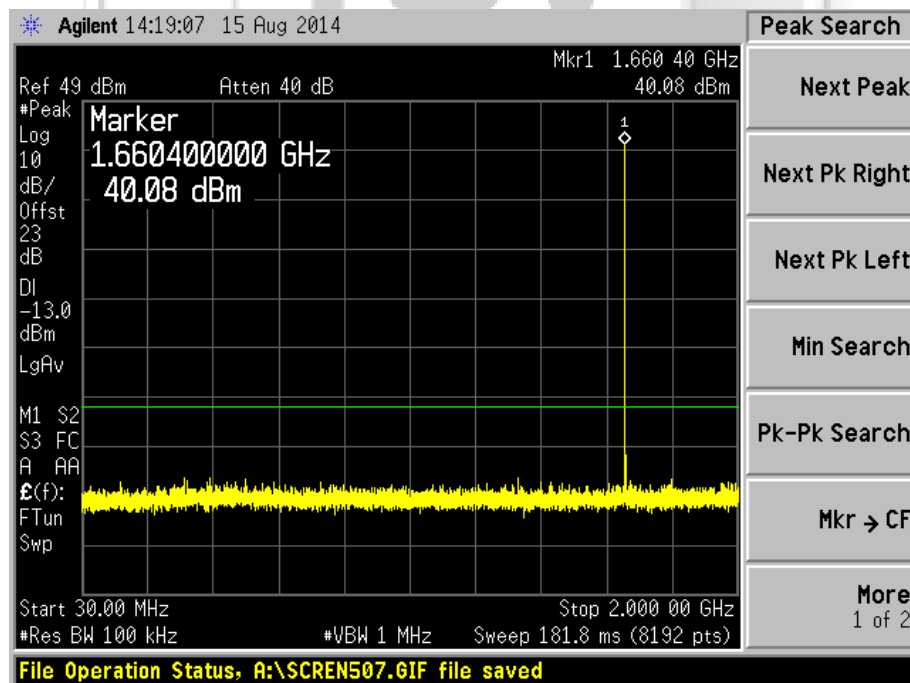
Plot 339 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_23\_QPSK



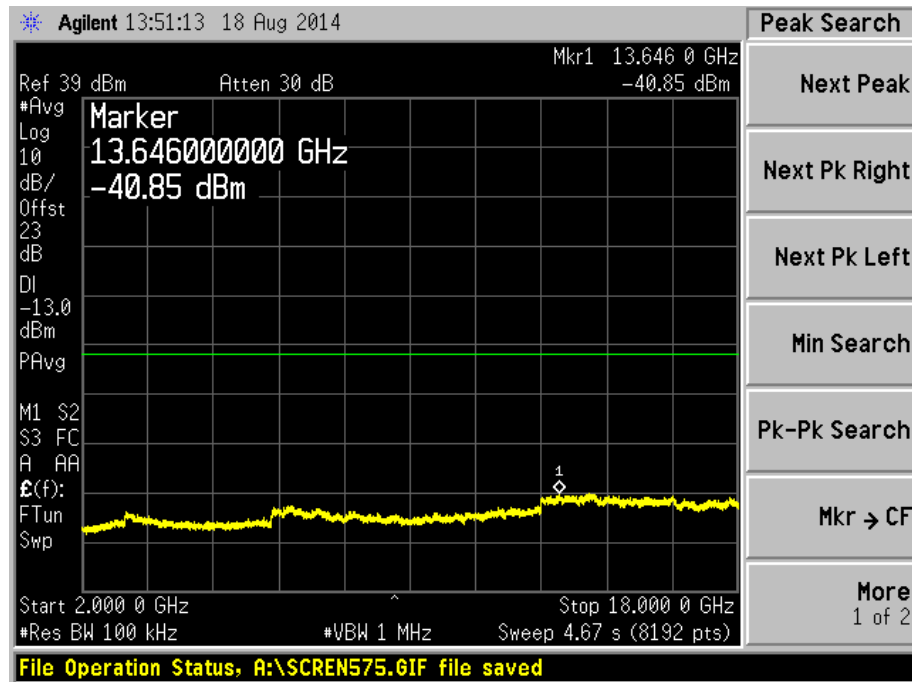
Plot 340 – Upper Channel



Plot 341 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

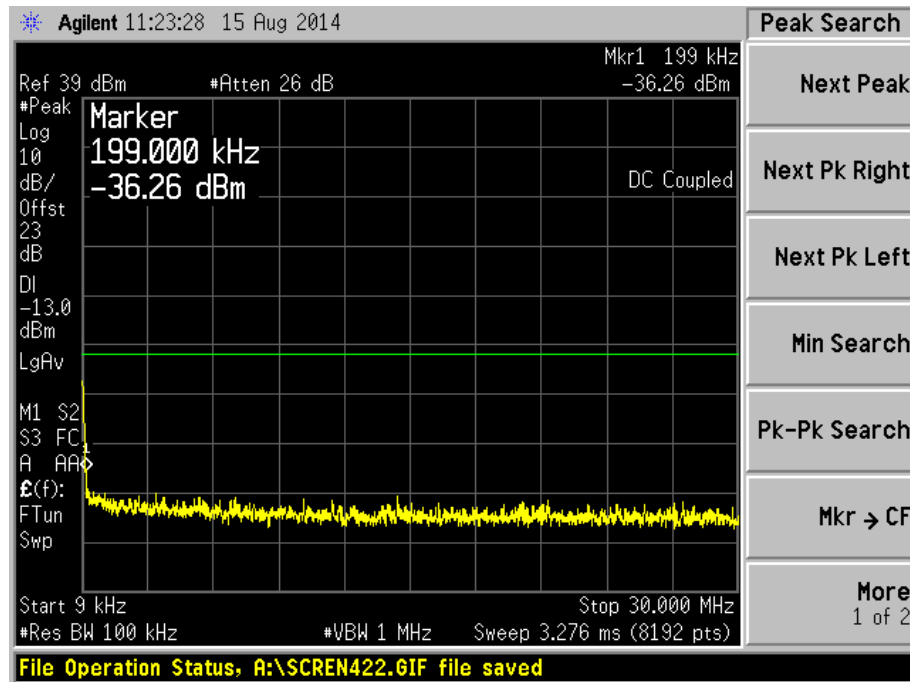
Out of Band Spurious Plots - PNB512\_23\_QPSK



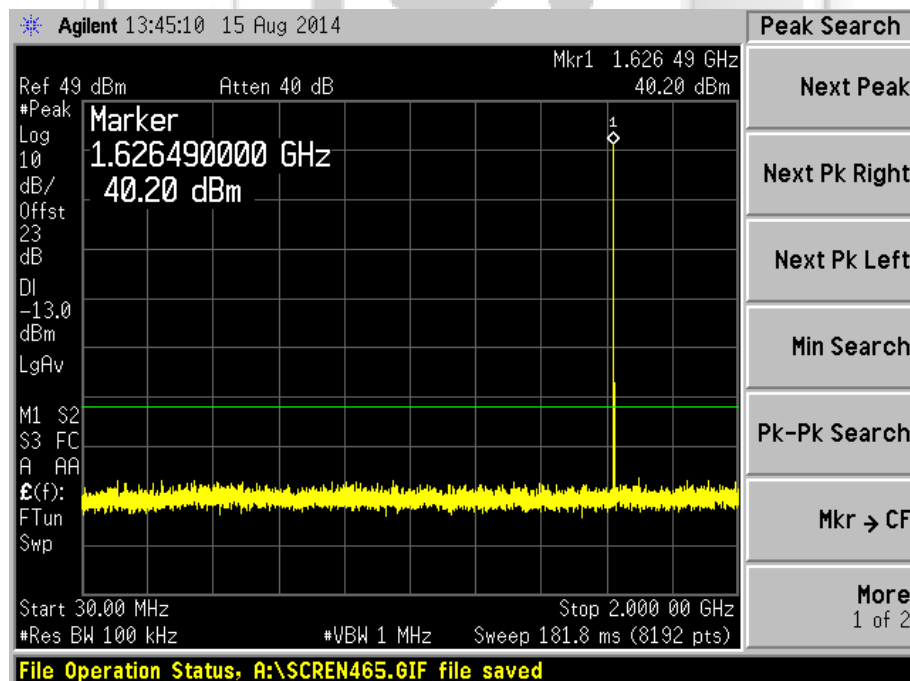
Plot 342 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_45\_16APSK



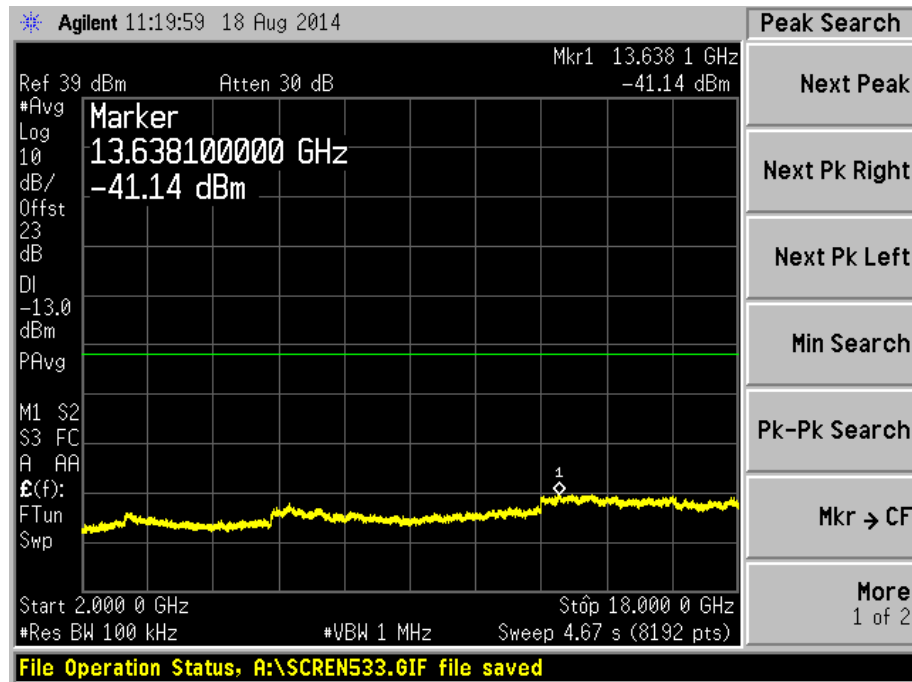
Plot 343 – Lower Channel



Plot 344 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

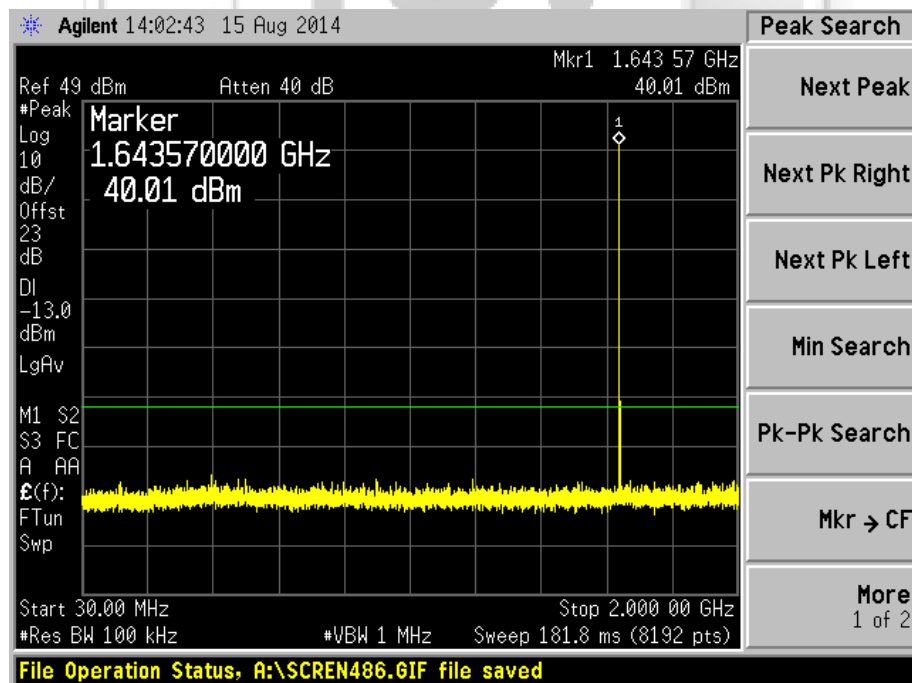
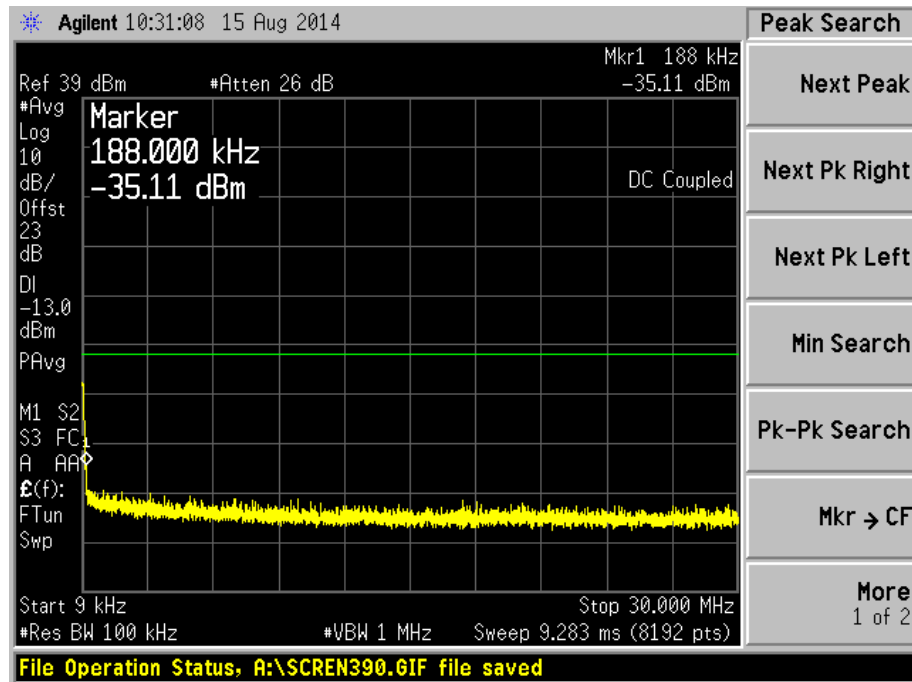
Out of Band Spurious Plots - PNB512\_45\_16APSK



Plot 345 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

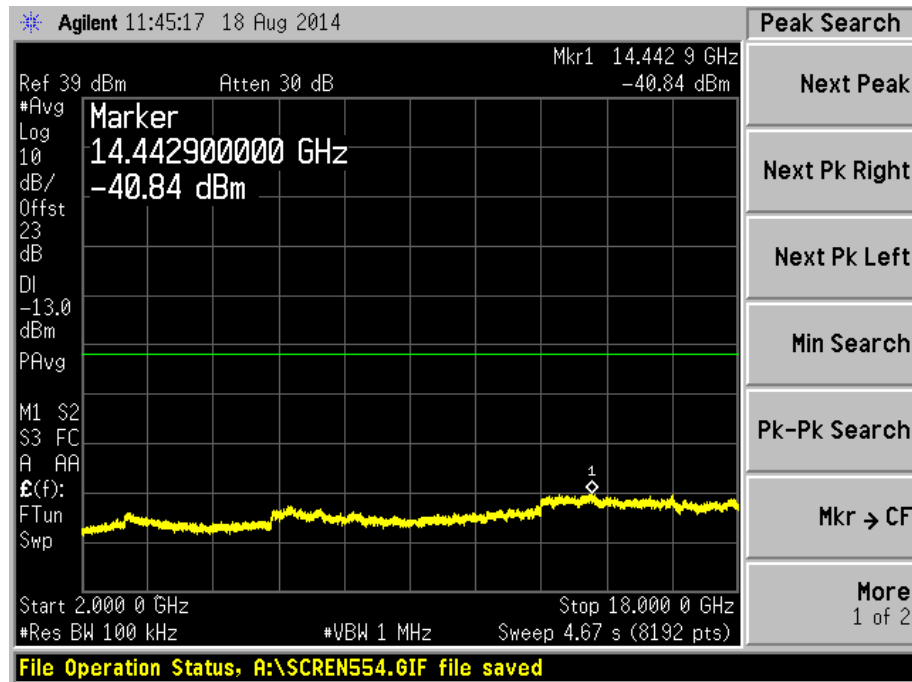
Out of Band Spurious Plots - PNB512\_45\_16APSK





UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

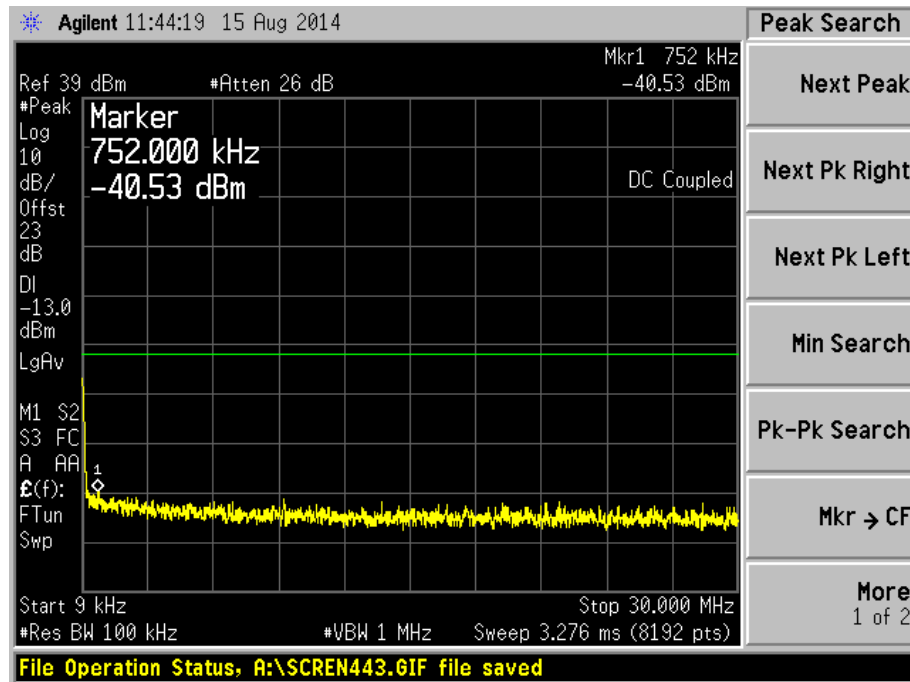
Out of Band Spurious Plots - PNB512\_45\_16APSK



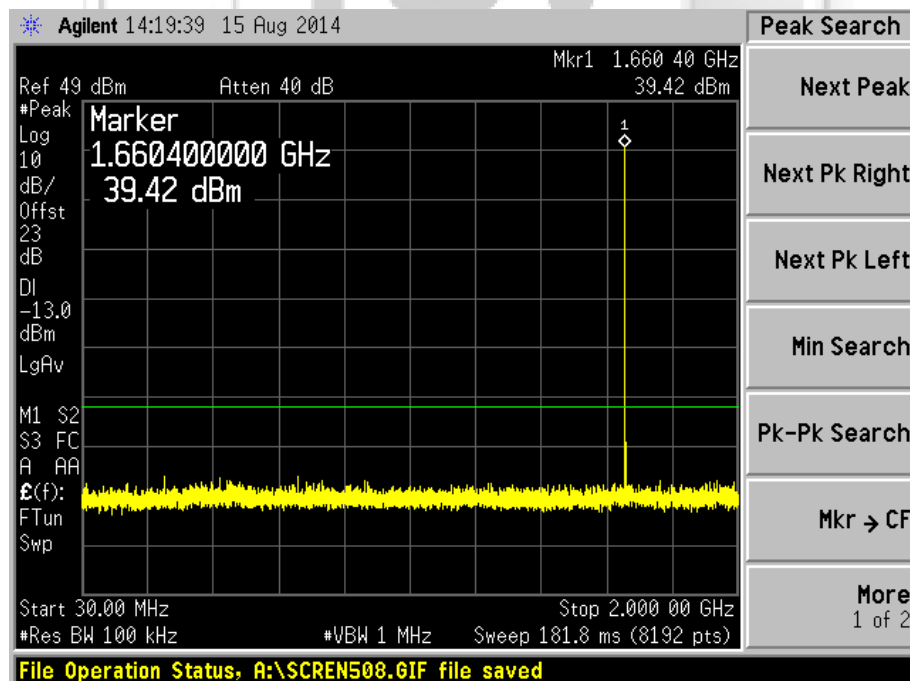
Plot 348 - Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_45\_16APSK



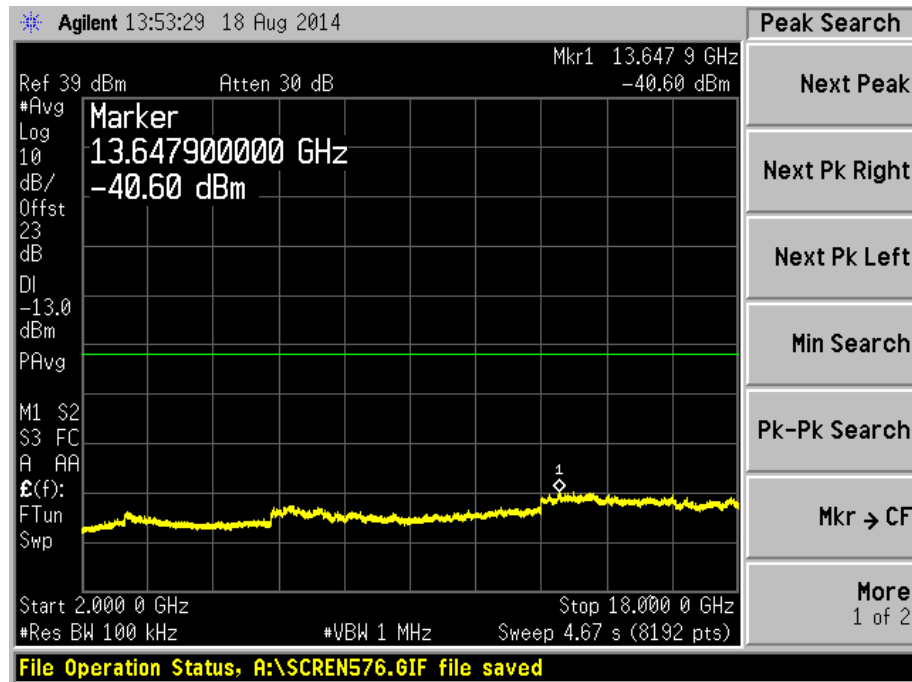
Plot 349 – Upper Channel



Plot 350 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

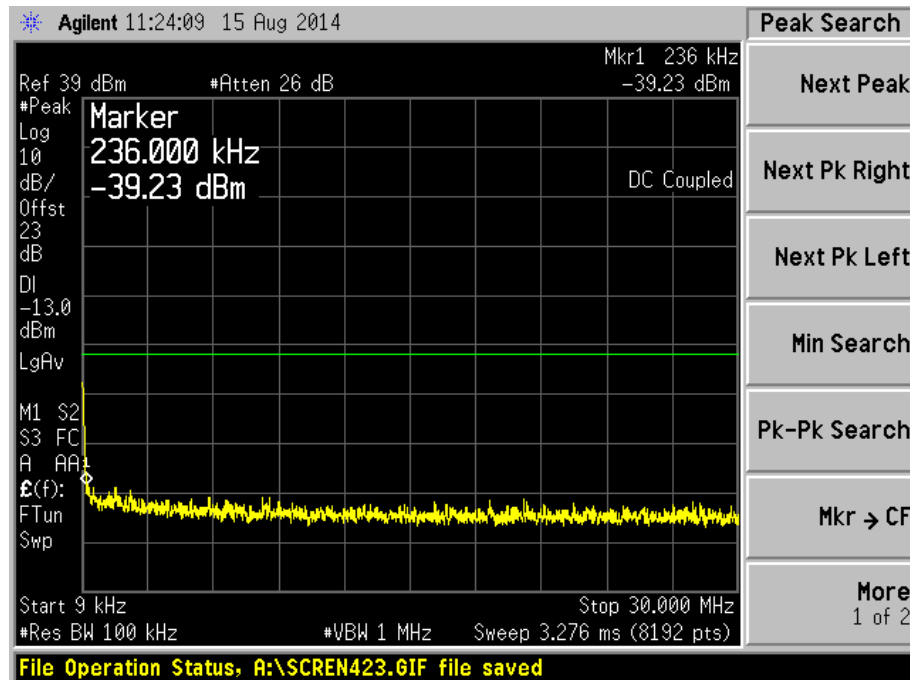
Out of Band Spurious Plots - PNB512\_45\_16APSK



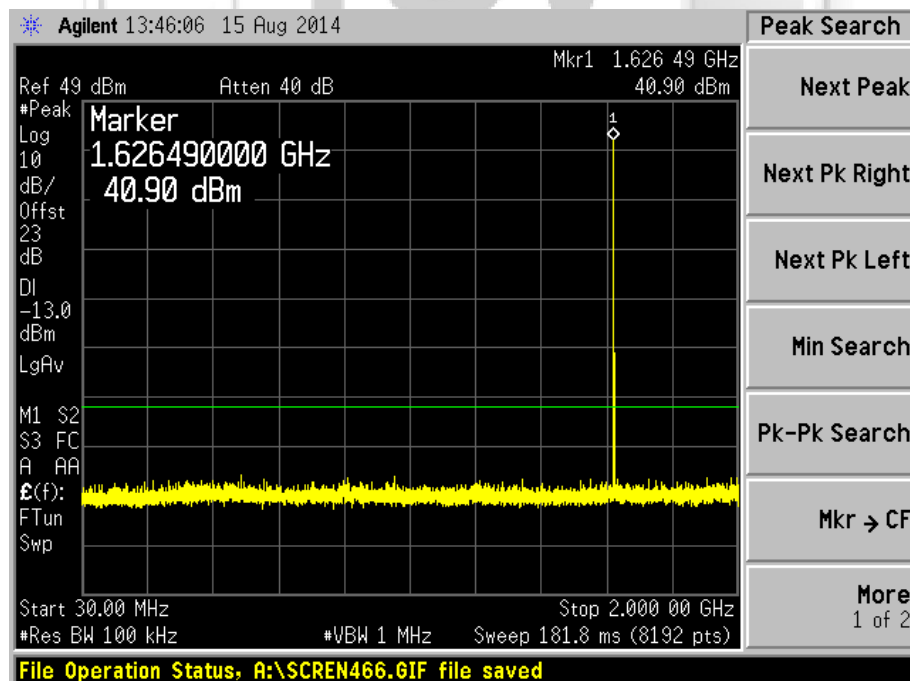
Plot 351 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_45\_QPSK



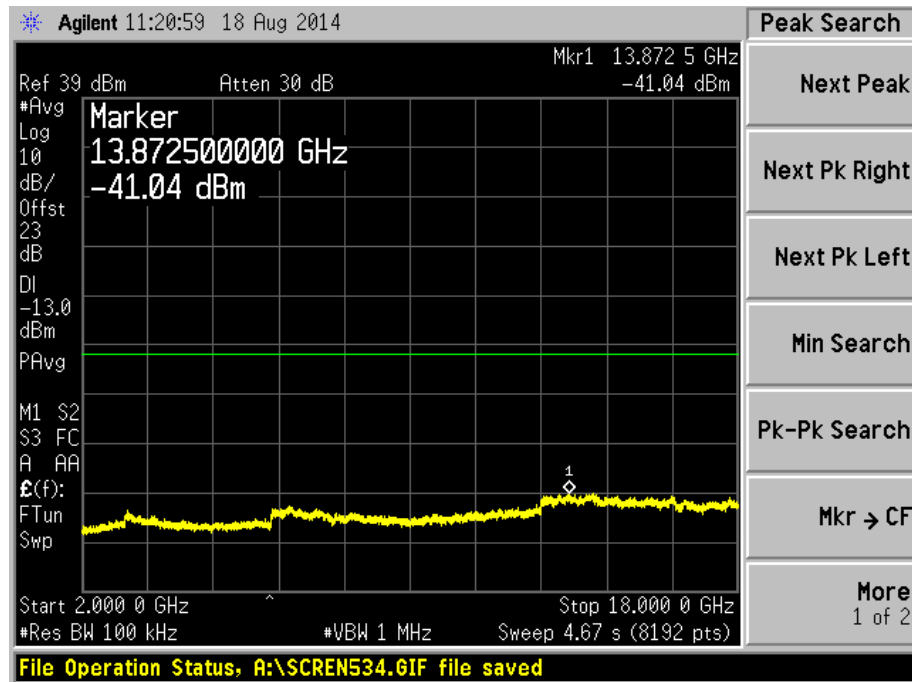
Plot 352 – Lower Channel



Plot 353 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

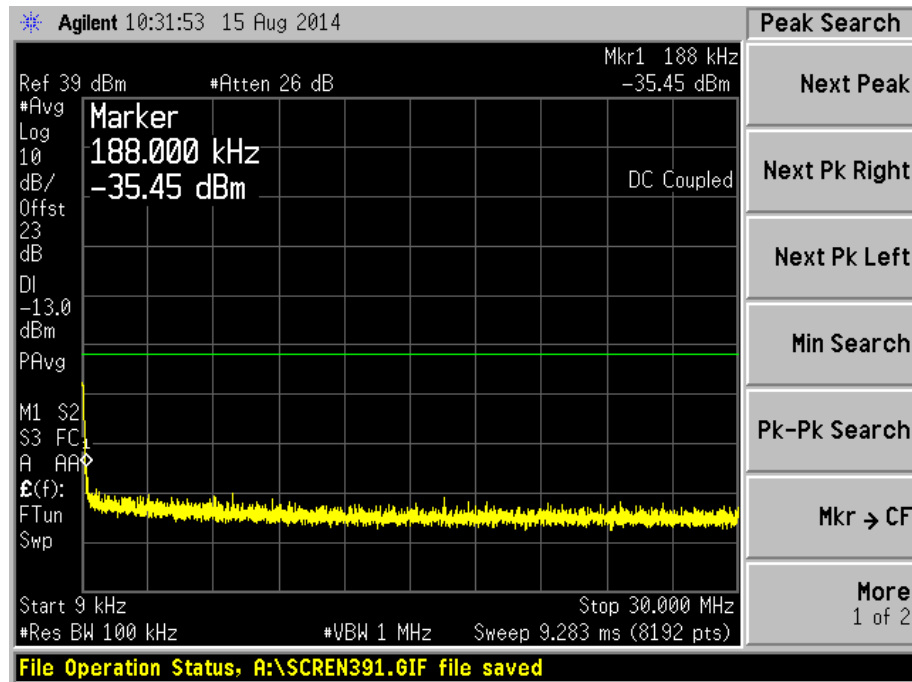
Out of Band Spurious Plots - PNB512\_45\_QPSK



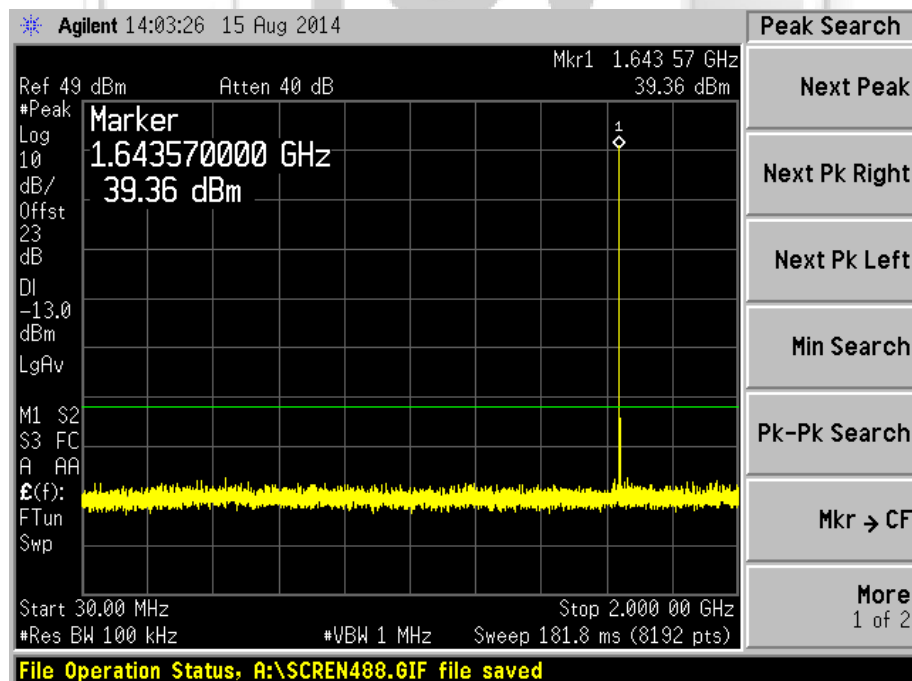
Plot 354 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_45\_QPSK



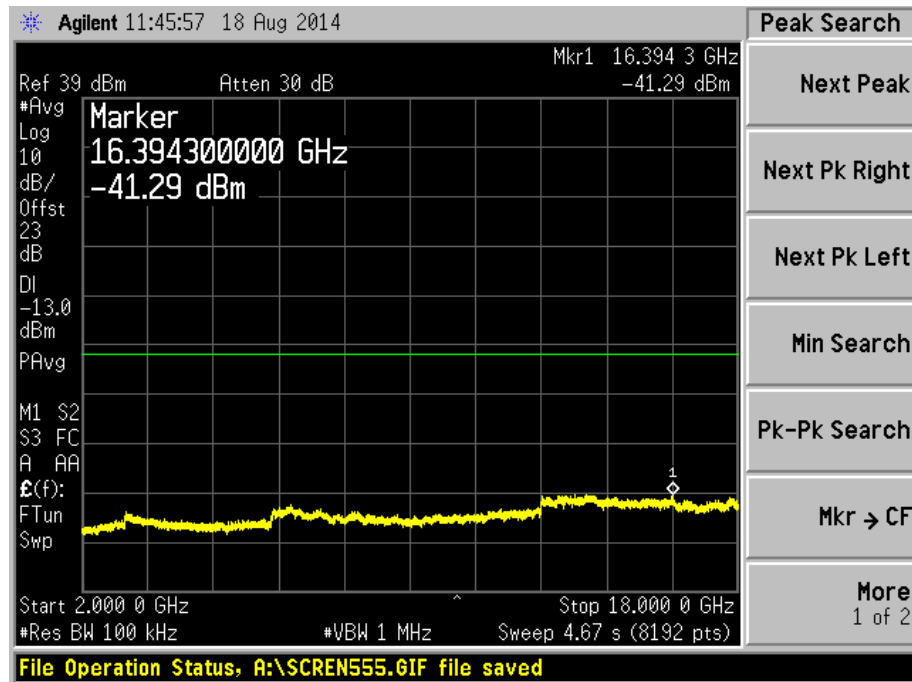
Plot 355 – Middle Channel



Plot 356 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

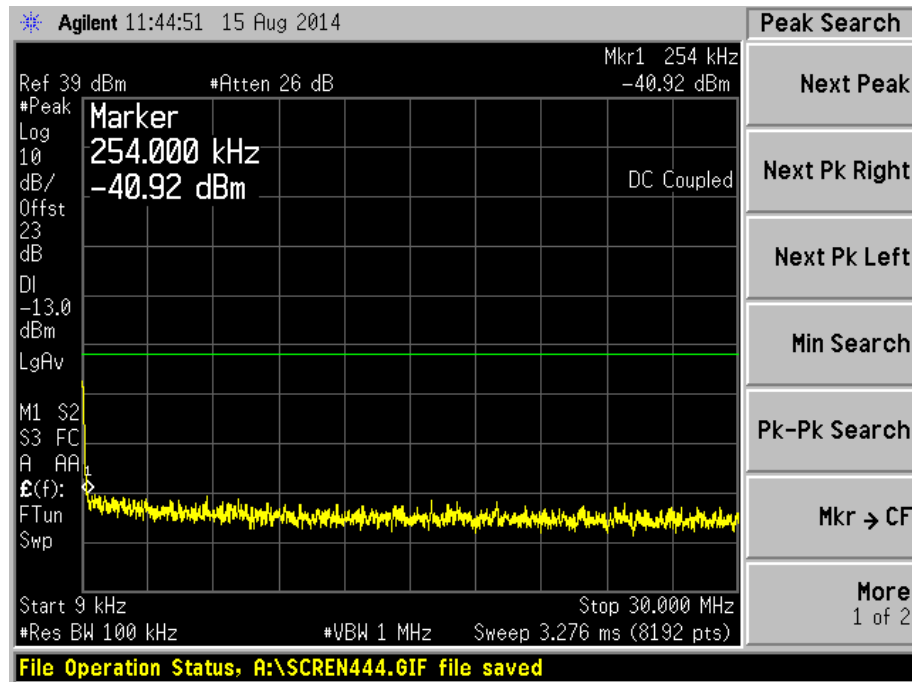
Out of Band Spurious Plots - PNB512\_45\_QPSK



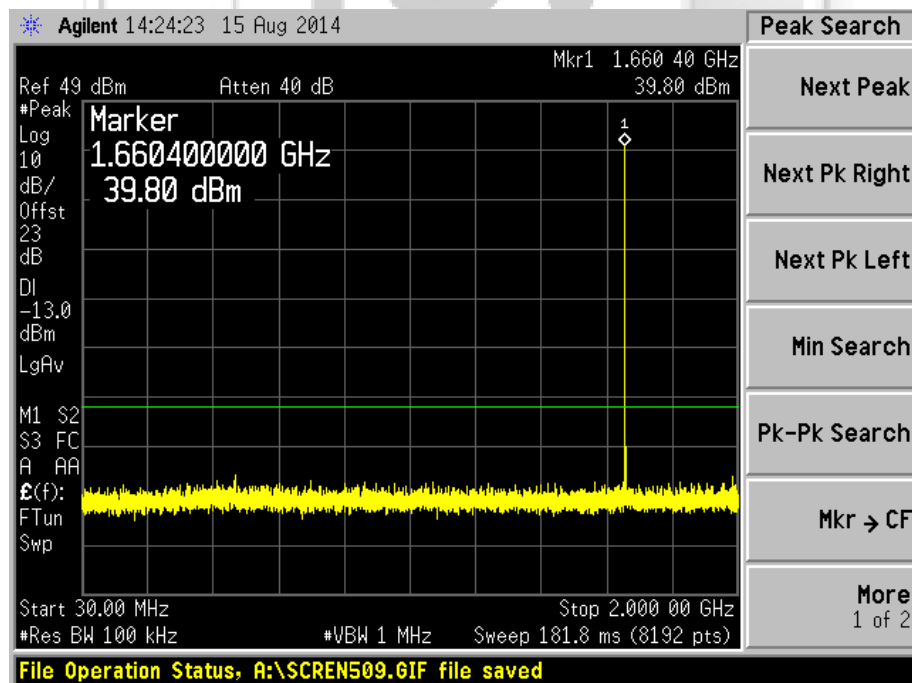
Plot 357 - Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB512\_45\_QPSK



Plot 358 – Upper Channel

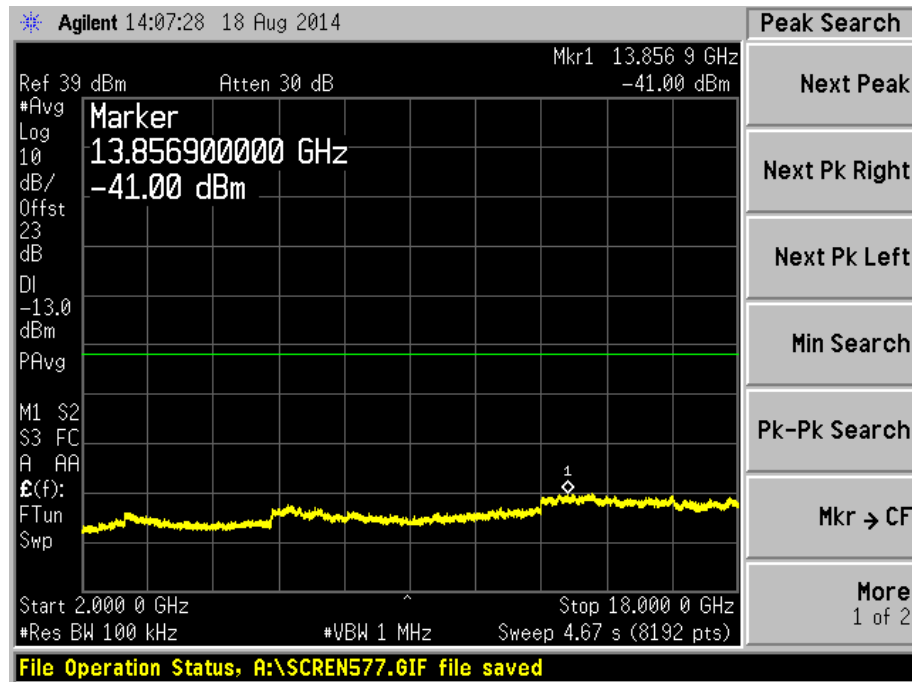


Plot 359 – Upper Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

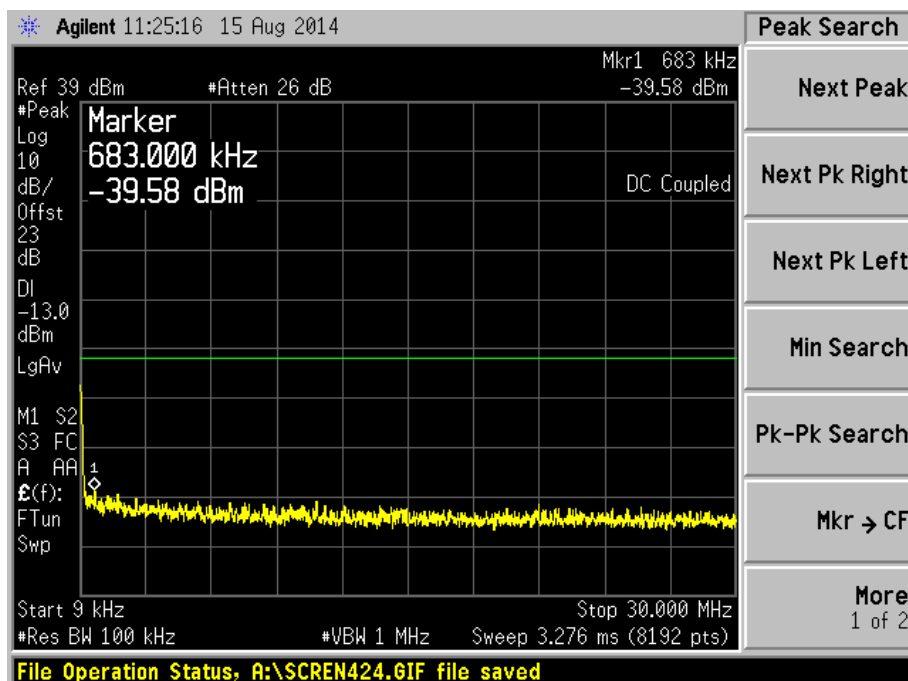
### Out of Band Spurious Plots - PNB512\_45\_QPSK



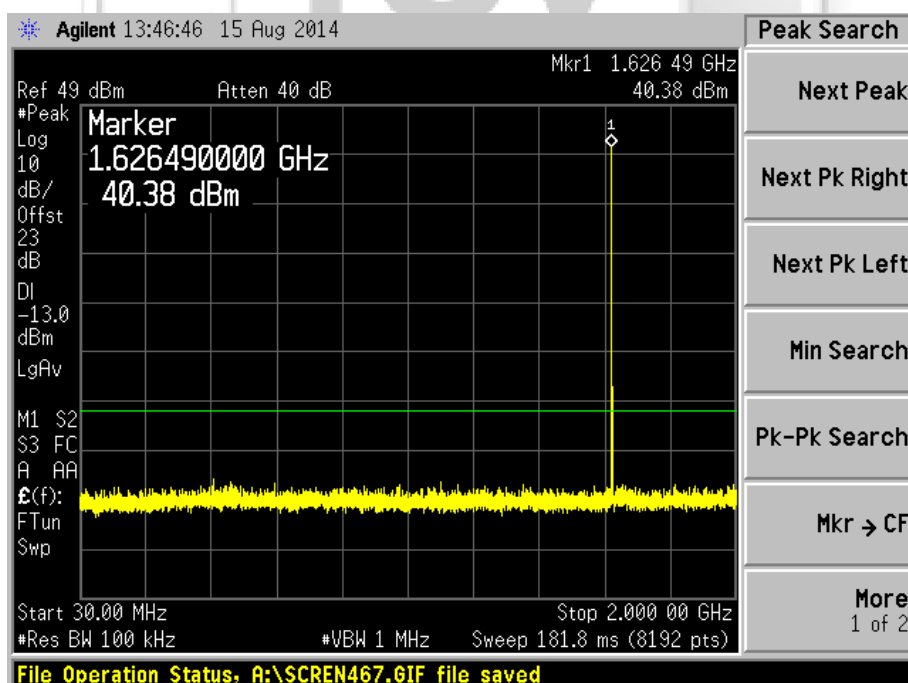
Plot 360 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB512\_910\_16APSK



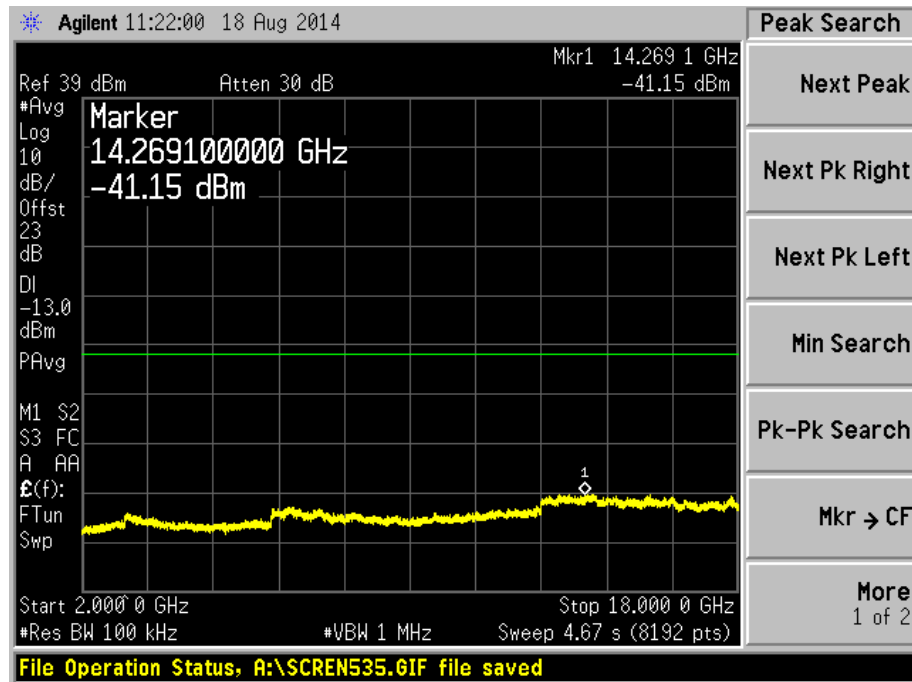
Plot 361 – Lower Channel



Plot 362 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

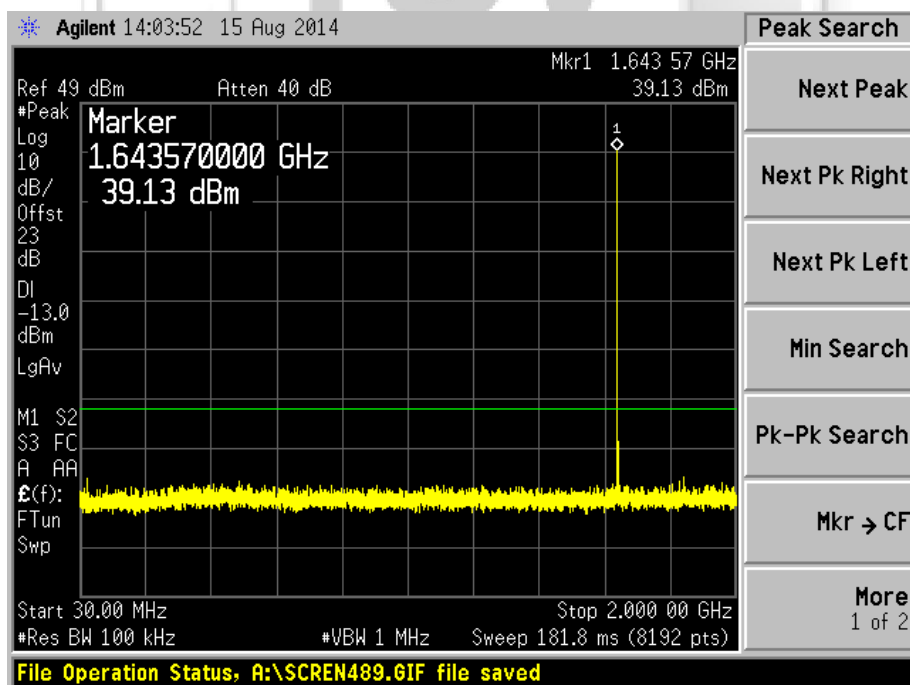
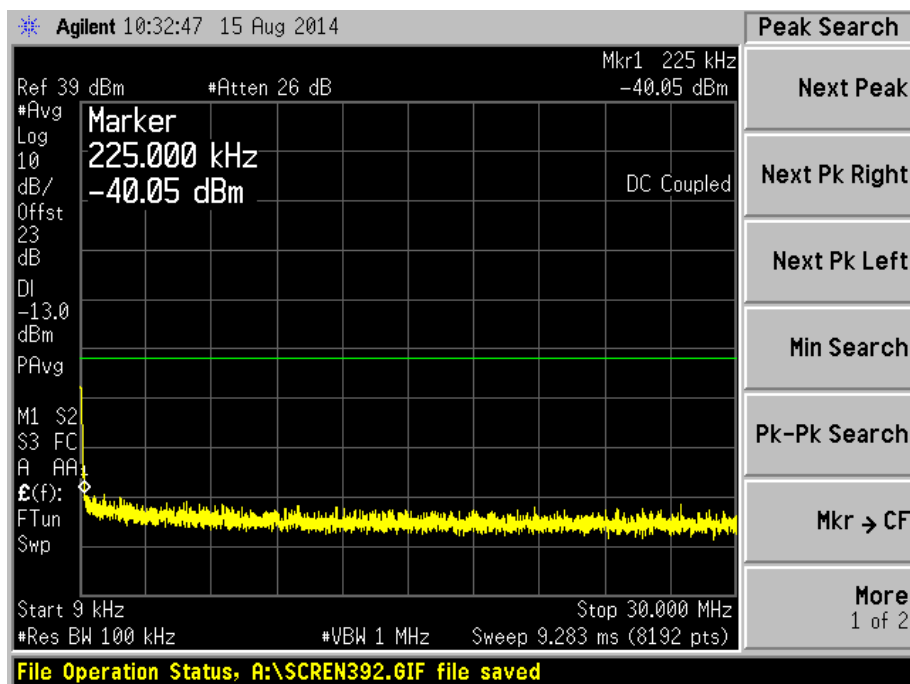
Out of Band Spurious Plots - PNB512\_910\_16APSK



Plot 363 – Lower Channel

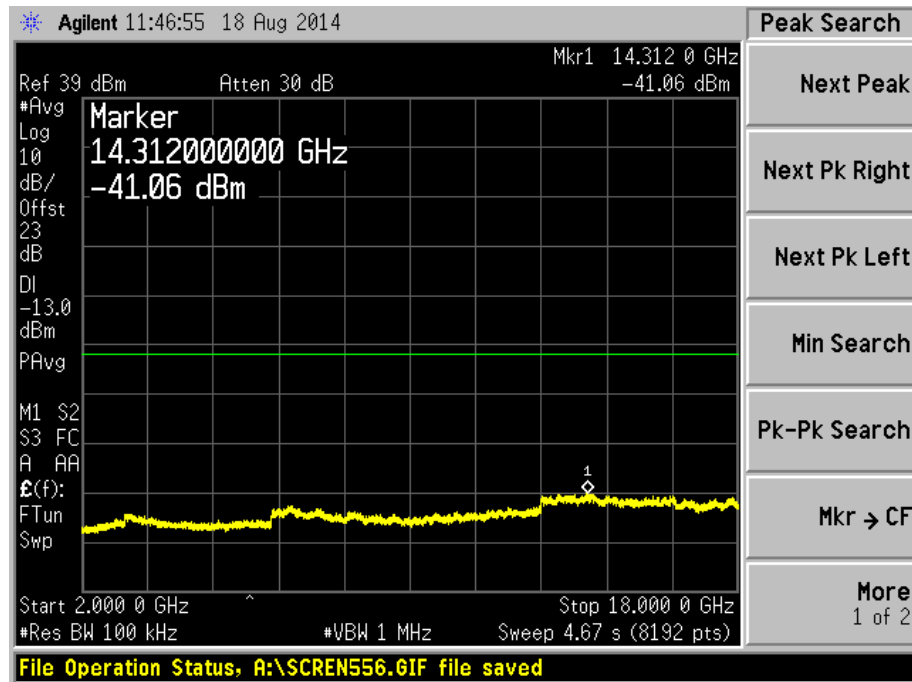
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_910\_16APSK



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

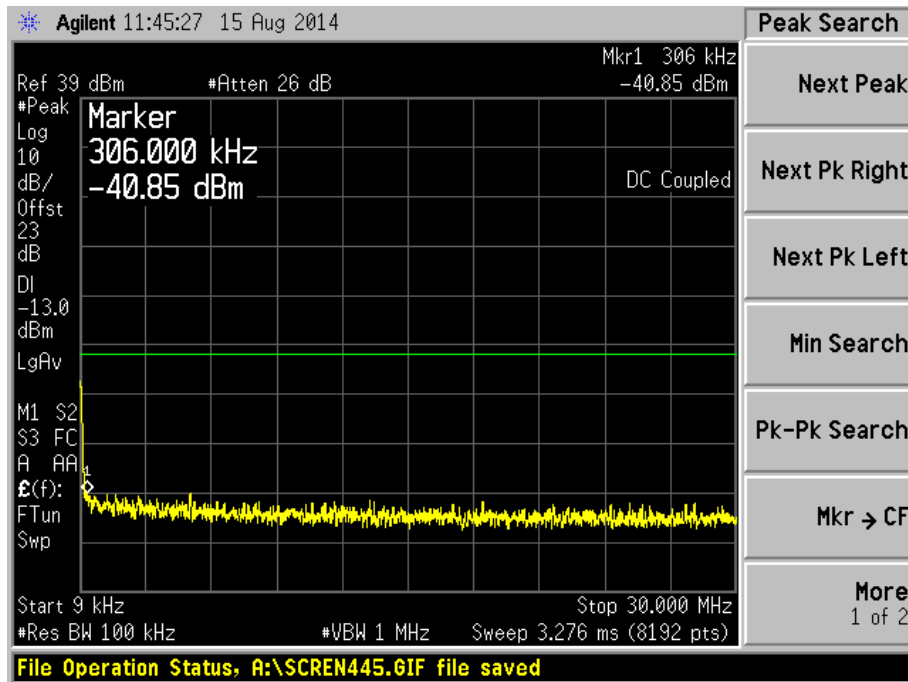
Out of Band Spurious Plots - PNB512\_910\_16APSK



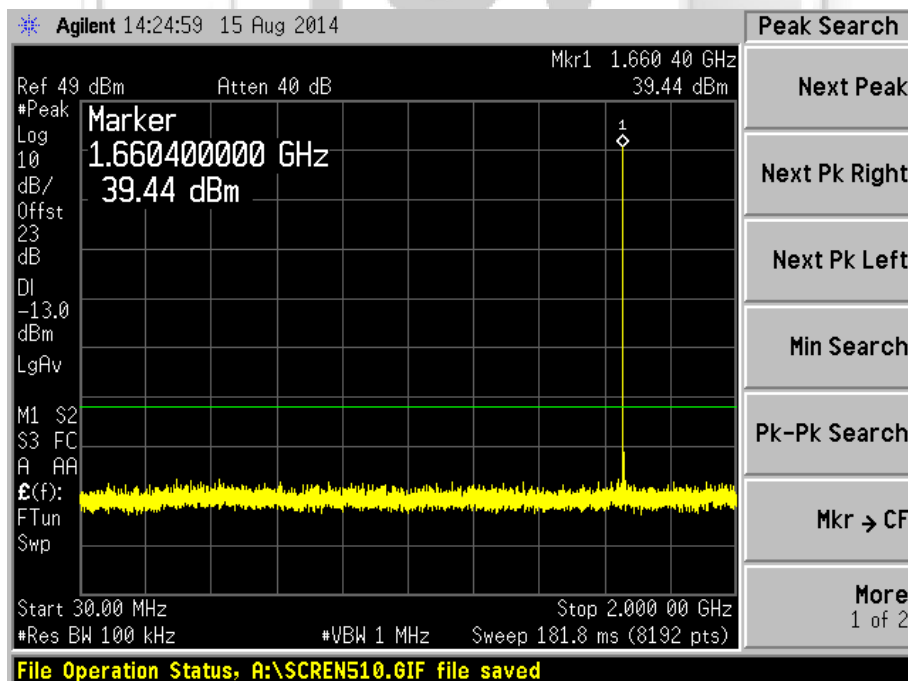
Plot 366 - Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB512\_910\_16APSK



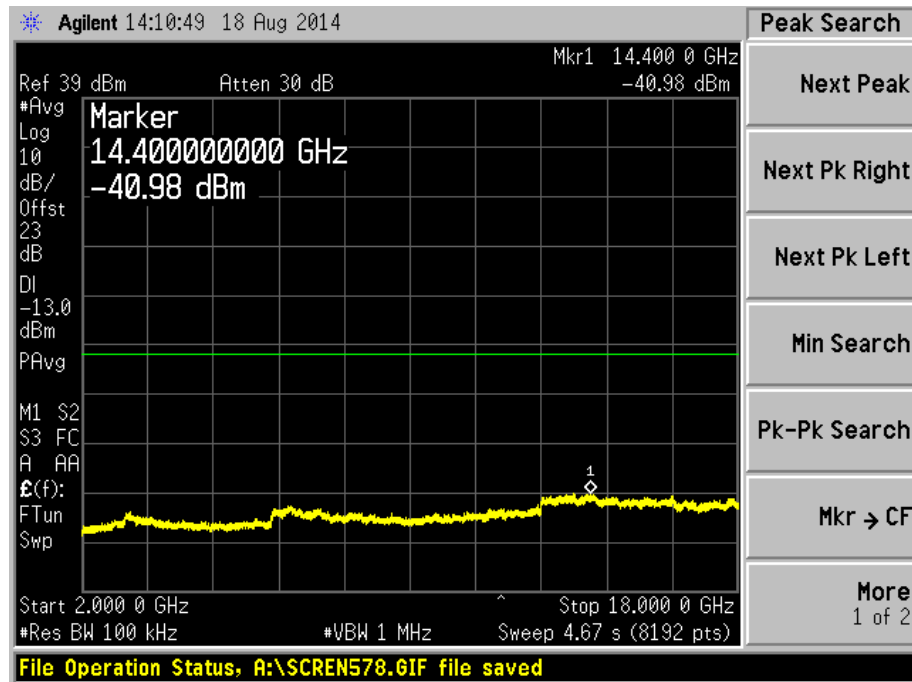
Plot 367 – Upper Channel



Plot 368 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

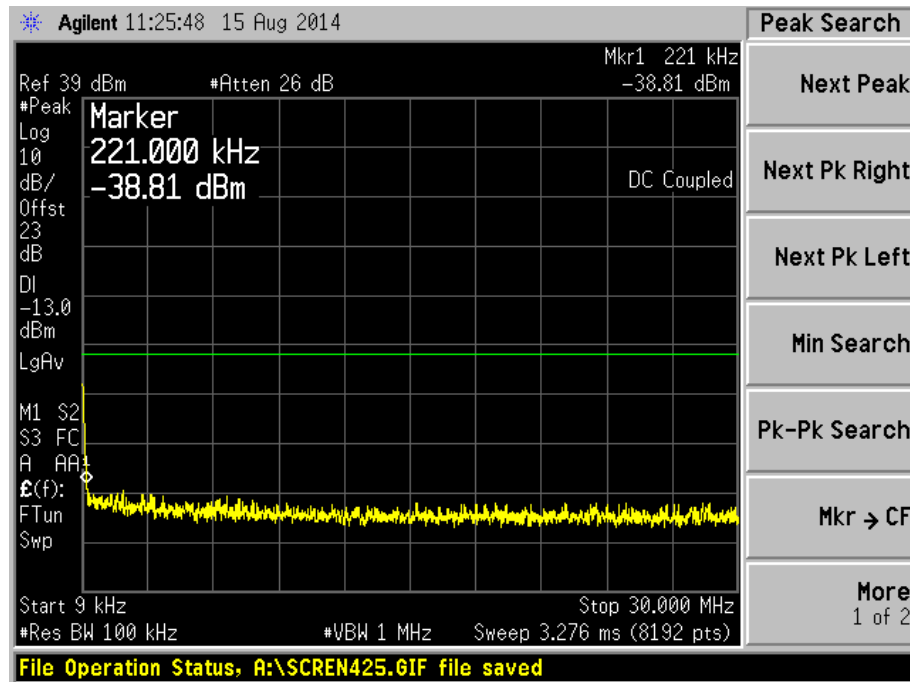
Out of Band Spurious Plots - PNB512\_910\_16APSK



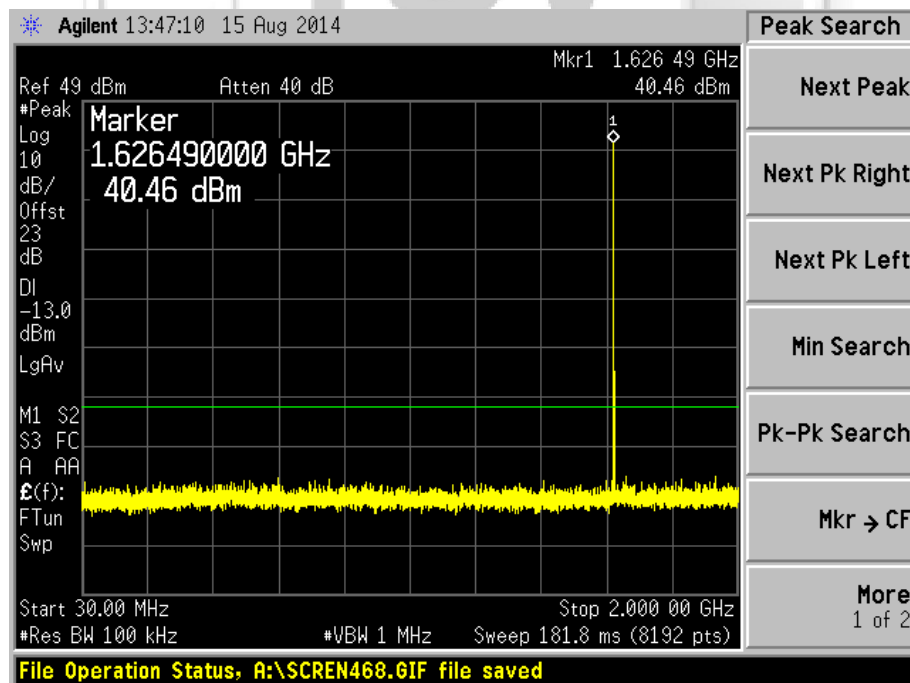
Plot 369 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB512\_910\_QPSK



Plot 370 – Lower Channel

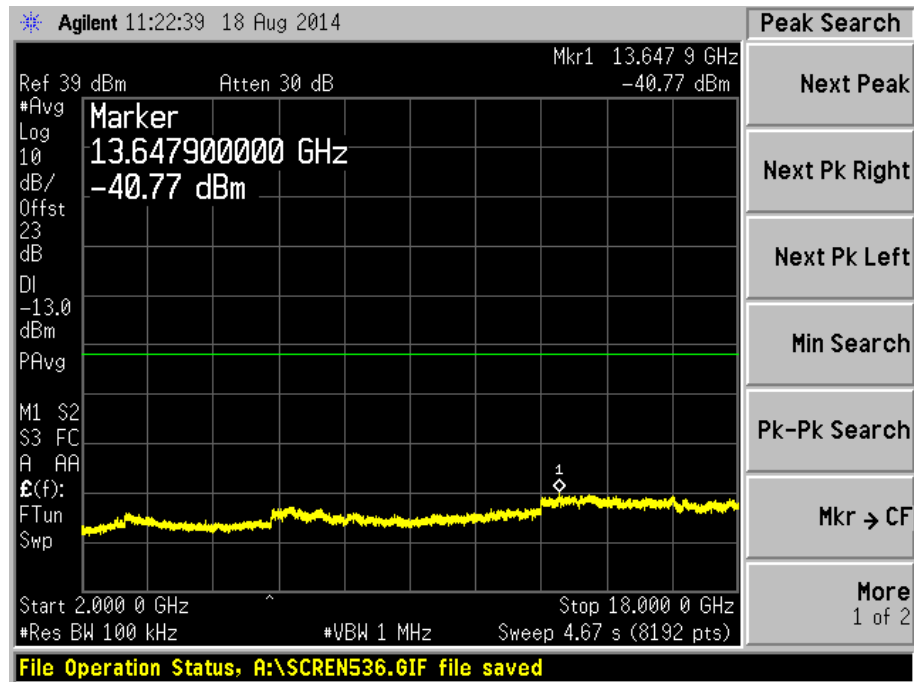


Plot 371 – Lower Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

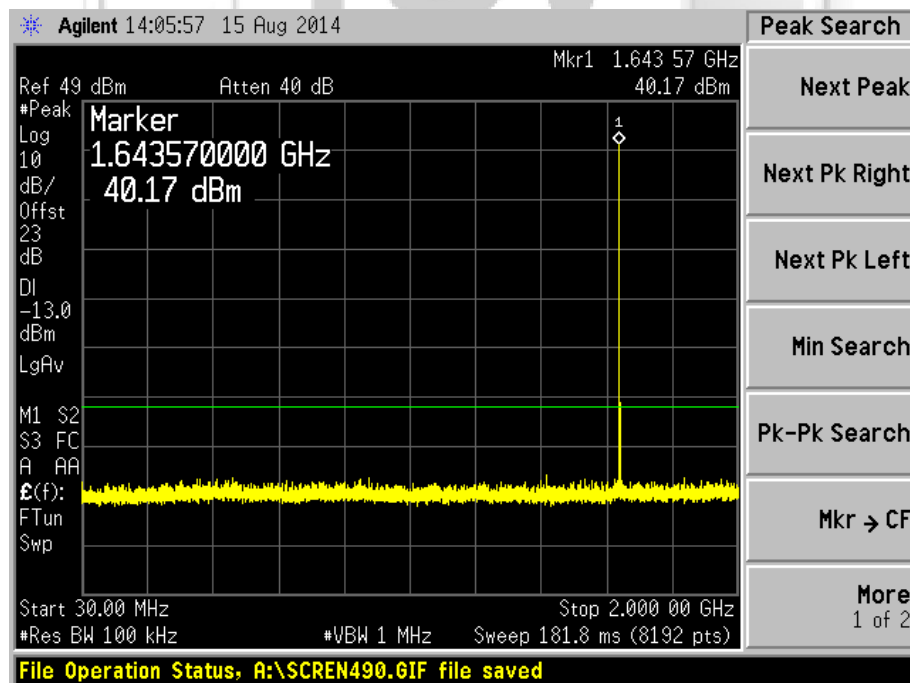
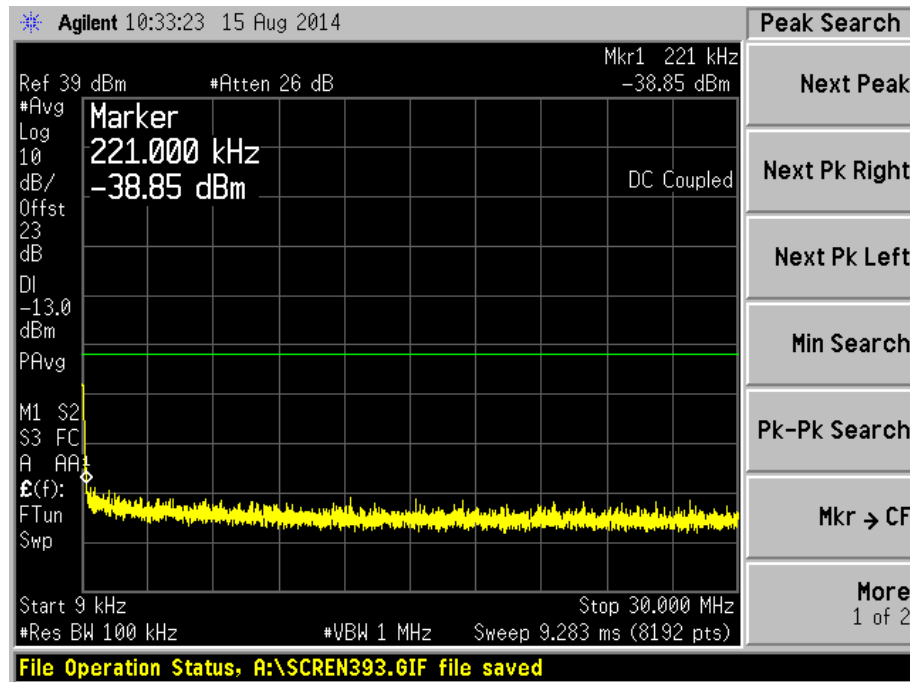
Out of Band Spurious Plots - PNB512\_910\_QPSK



Plot 372 – Lower Channel

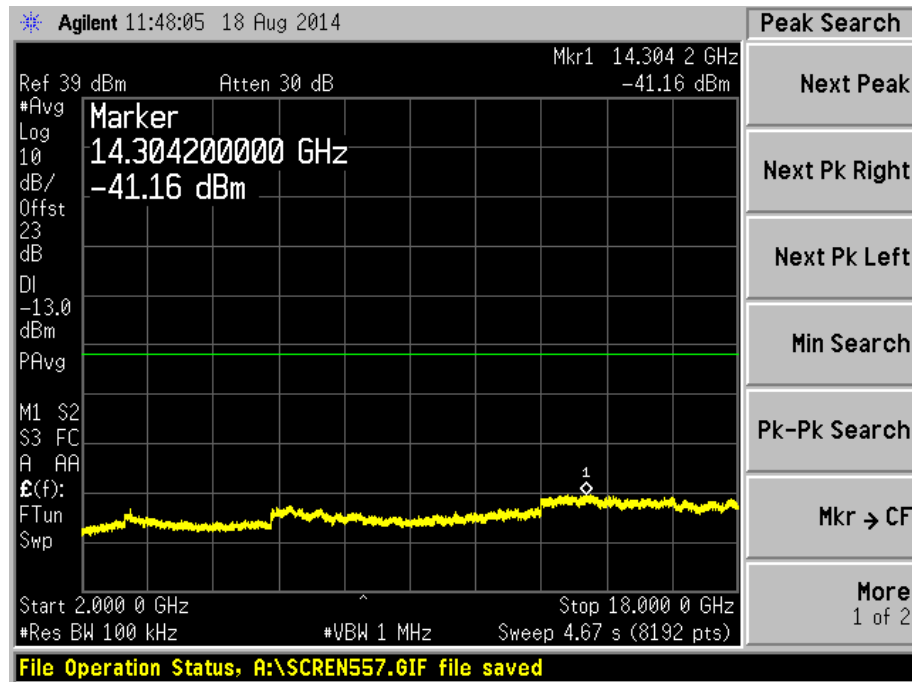
## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB512\_910\_QPSK



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

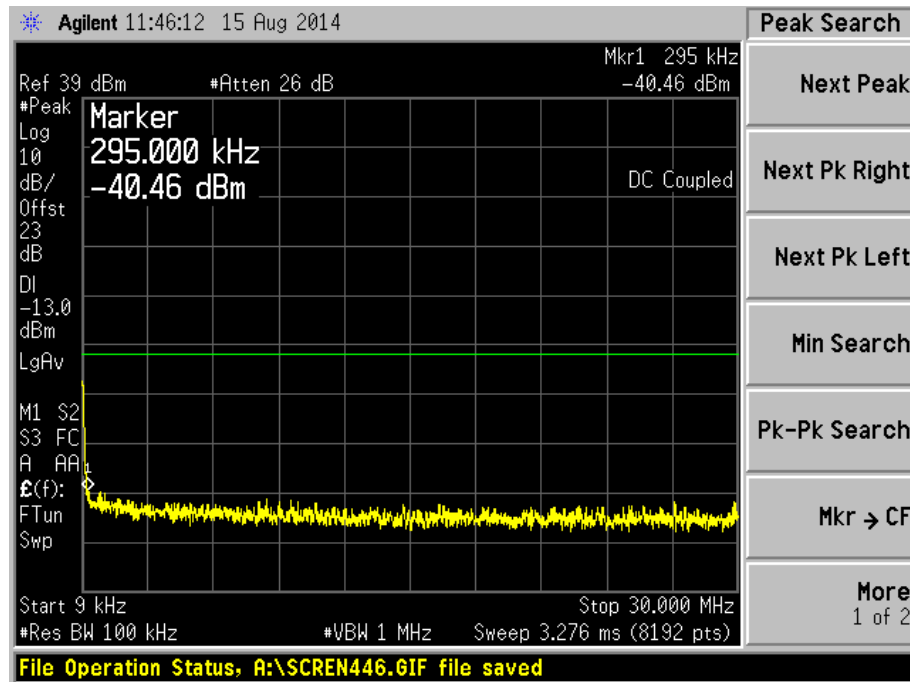
Out of Band Spurious Plots - PNB512\_910\_QPSK



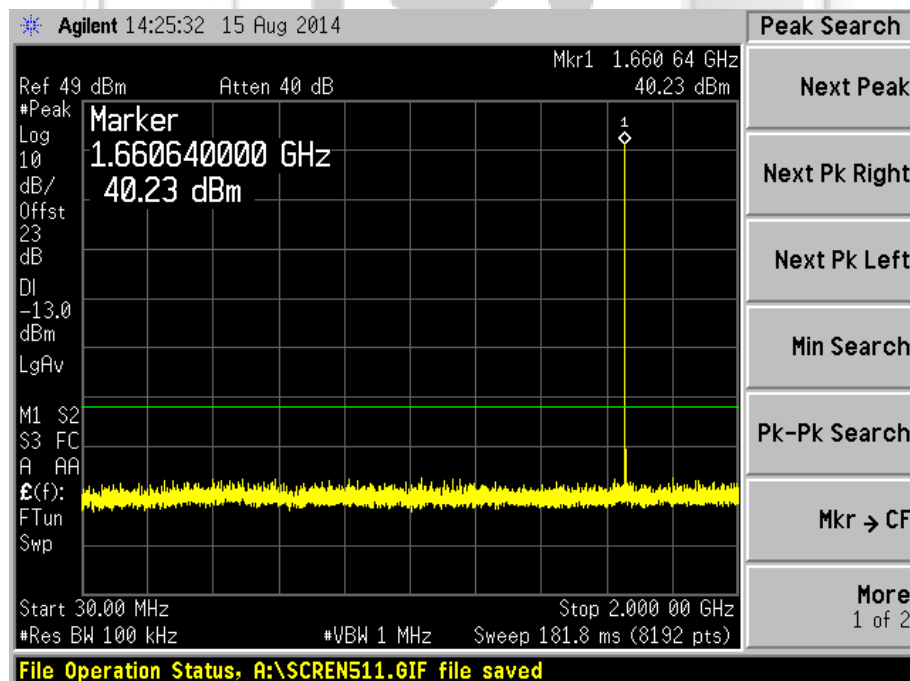
Plot 365 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB512\_910\_QPSK



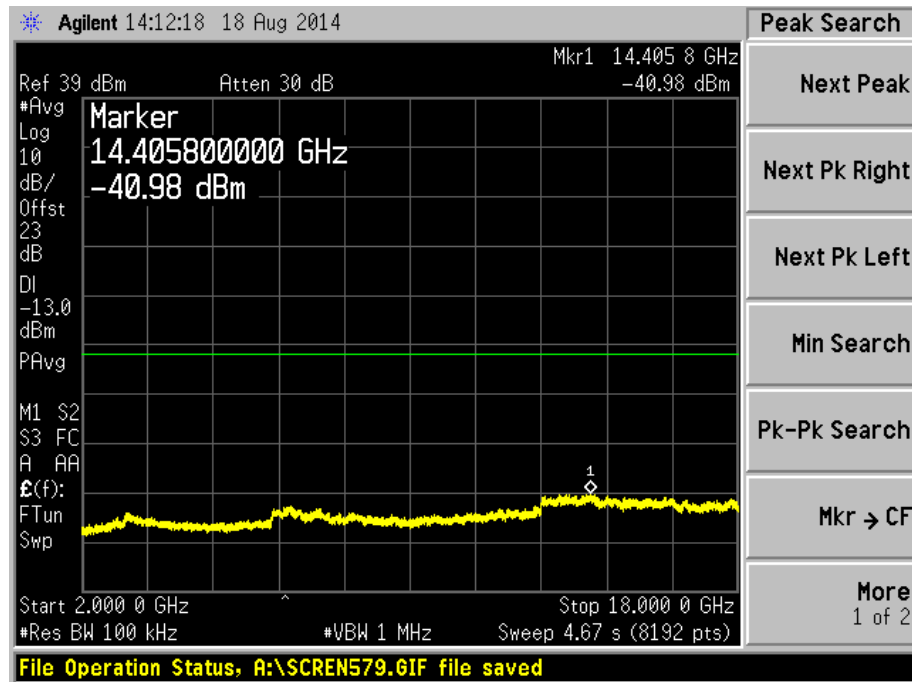
Plot 376 - Upper Channel



Plot 377 - Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

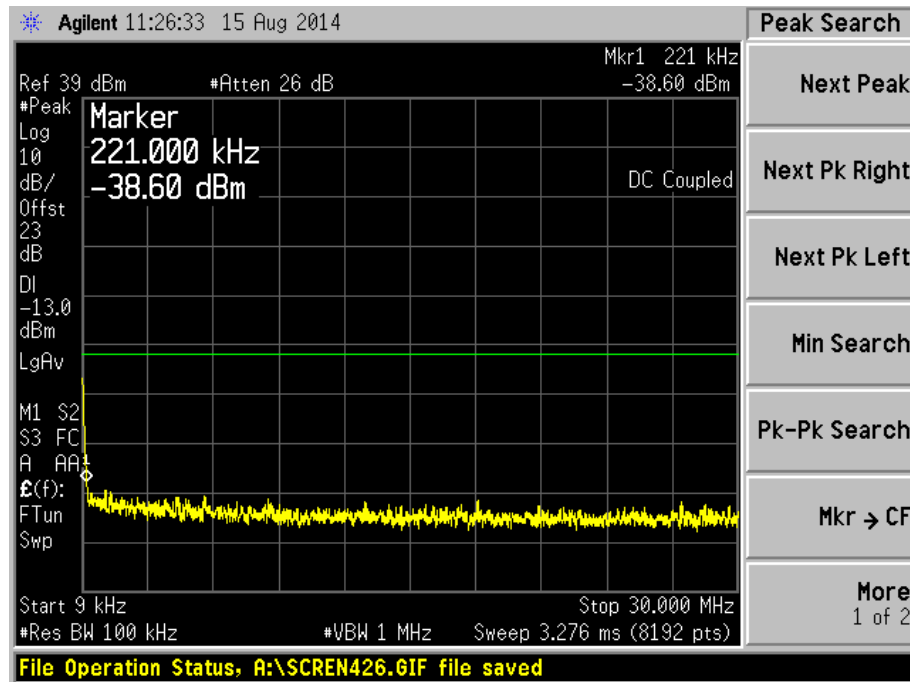
Out of Band Spurious Plots - PNB512\_910\_QPSK



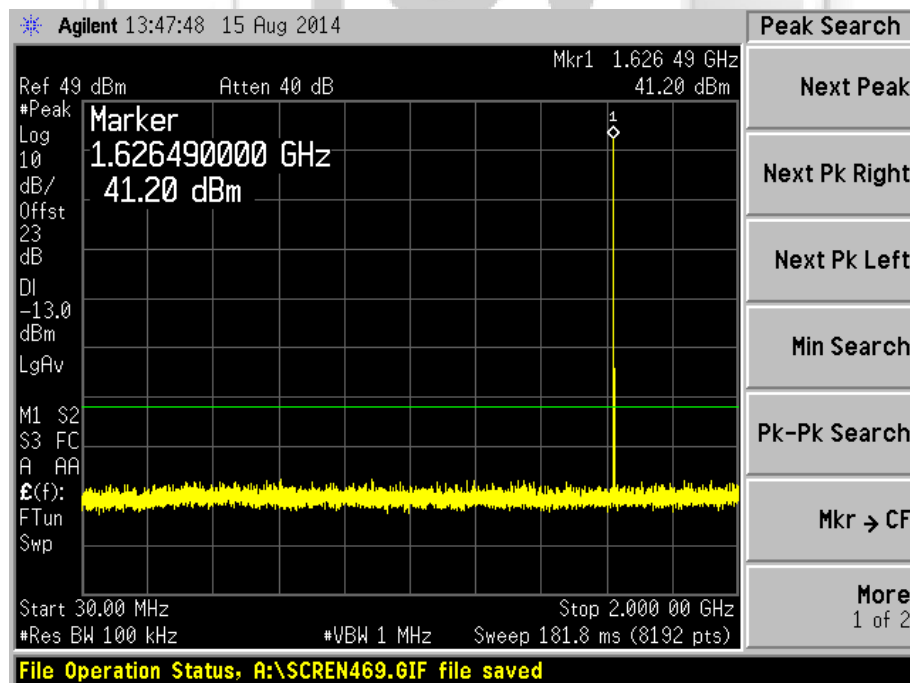
Plot 378 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_12\_QPSK



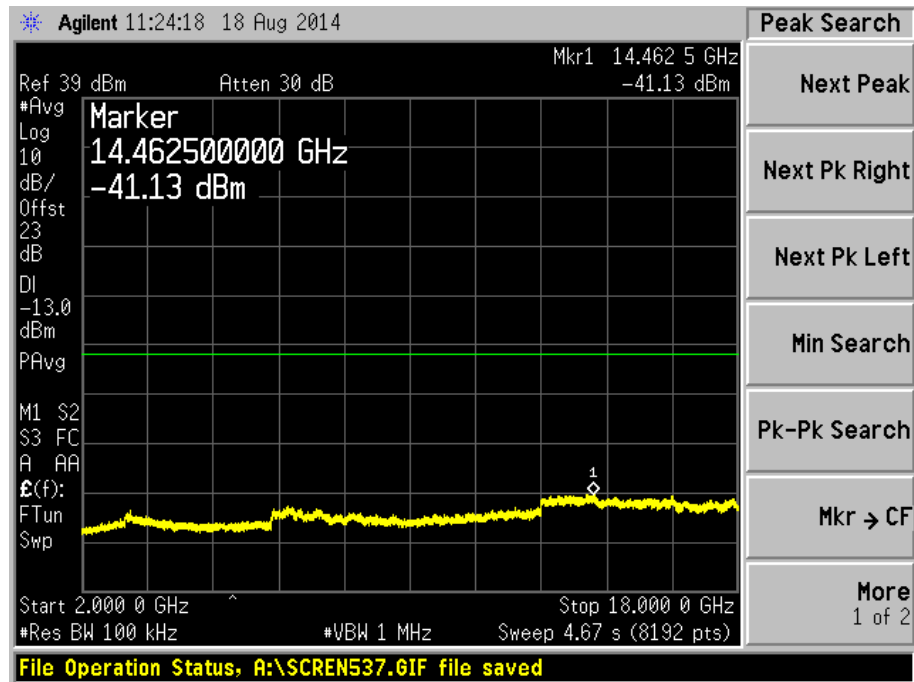
Plot 379 – Lower Channel



Plot 380 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

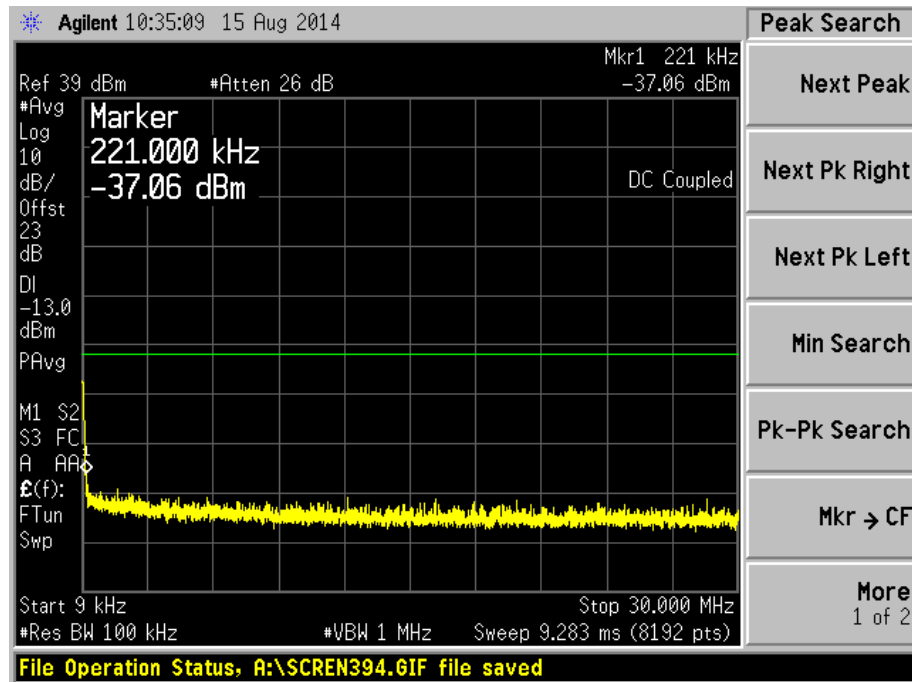
Out of Band Spurious Plots - PNB53\_12\_QPSK



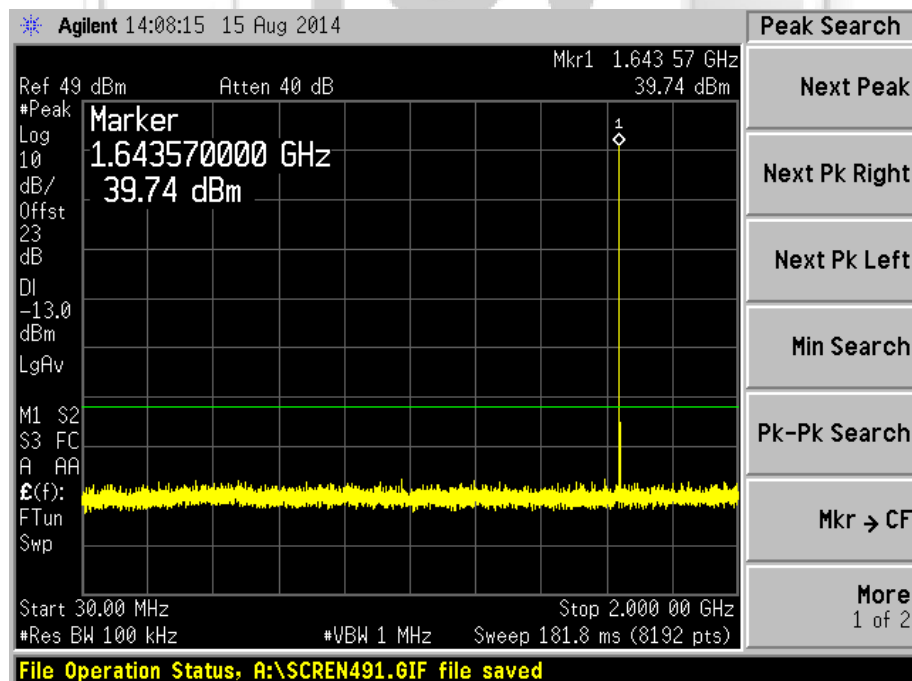
Plot 381 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_12\_QPSK



Plot 382 – Middle Channel

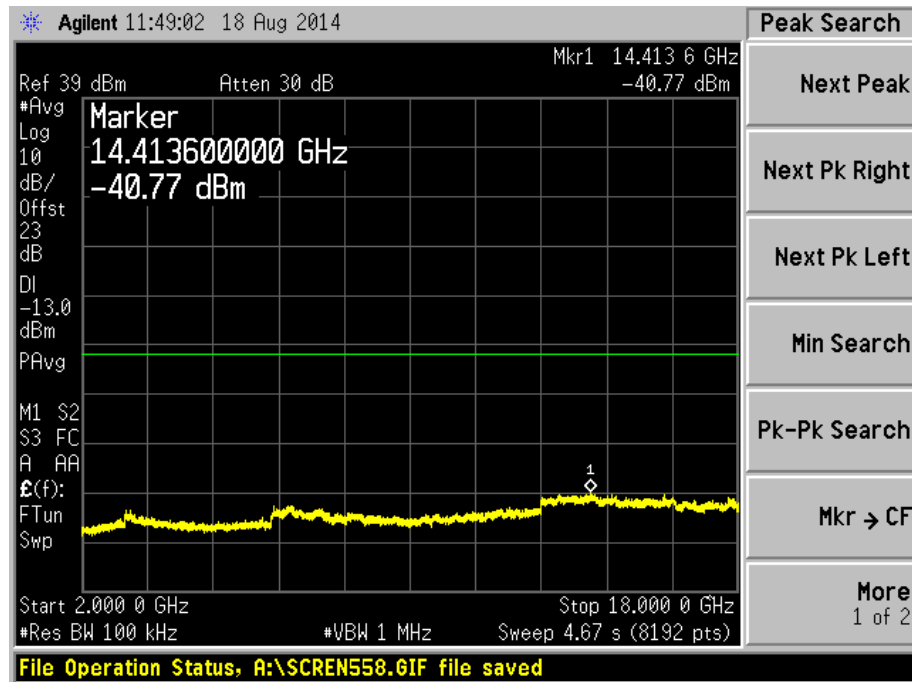


Plot 383 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

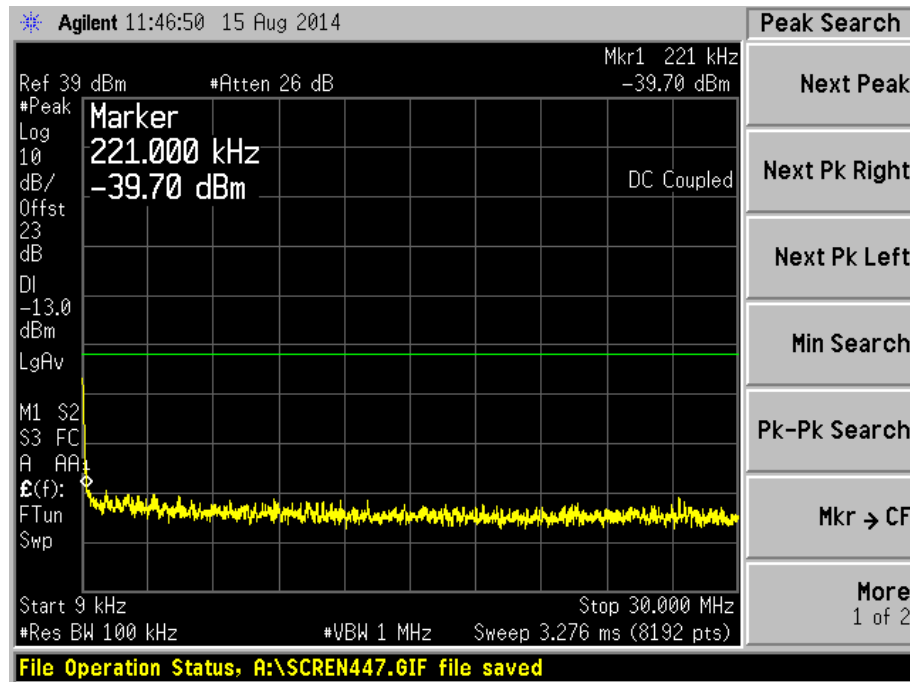
Out of Band Spurious Plots - PNB53\_12\_QPSK



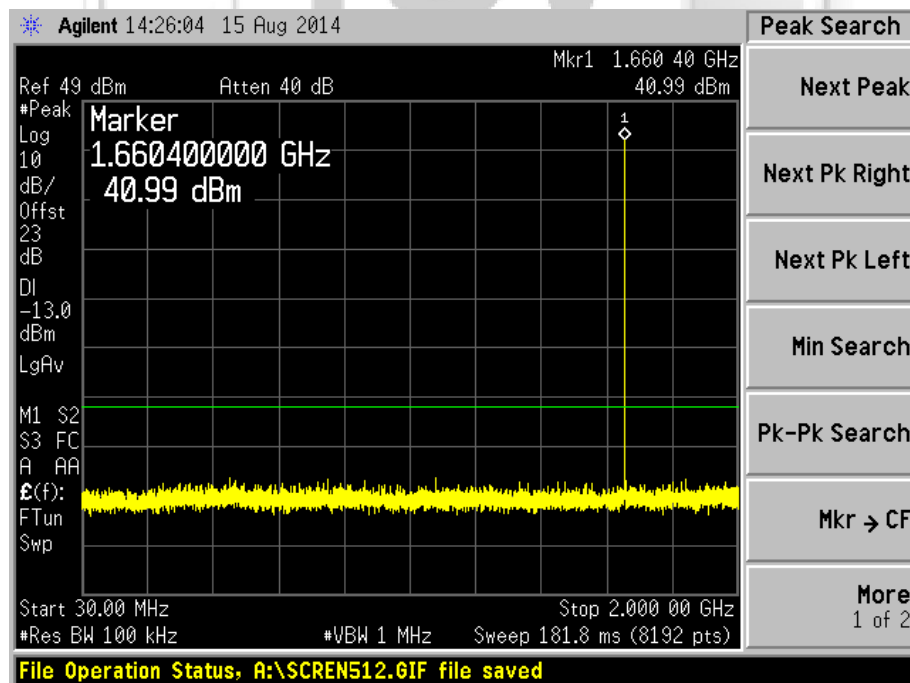
Plot 384 - Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_12\_QPSK



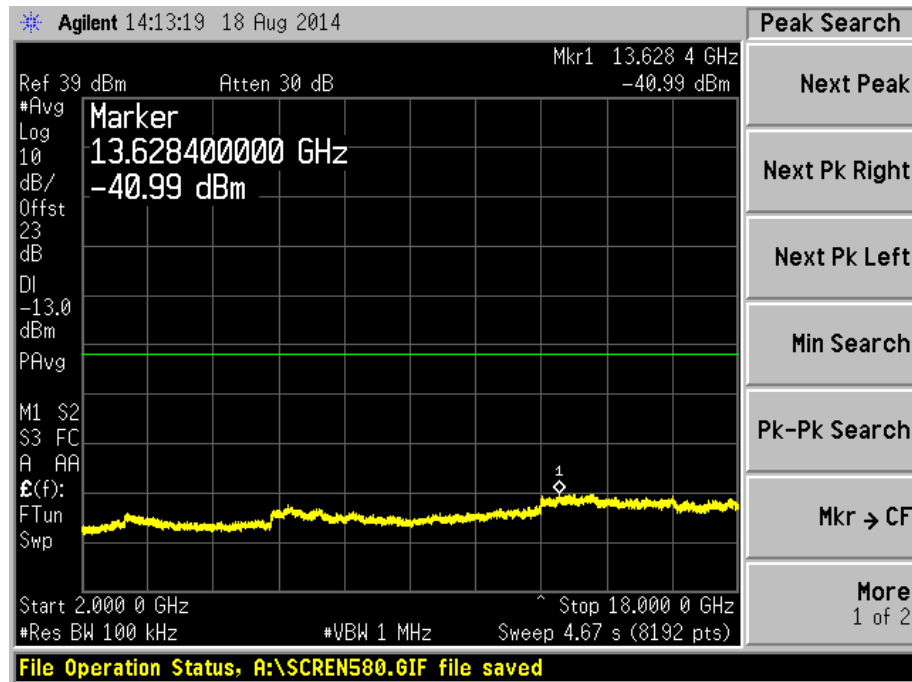
Plot 385 – Upper Channel



Plot 386 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

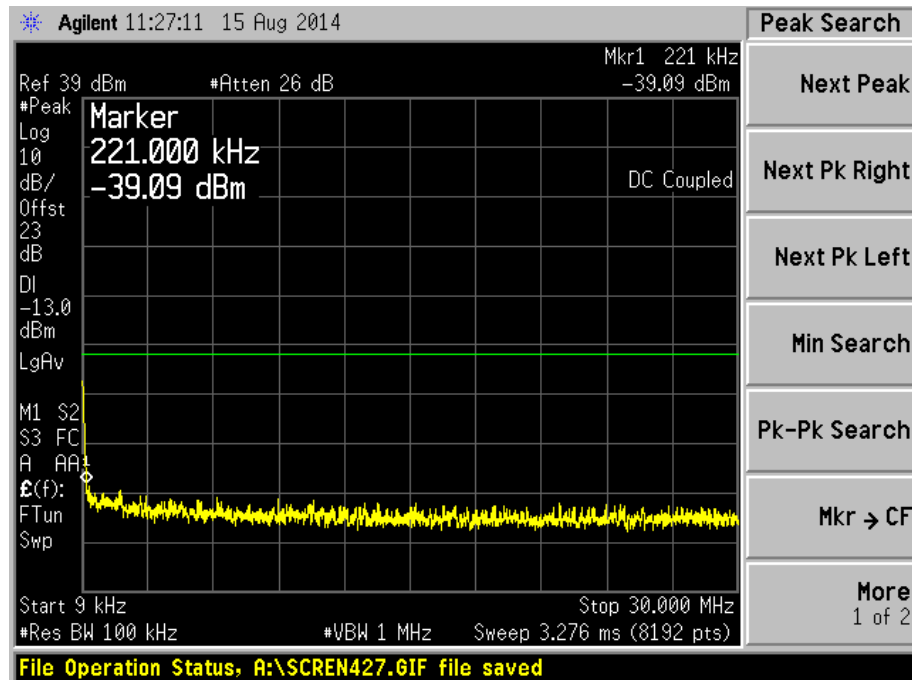
Out of Band Spurious Plots - PNB53\_12\_QPSK



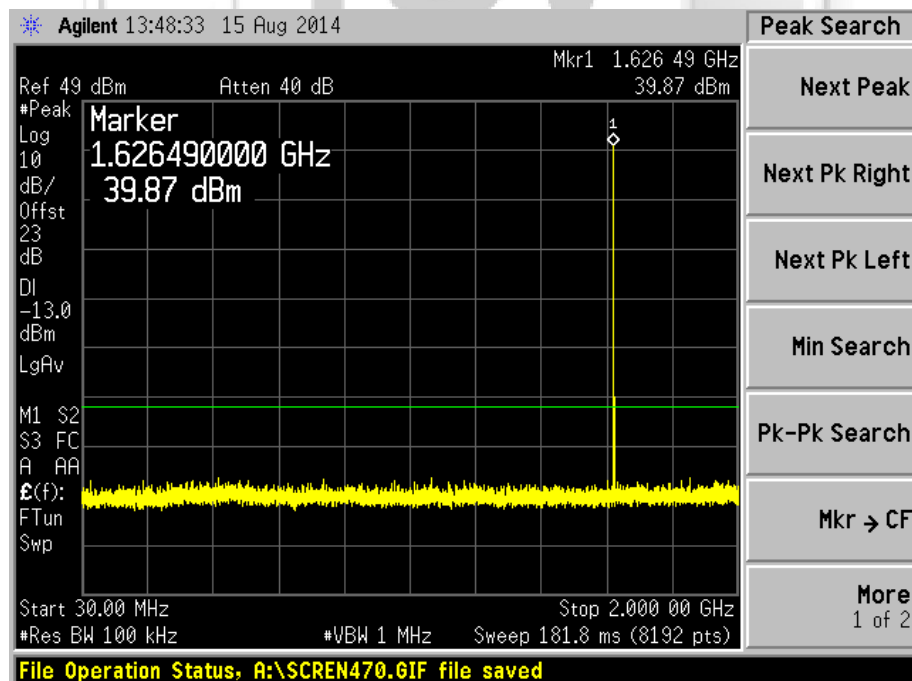
Plot 387 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_23\_16APSK



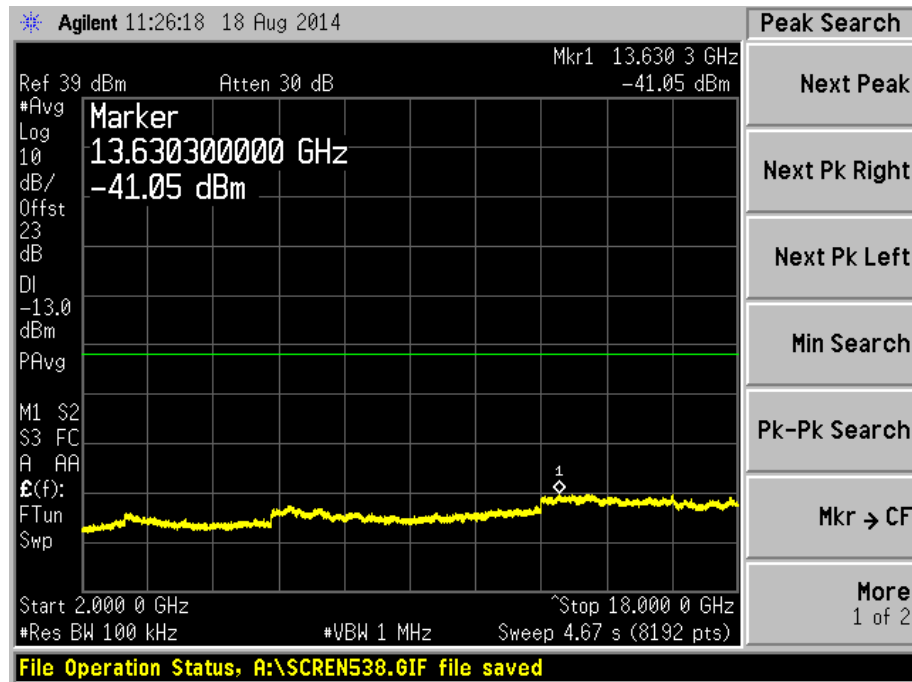
Plot 388 – Lower Channel



Plot 389 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

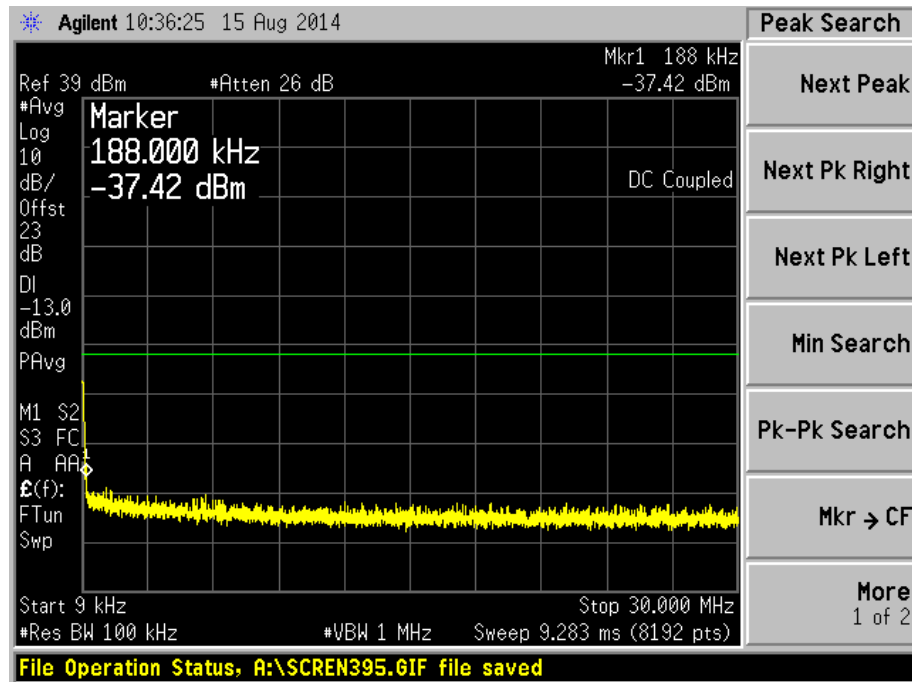
Out of Band Spurious Plots - PNB53\_23\_16APSK



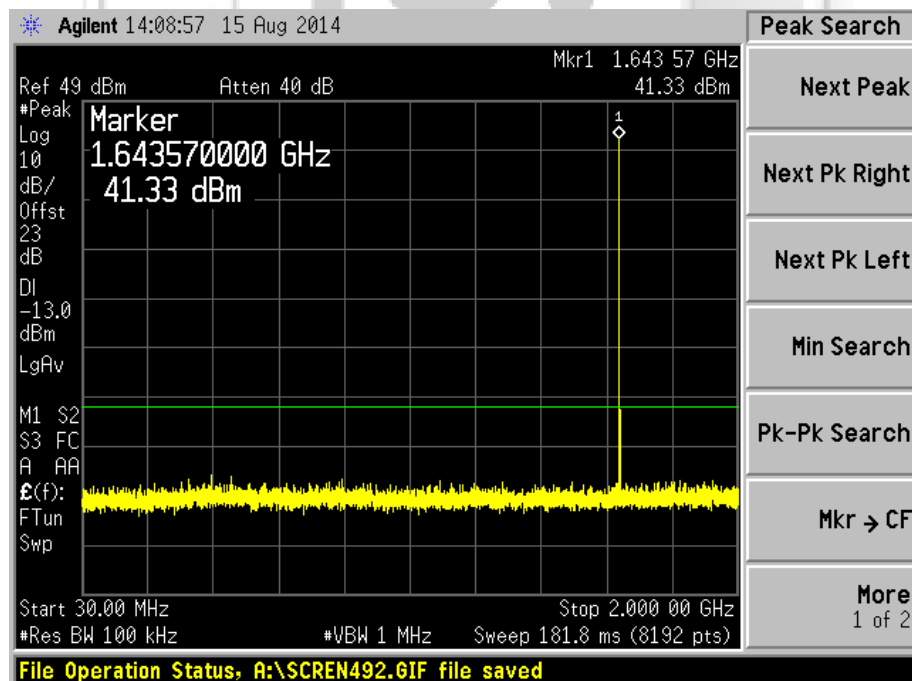
Plot 390 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_23\_16APSK



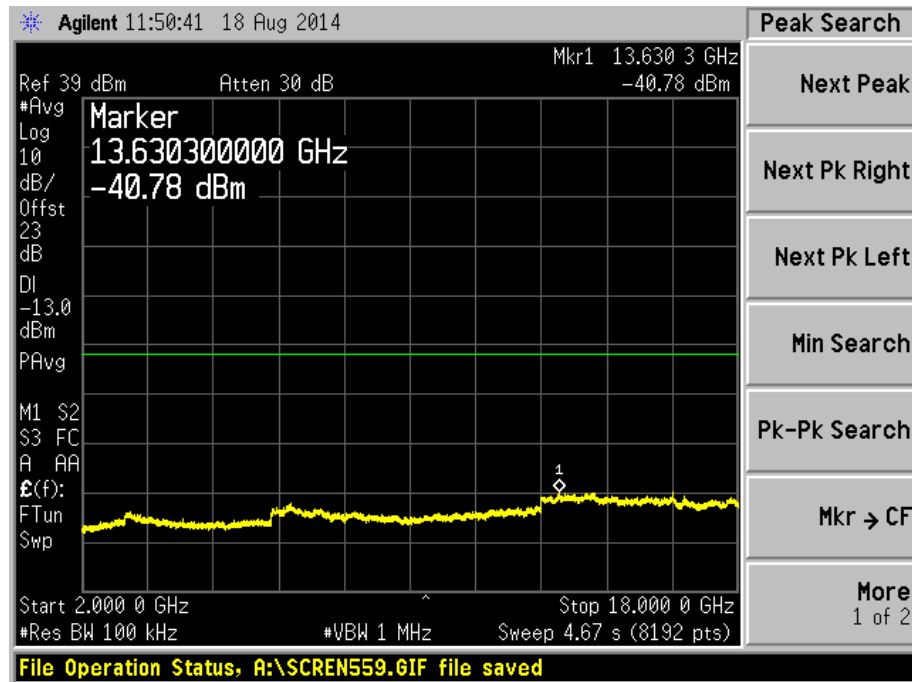
Plot 391 – Middle Channel



Plot 392 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

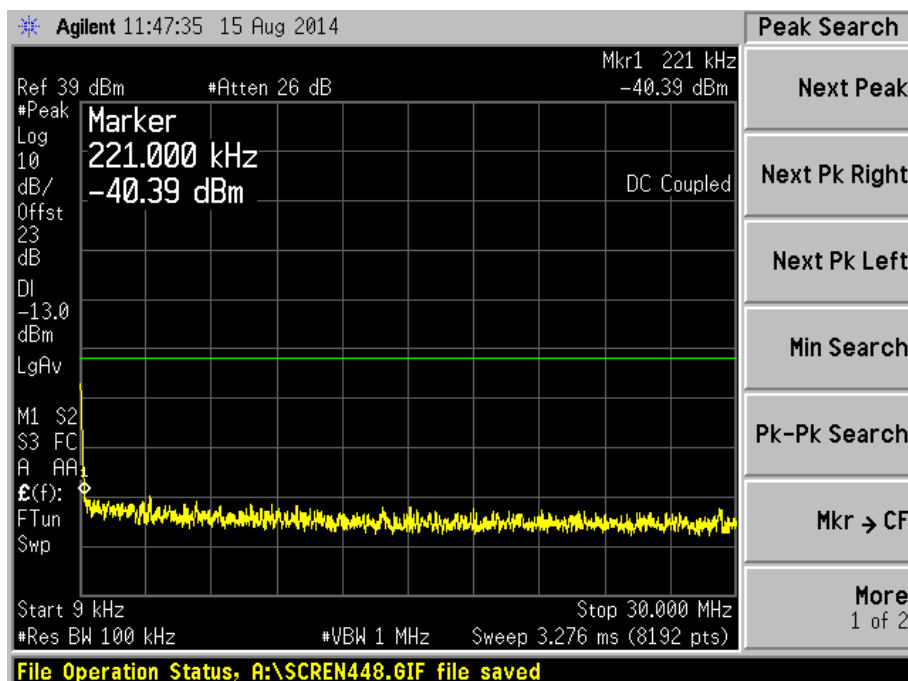
Out of Band Spurious Plots - PNB53\_23\_16APSK



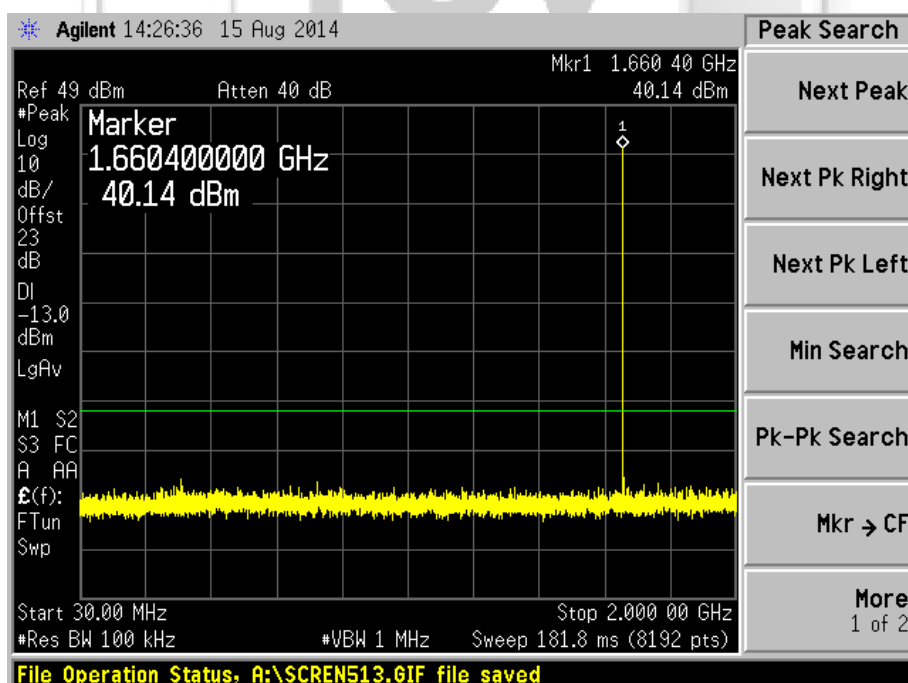
Plot 393 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB53\_23\_16APSK



Plot 394 – Upper Channel

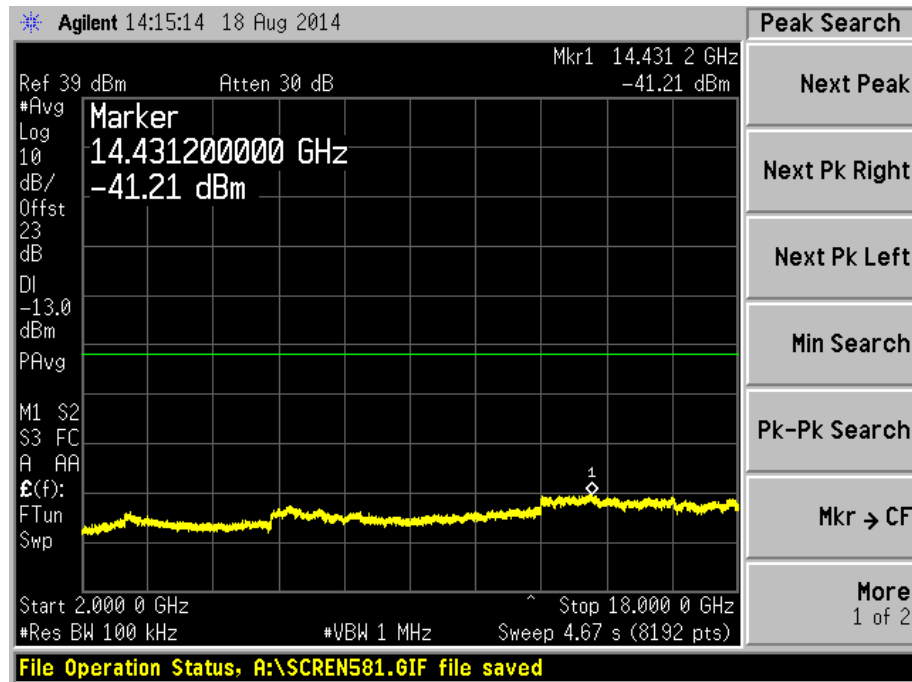


Plot 395 – Upper Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

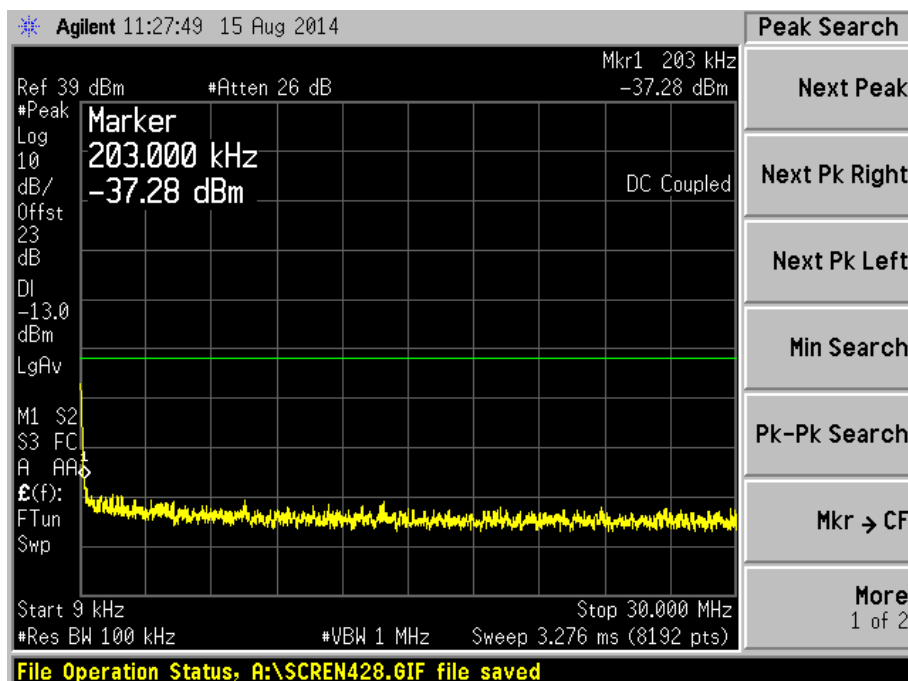
### Out of Band Spurious Plots - PNB53\_23\_16APSK



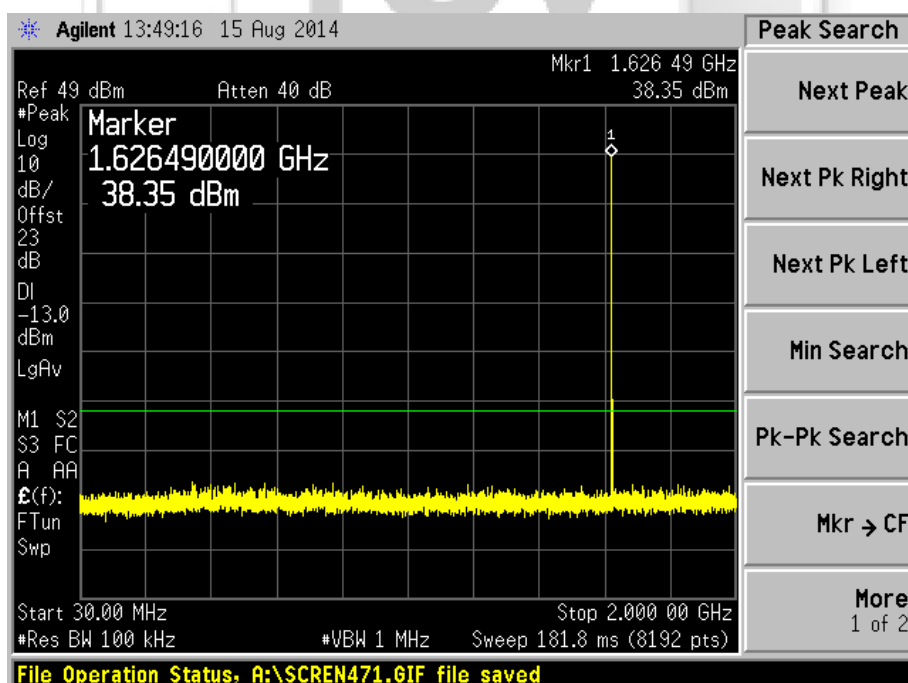
Plot 396 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB53\_23\_QPSK



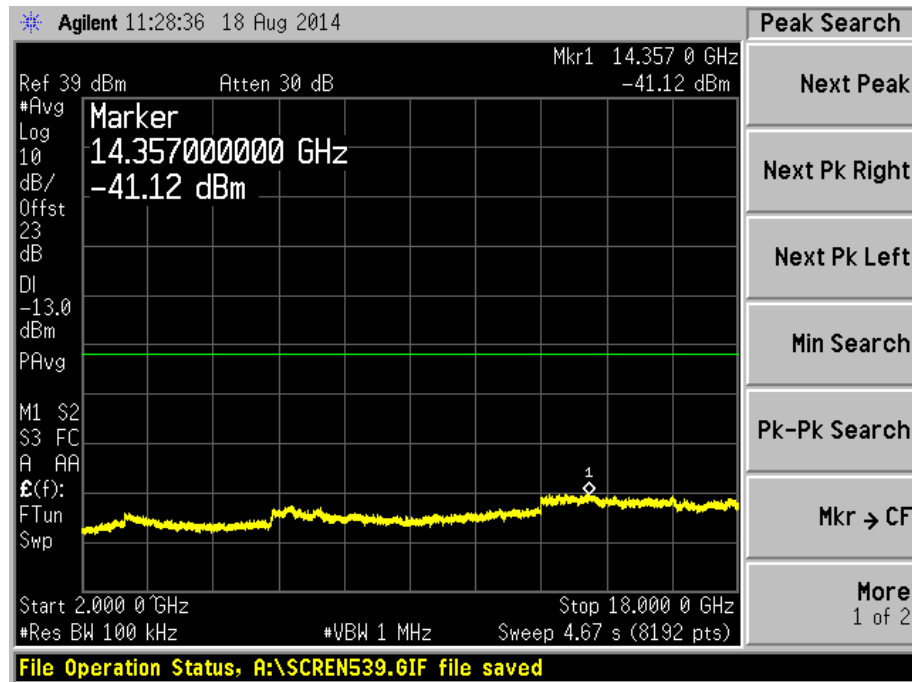
Plot 397 – Lower Channel



Plot 398 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

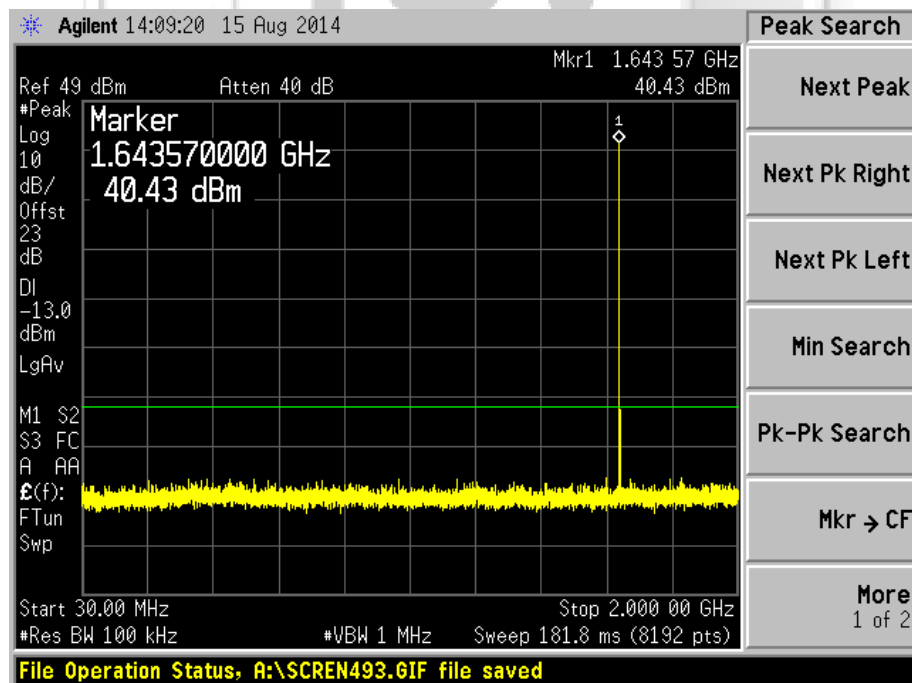
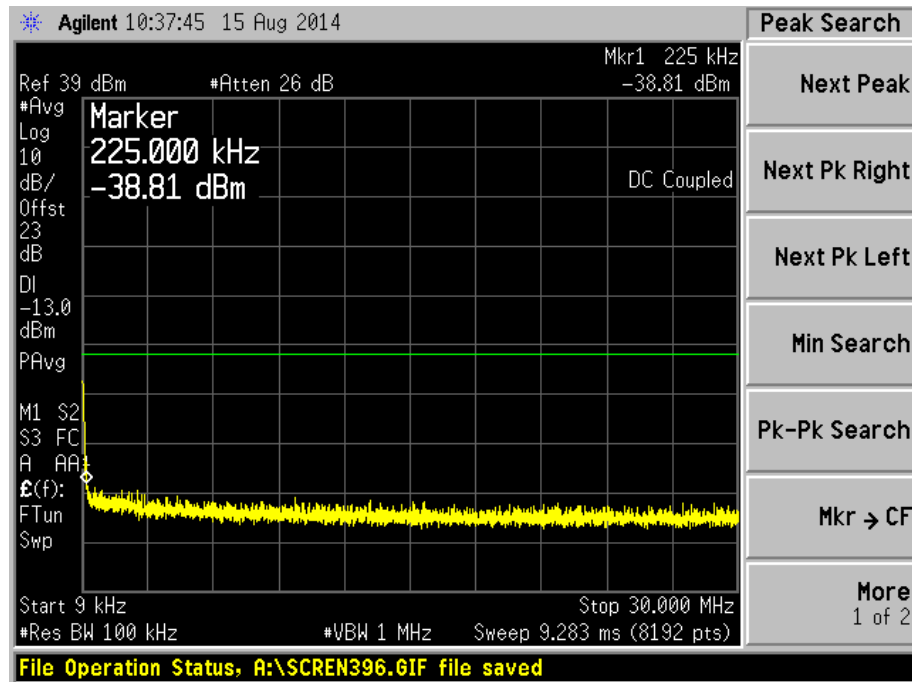
Out of Band Spurious Plots - PNB53\_23\_QPSK



Plot 399 – Lower Channel

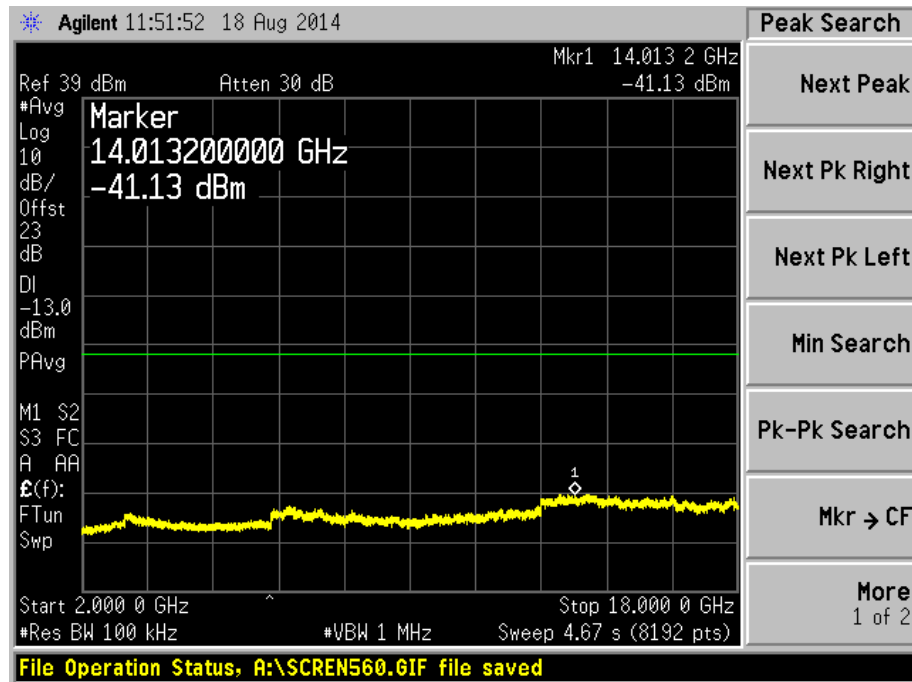
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_23\_QPSK



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

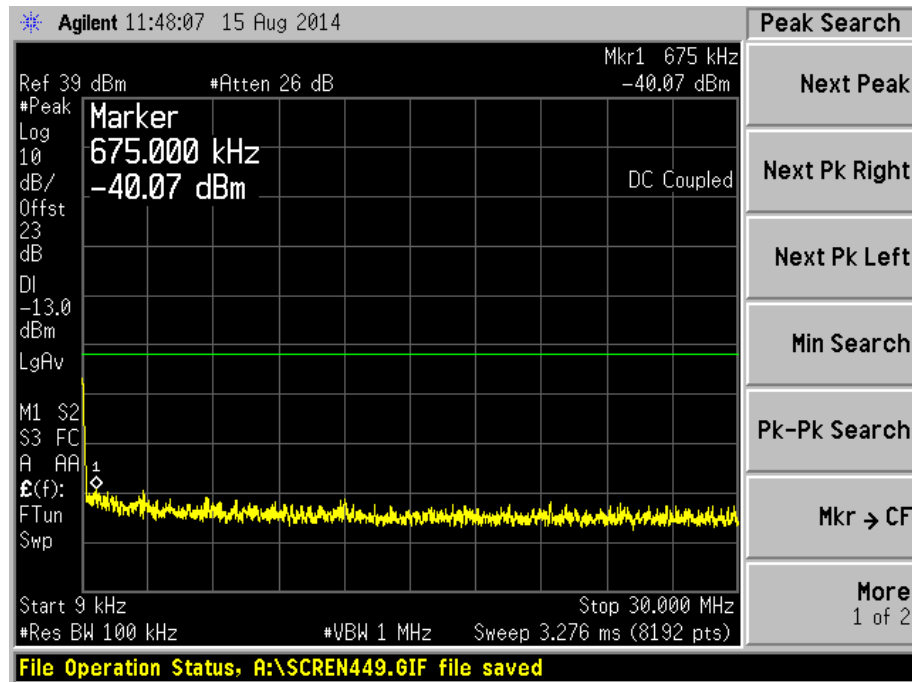
Out of Band Spurious Plots - PNB53\_23\_QPSK



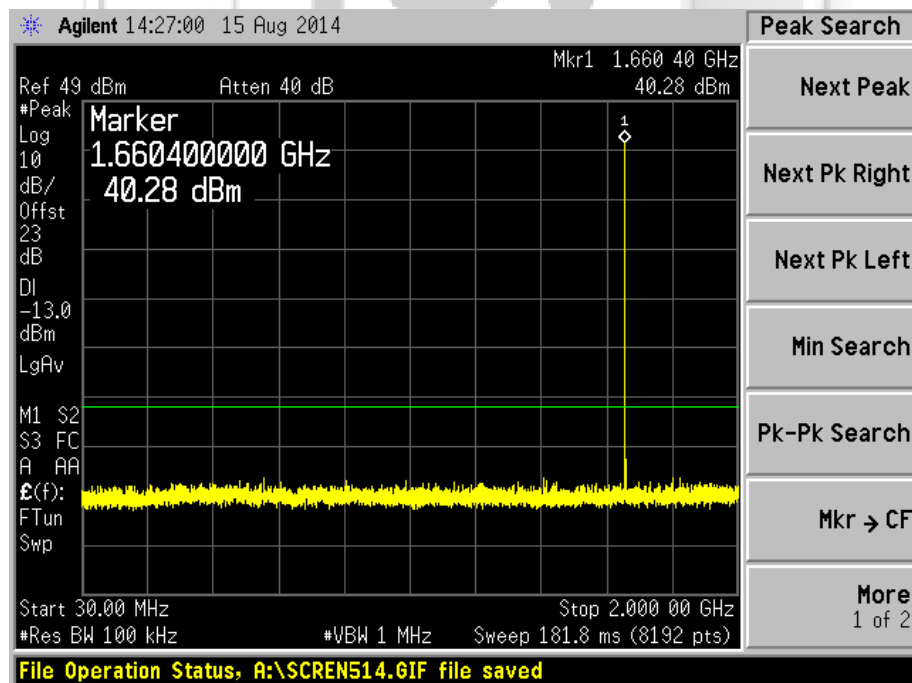
Plot 402 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB53\_23\_QPSK



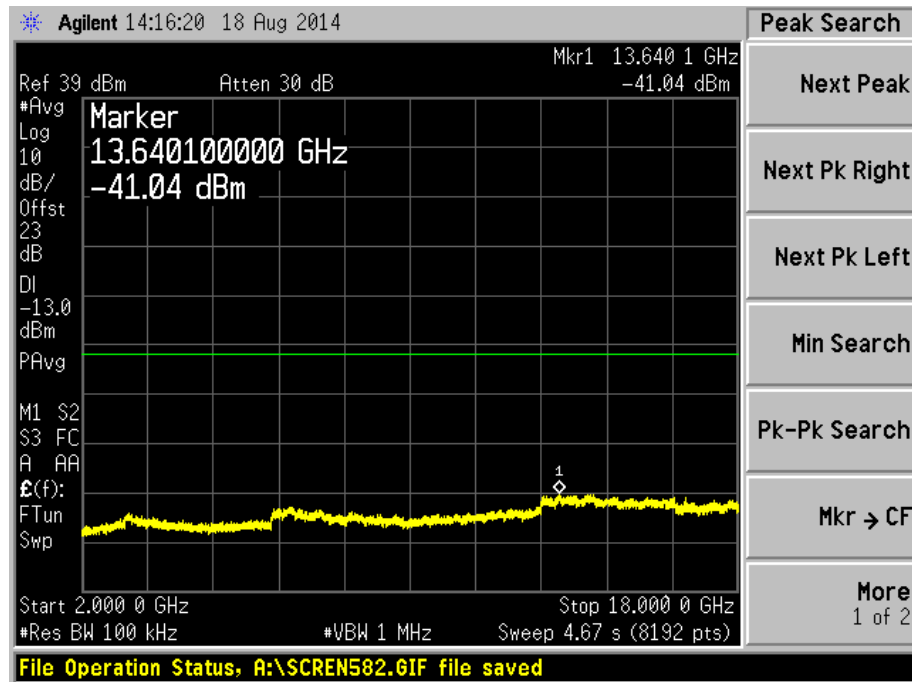
Plot 403 – Upper Channel



Plot 404 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

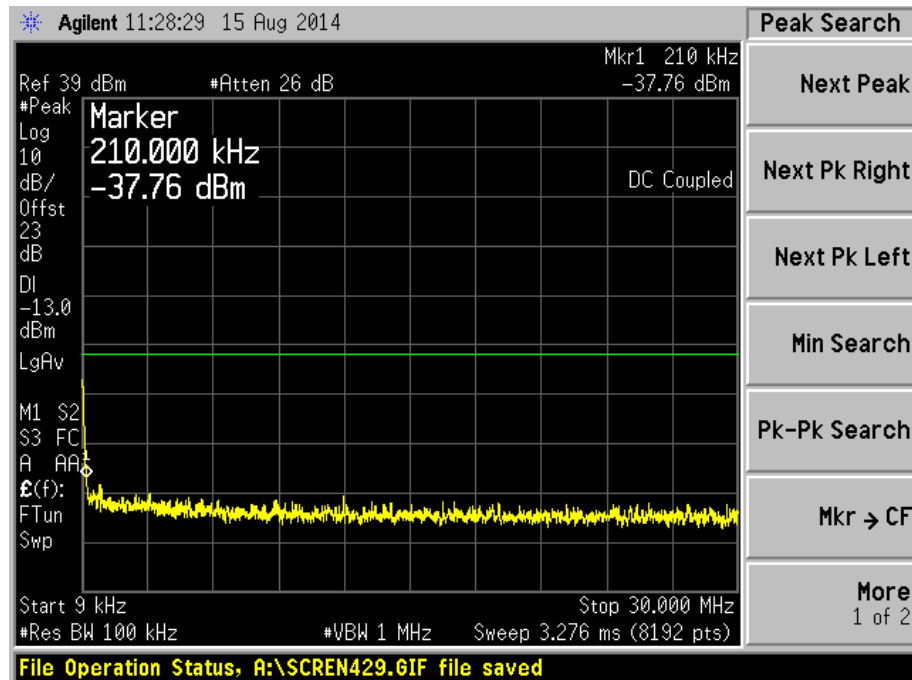
Out of Band Spurious Plots - PNB53\_23\_QPSK



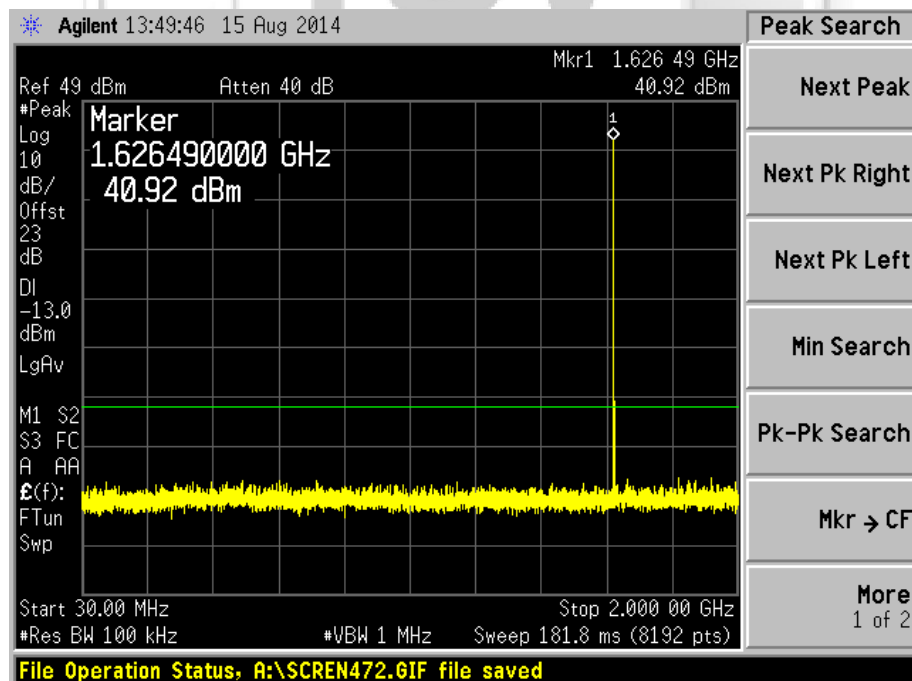
Plot 405 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_45\_16APSK



Plot 406 – Lower Channel

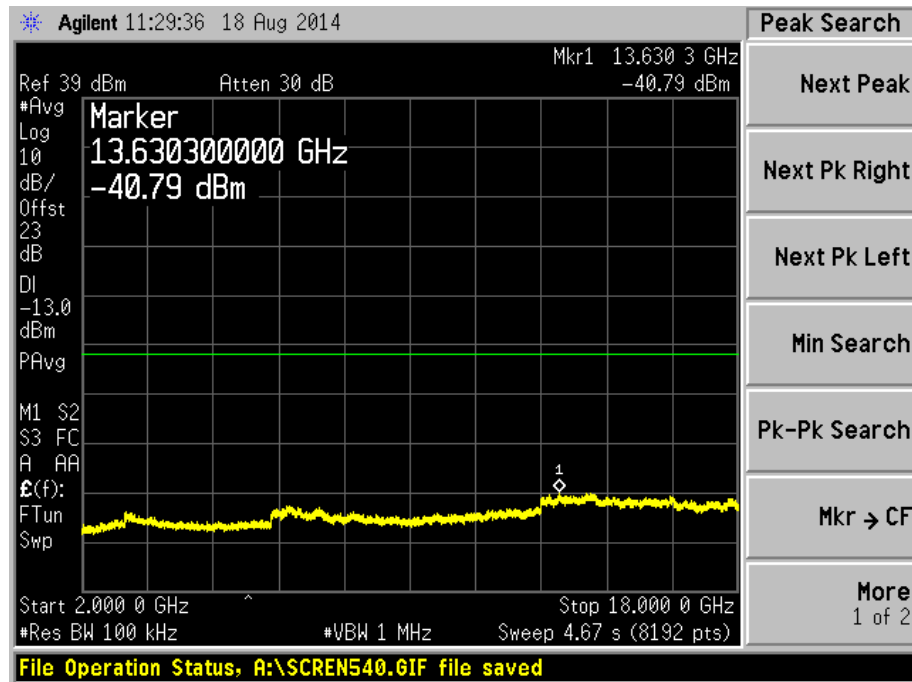


Plot 407 – Lower Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

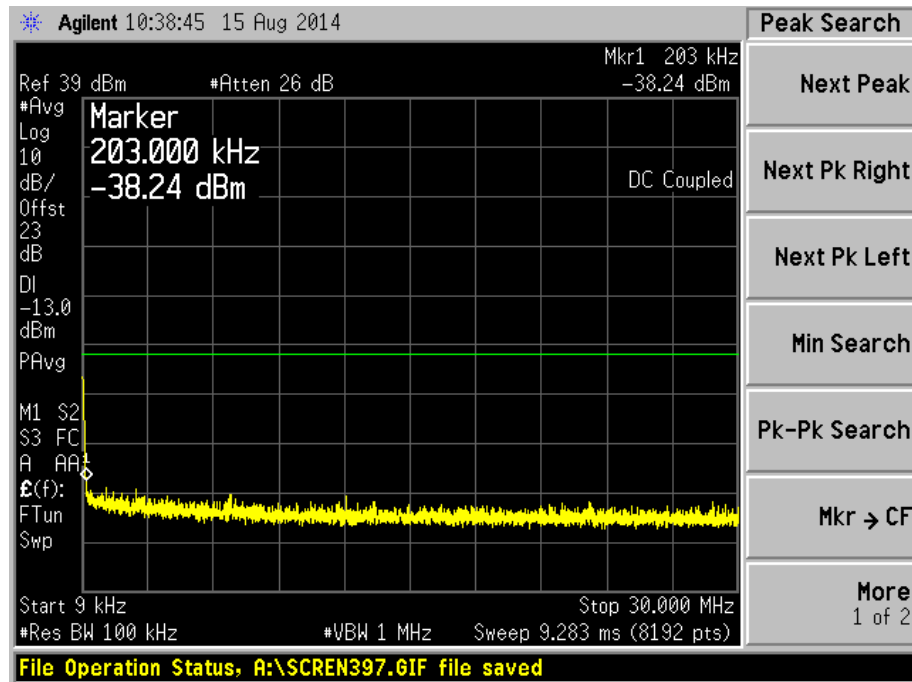
Out of Band Spurious Plots - PNB53\_45\_16APSK



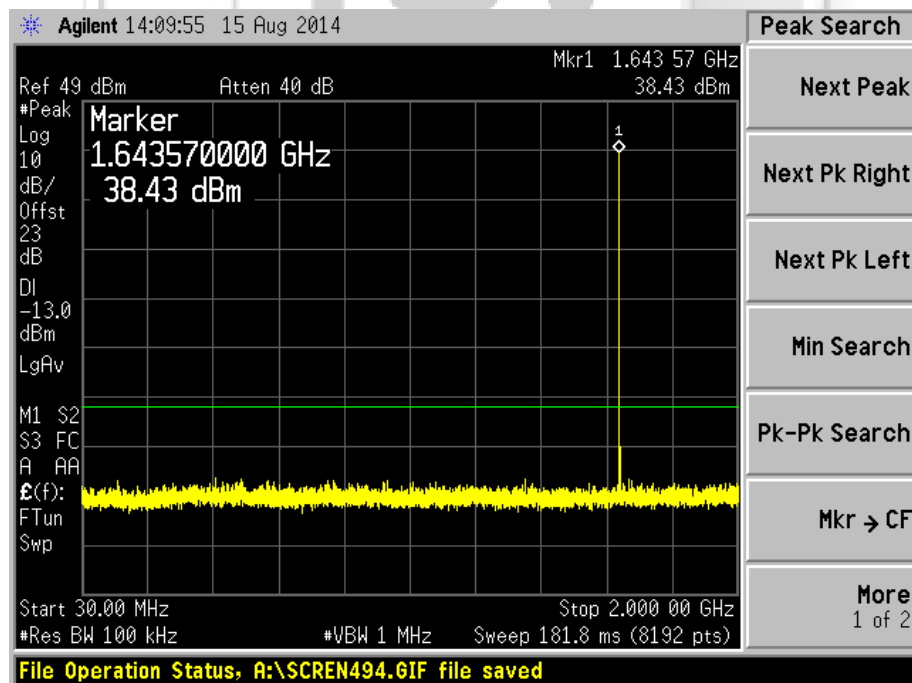
Plot 408 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_45\_16APSK



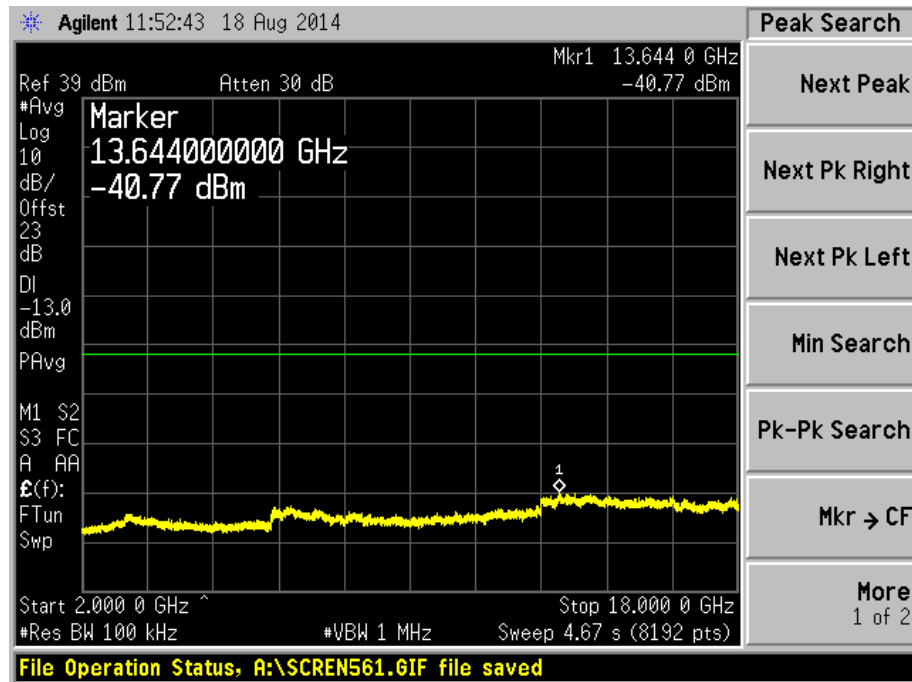
Plot 409 – Middle Channel



Plot 410 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

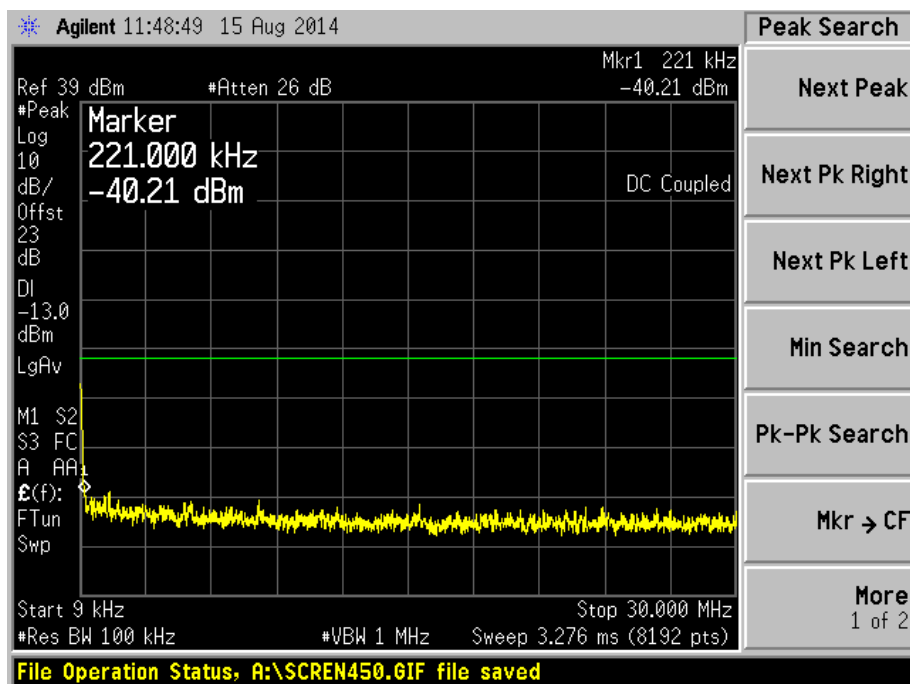
Out of Band Spurious Plots - PNB53\_45\_16APSK



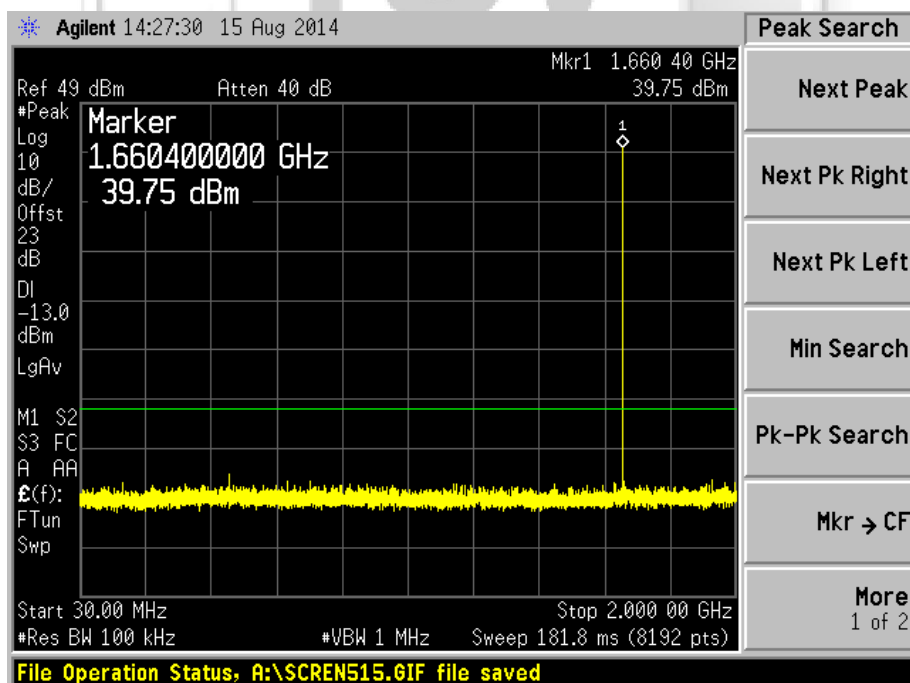
Plot 411 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_45\_16APSK



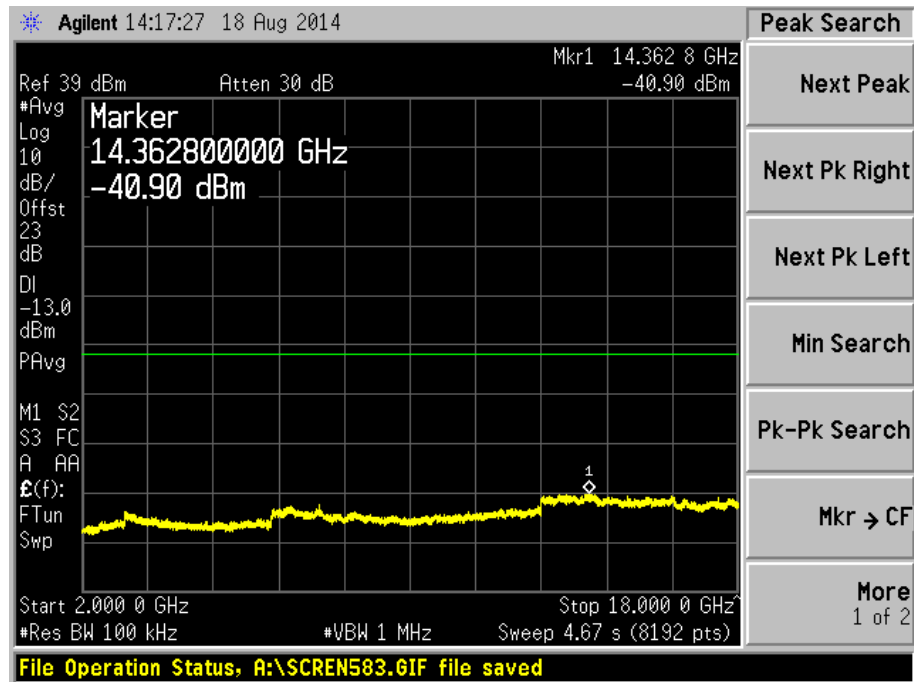
Plot 412 – Upper Channel



Plot 413 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

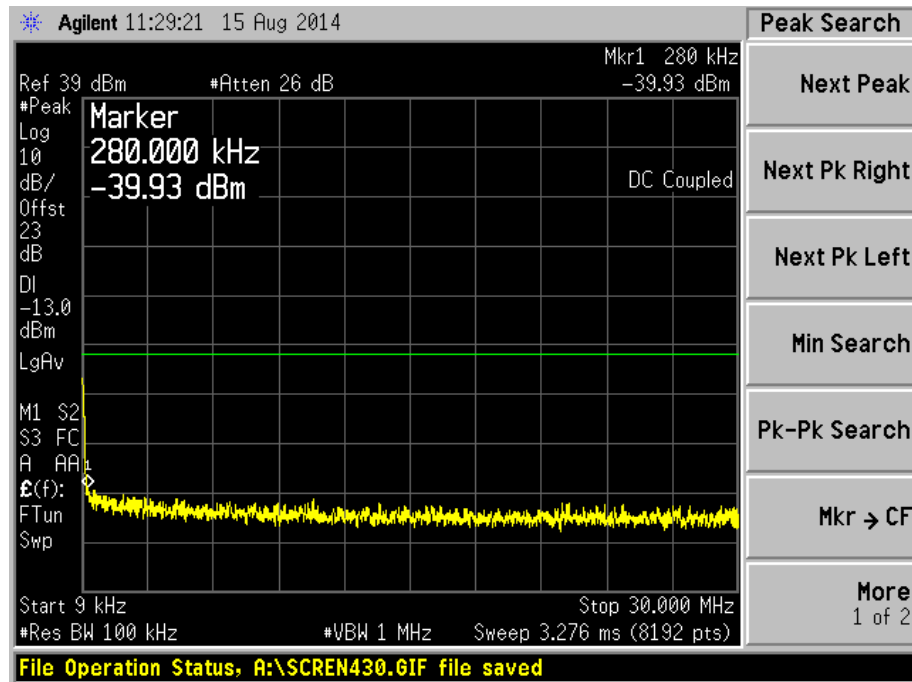
Out of Band Spurious Plots - PNB53\_45\_16APSK



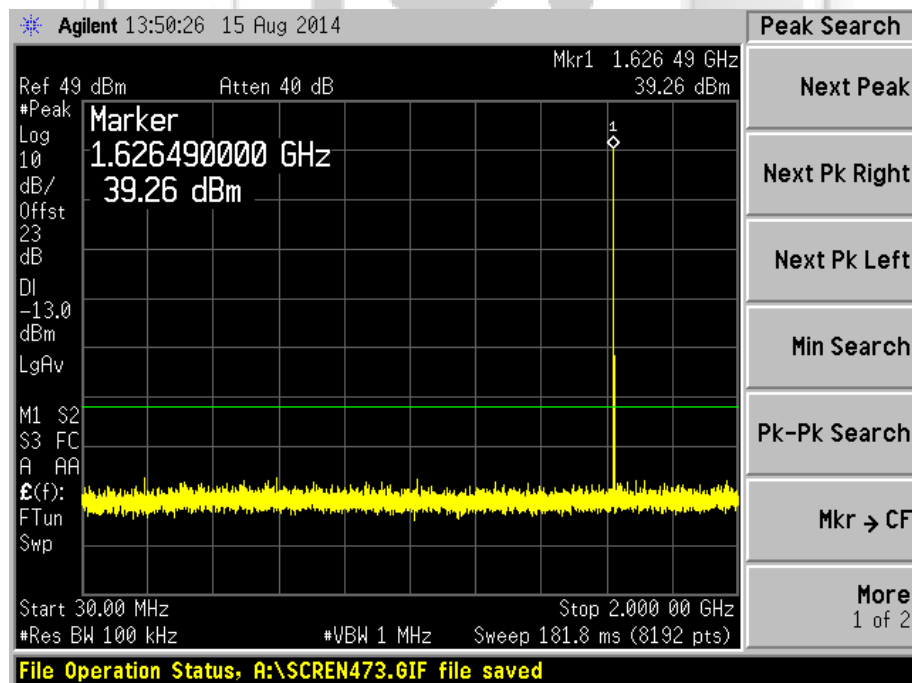
Plot 414 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_45\_QPSK



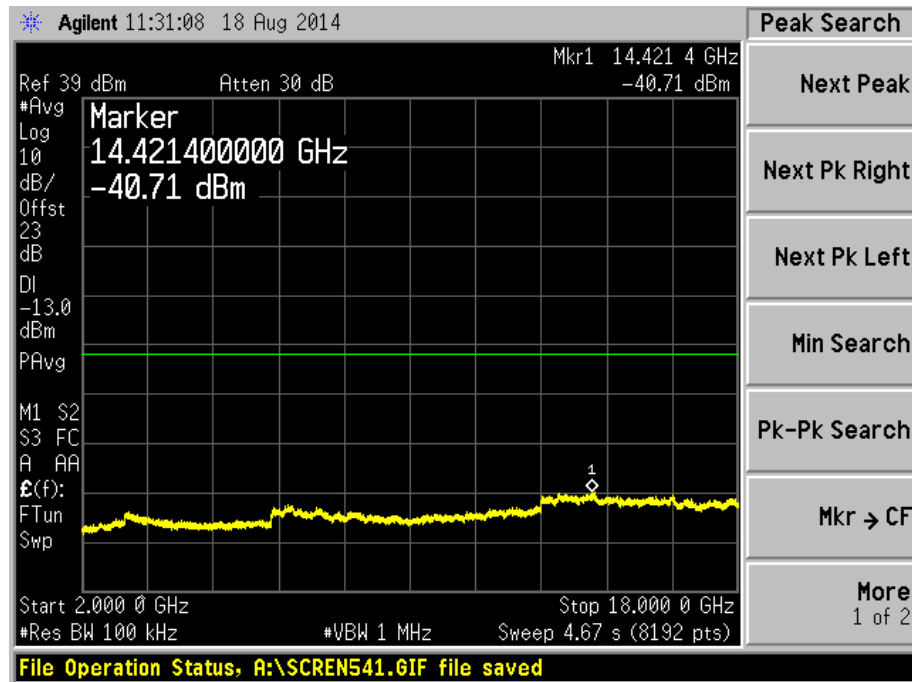
Plot 415 – Lower Channel



Plot 416 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

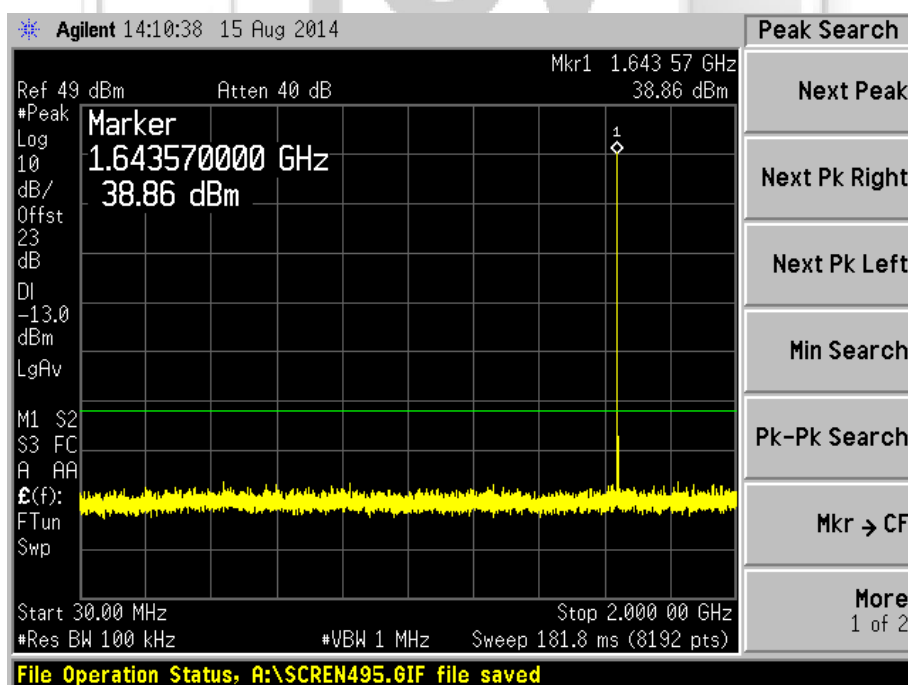
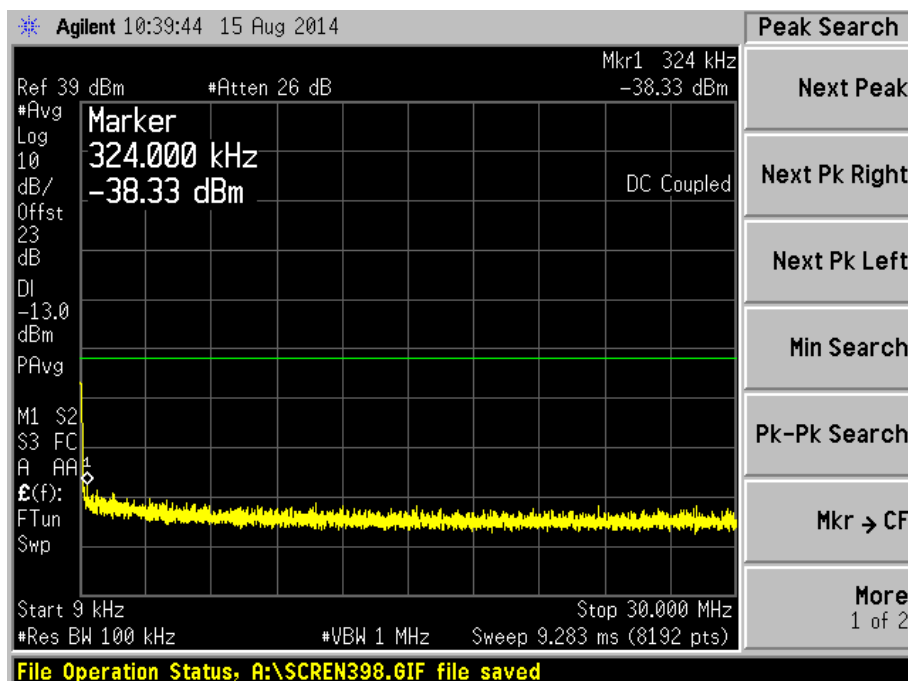
Out of Band Spurious Plots - PNB53\_45\_QPSK



Plot 417 – Lower Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

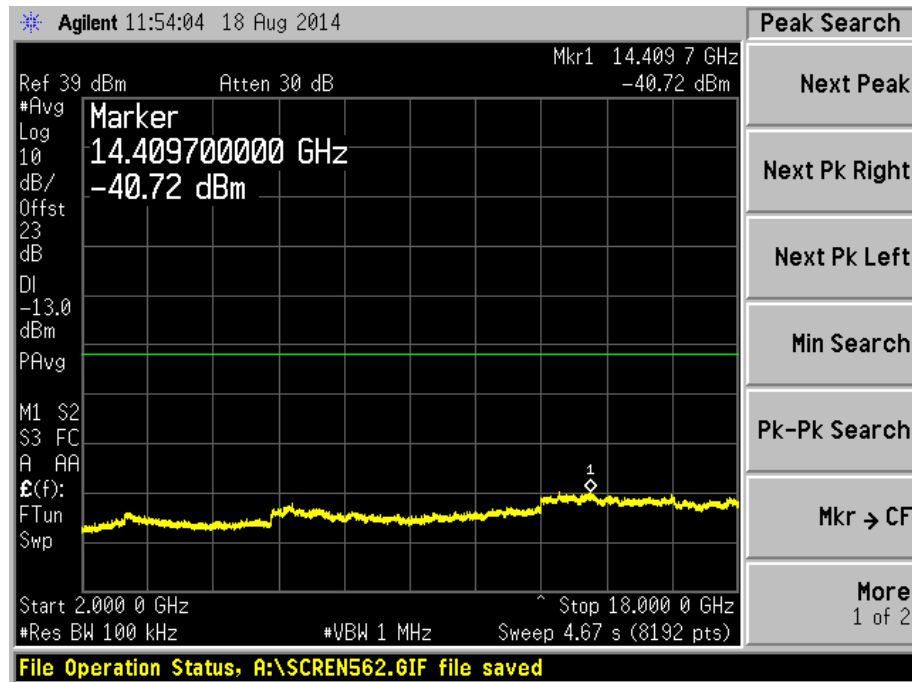
### Out of Band Spurious Plots - PNB53\_45\_QPSK





## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

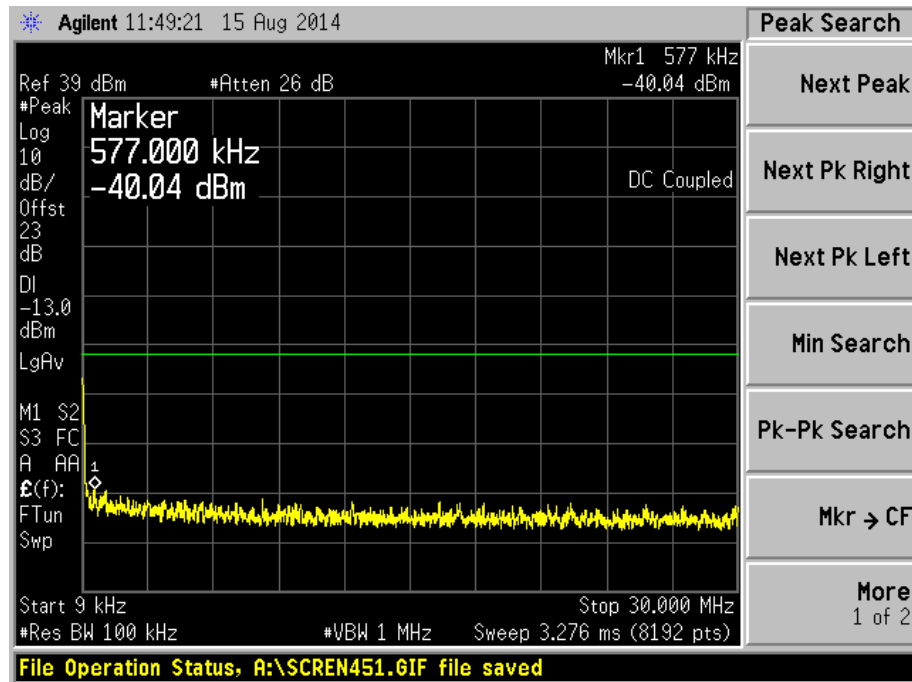
### Out of Band Spurious Plots - PNB53\_45\_QPSK



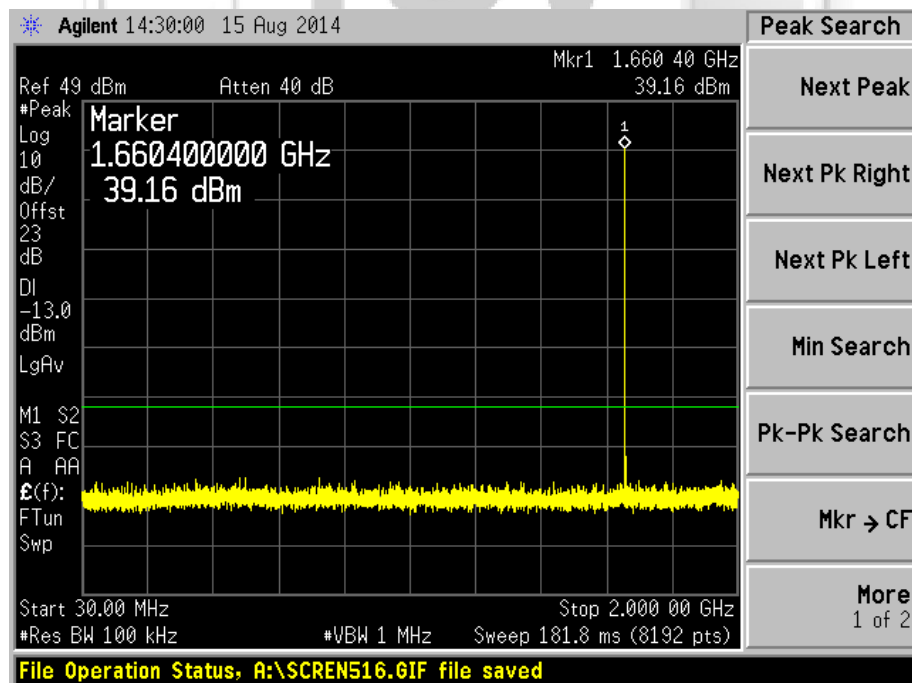
Plot 420 – Middle Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB53\_45\_QPSK



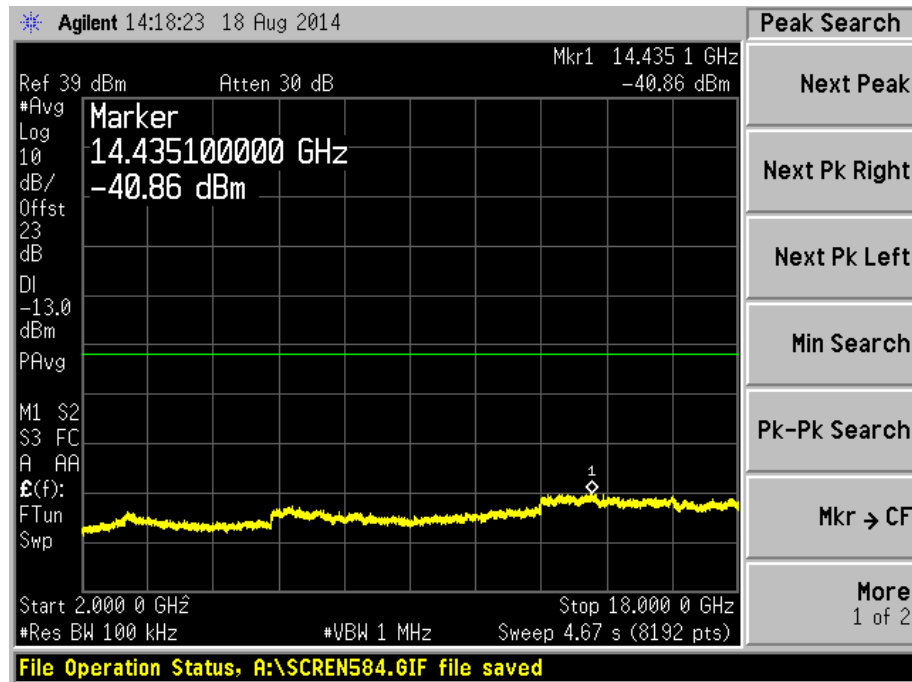
Plot 421 – Upper Channel



Plot 422 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

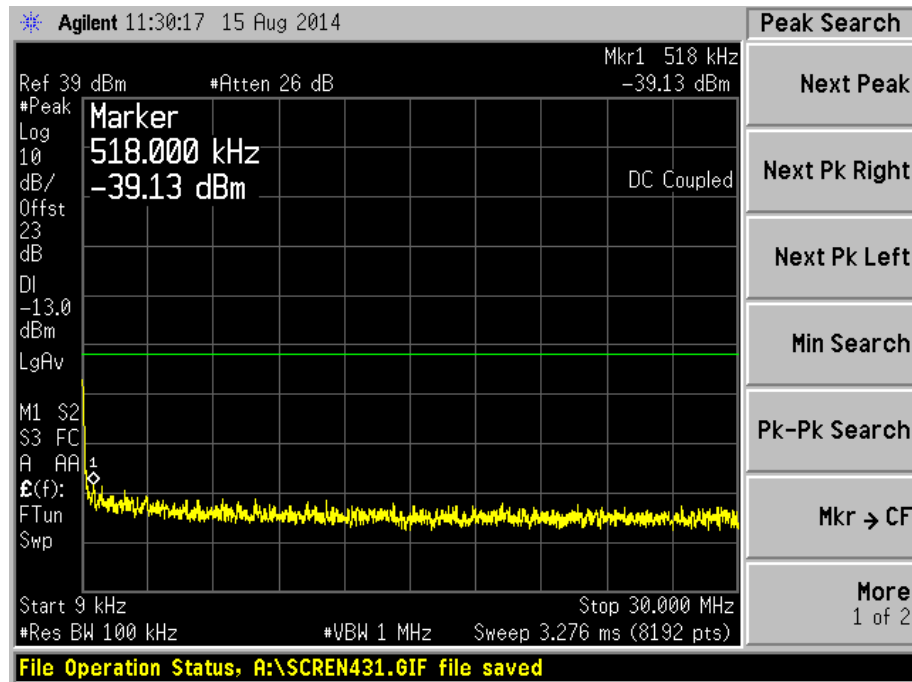
Out of Band Spurious Plots - PNB53\_45\_QPSK



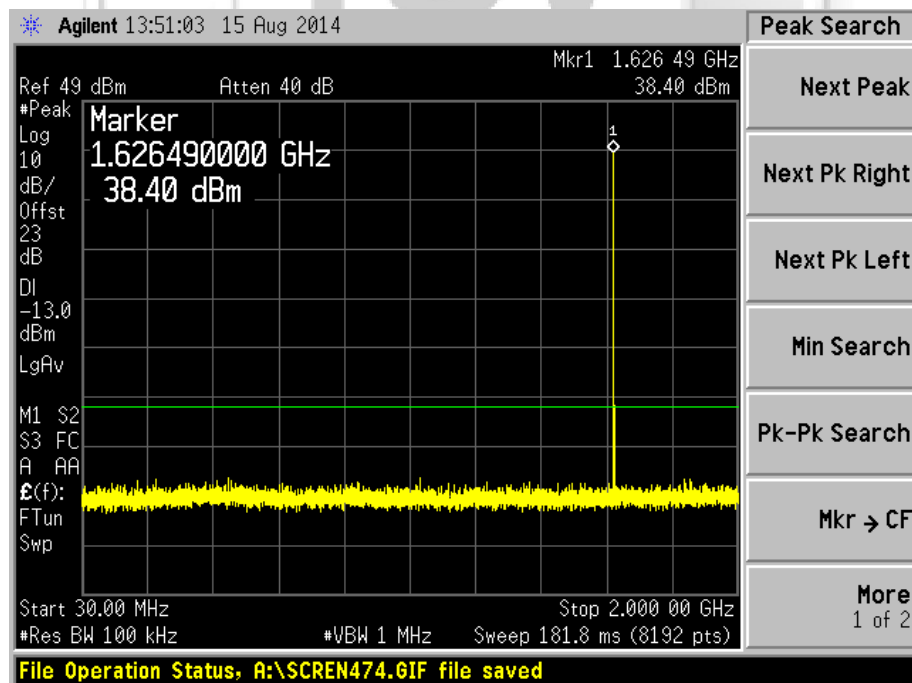
Plot 423 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB53\_910\_16APSK



Plot 424 – Lower Channel

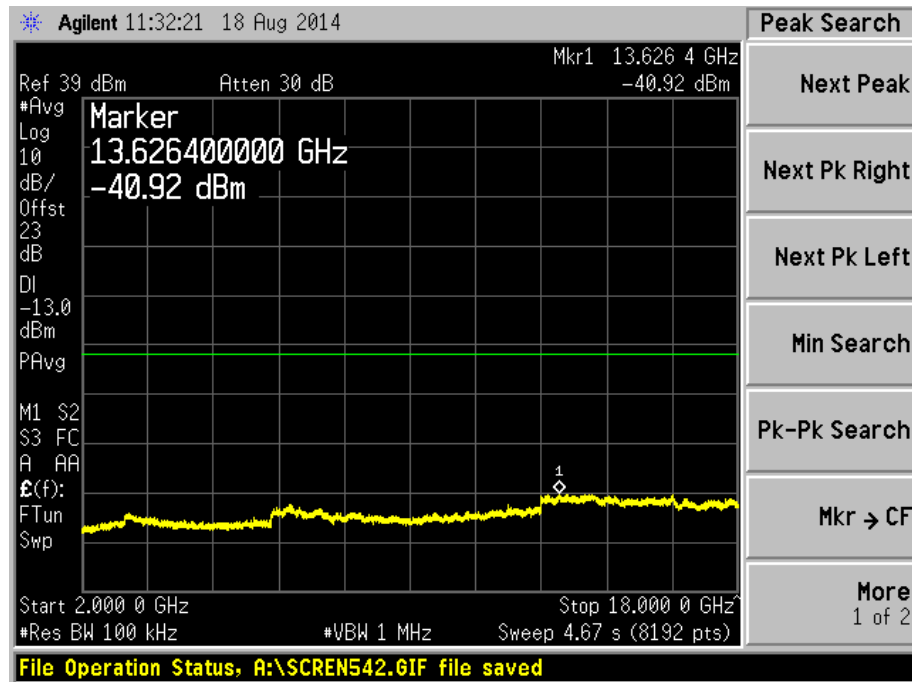


Plot 425 – Lower Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

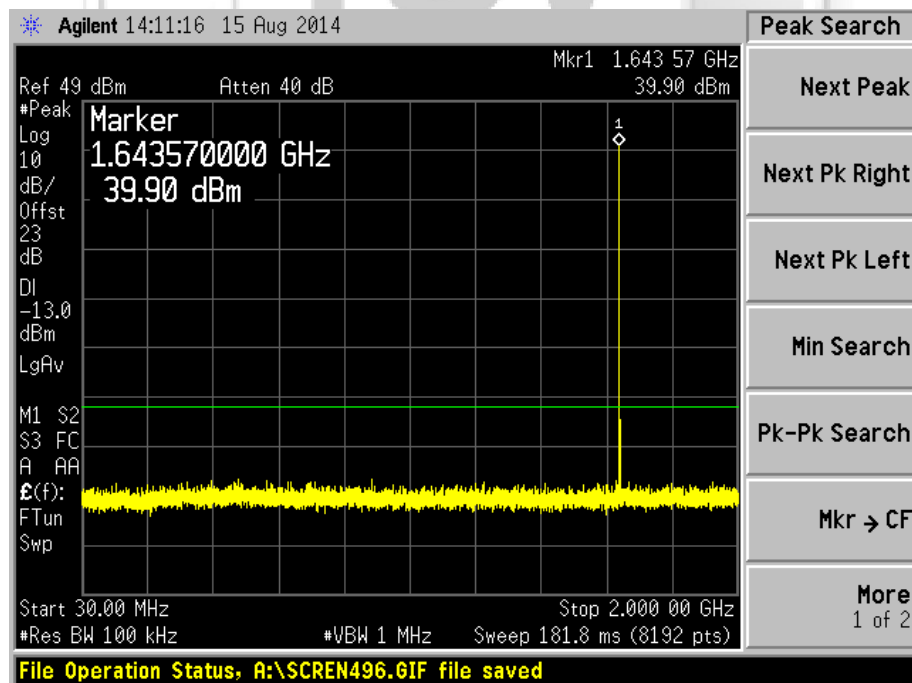
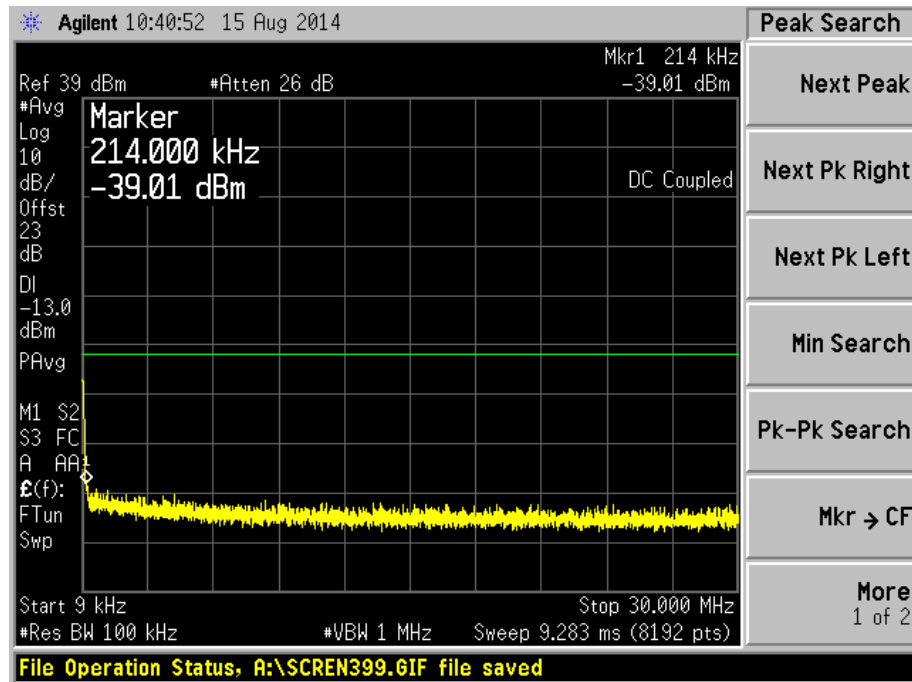
Out of Band Spurious Plots - PNB53\_910\_16APSK



Plot 426 – Lower Channel

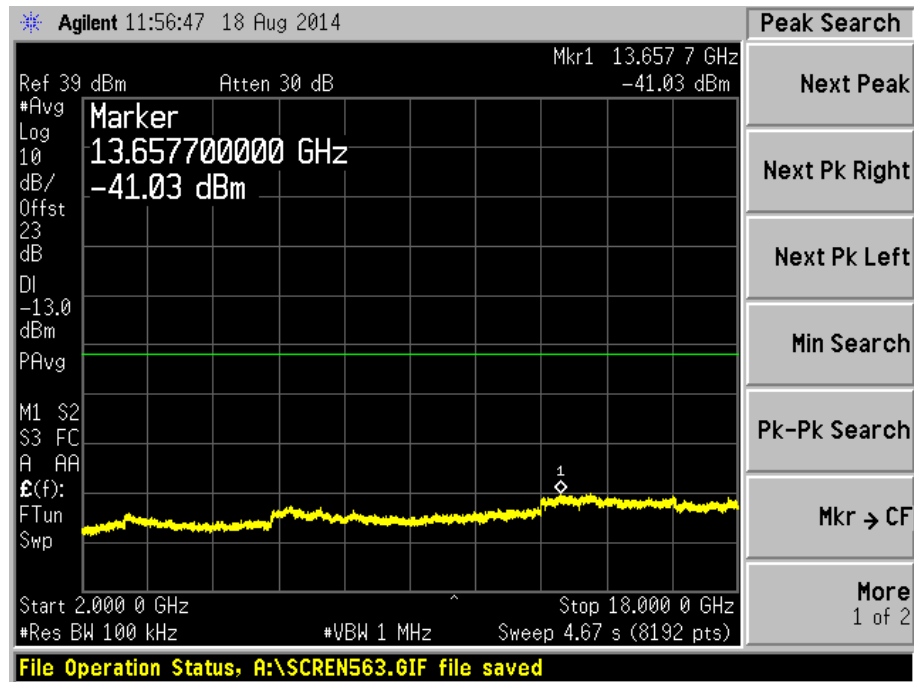
UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_910\_16APSK



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

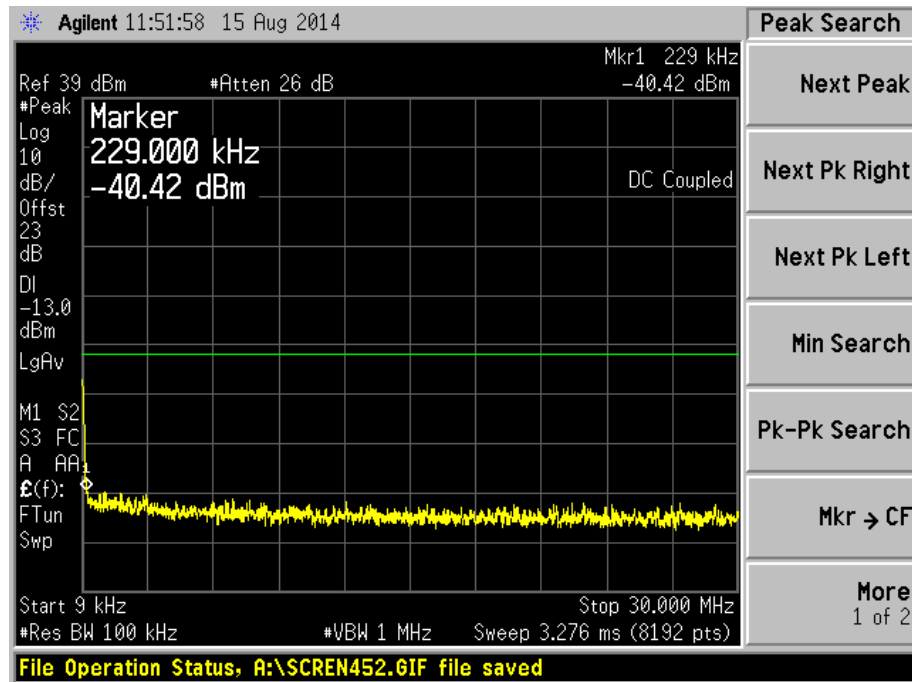
Out of Band Spurious Plots - PNB53\_910\_16APSK



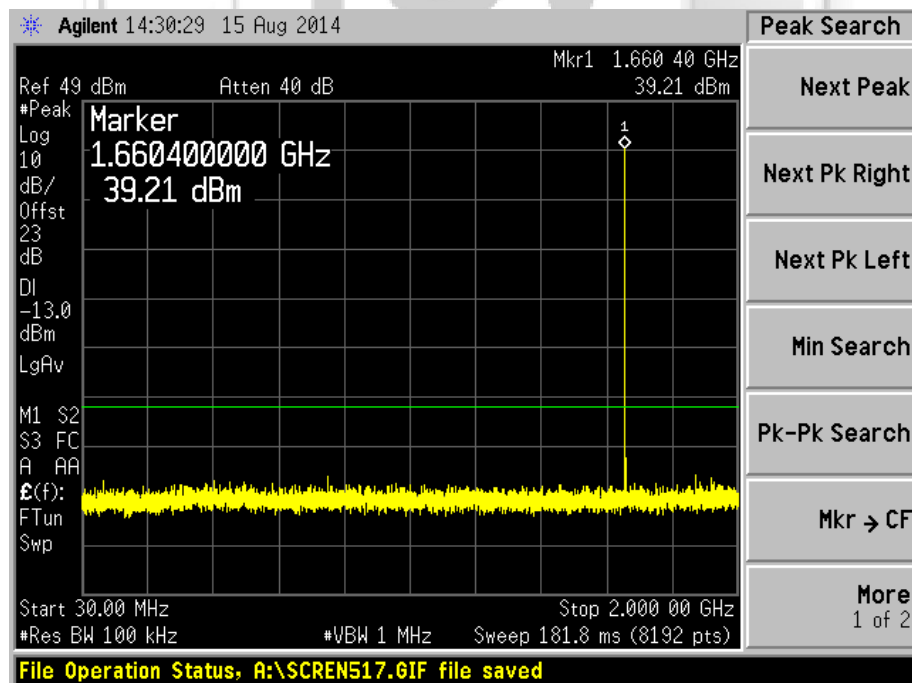
Plot 429 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_910\_16APSK



Plot 430 – Upper Channel

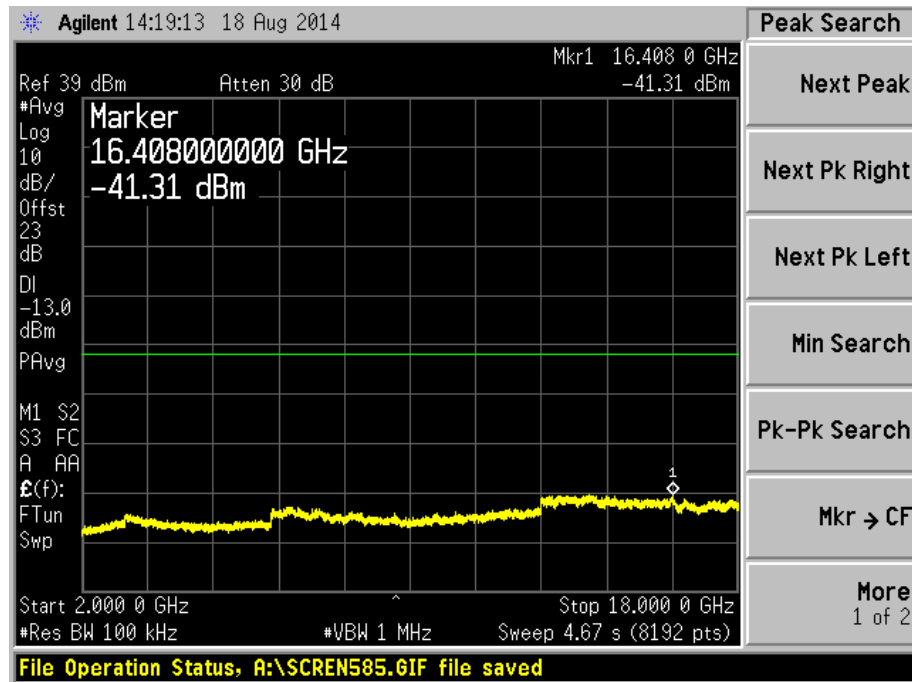


Plot 431 – Upper Channel



## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

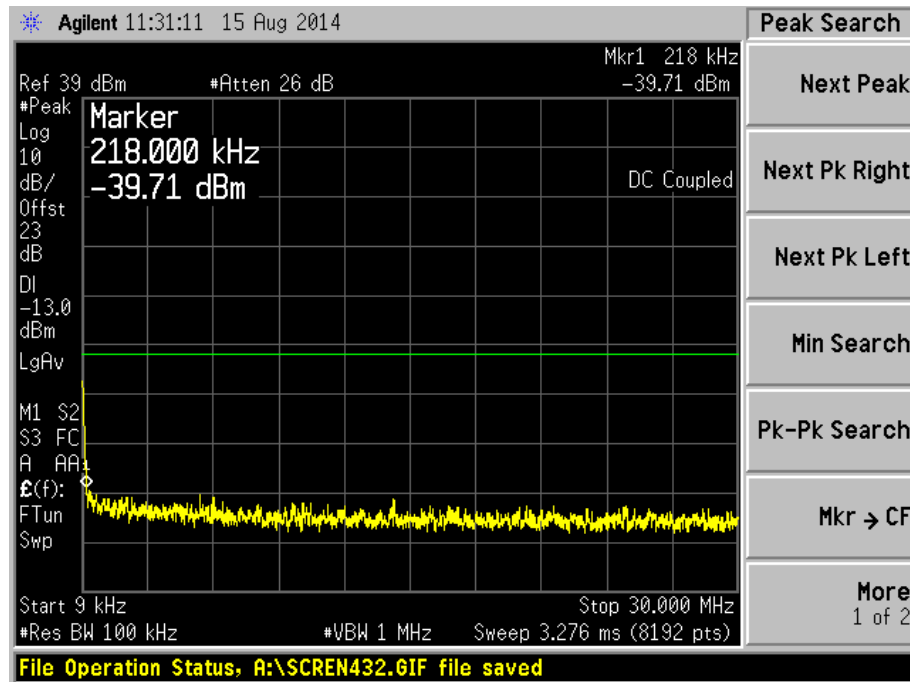
### Out of Band Spurious Plots - PNB53\_910\_16APSK



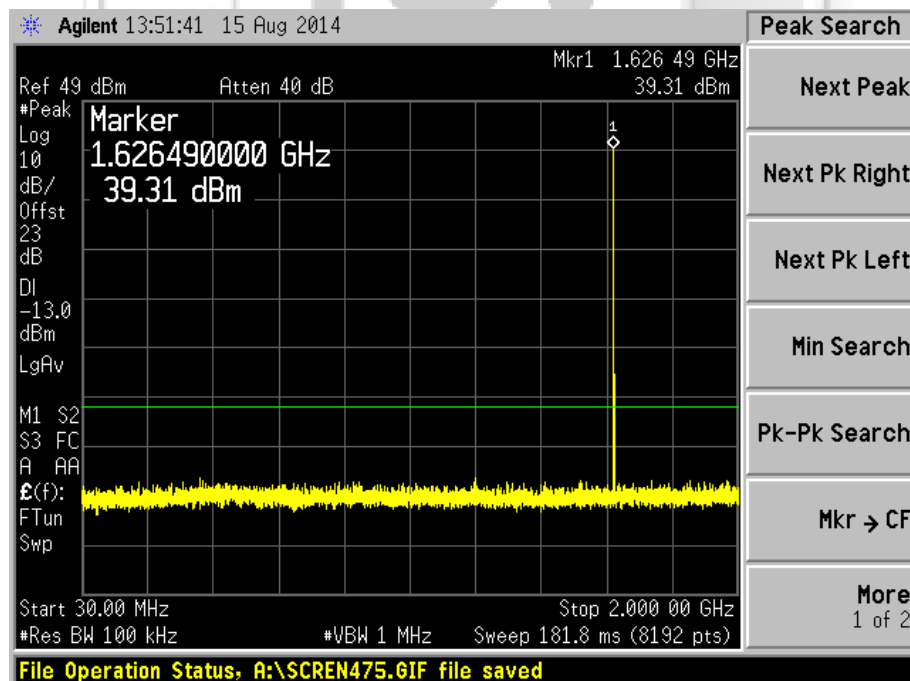
Plot 432 – Upper Channel

## UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

### Out of Band Spurious Plots - PNB53\_910\_QPSK



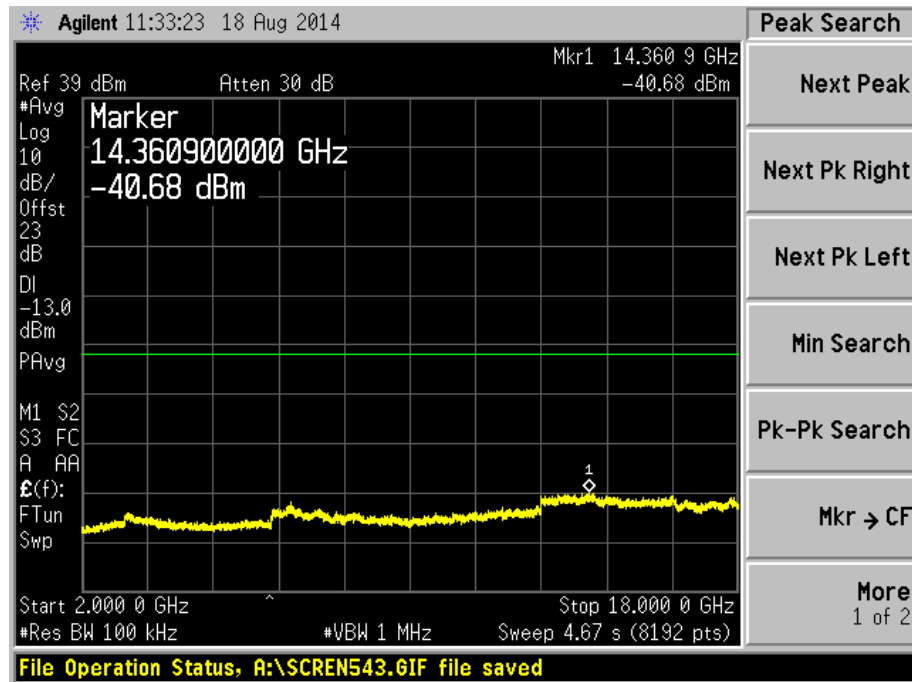
Plot 433 – Lower Channel



Plot 434 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

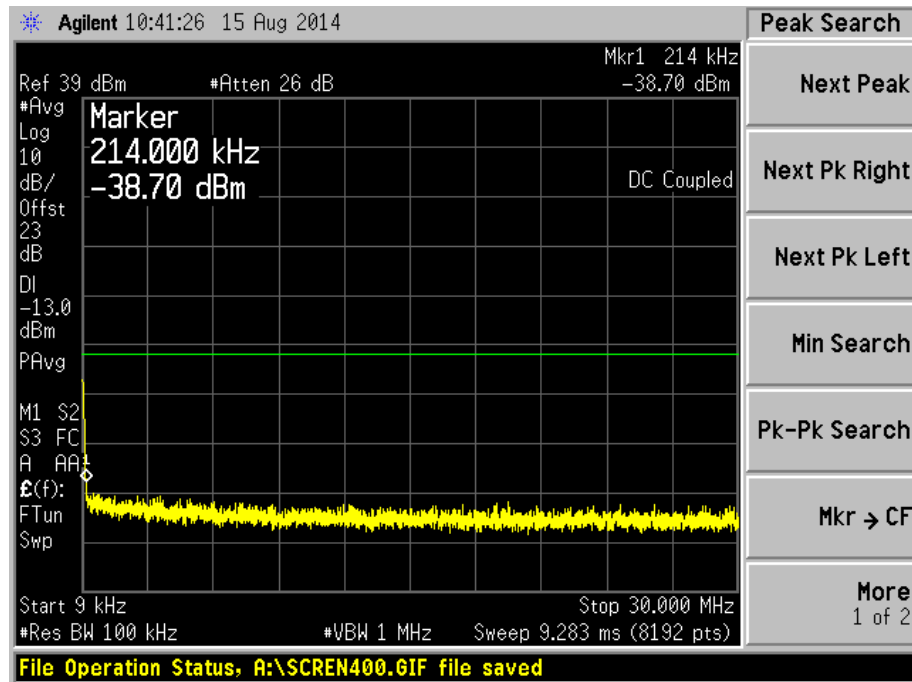
Out of Band Spurious Plots - PNB53\_910\_QPSK



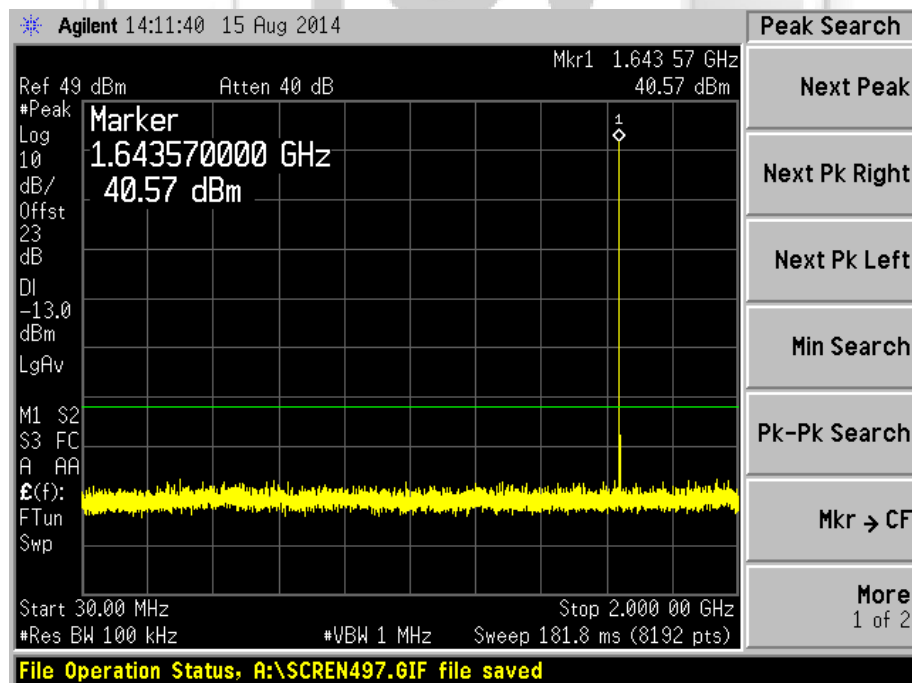
Plot 435 – Lower Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_910\_QPSK



Plot 436 – Middle Channel

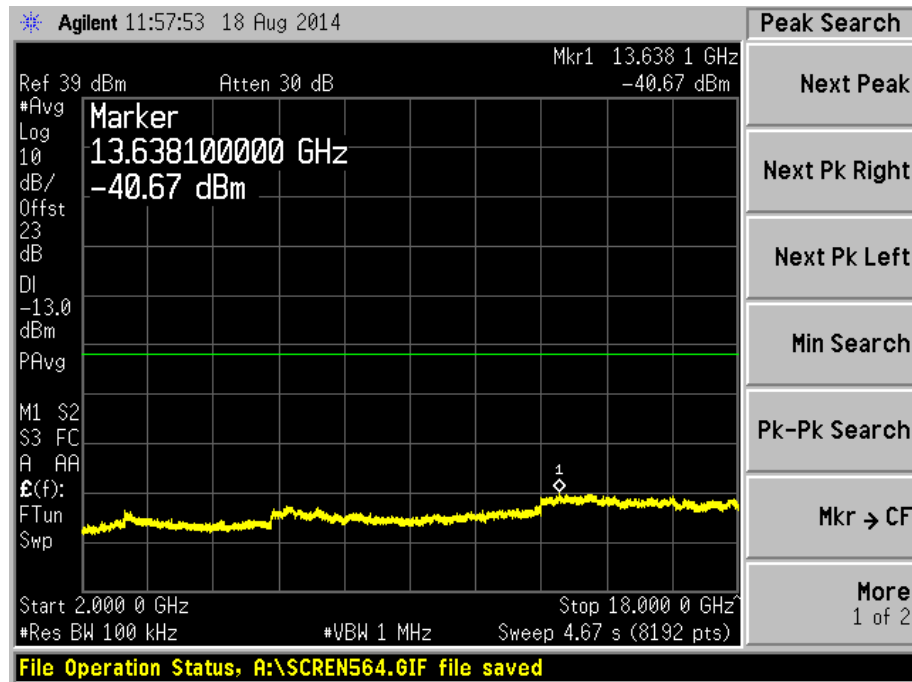


Plot 437 – Middle Channel



UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

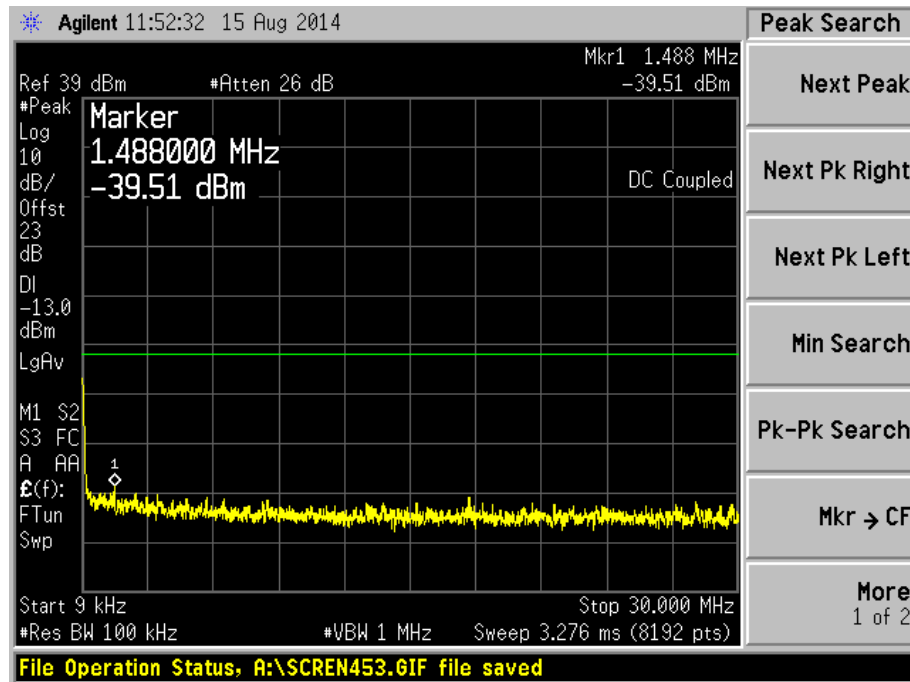
Out of Band Spurious Plots - PNB53\_910\_QPSK



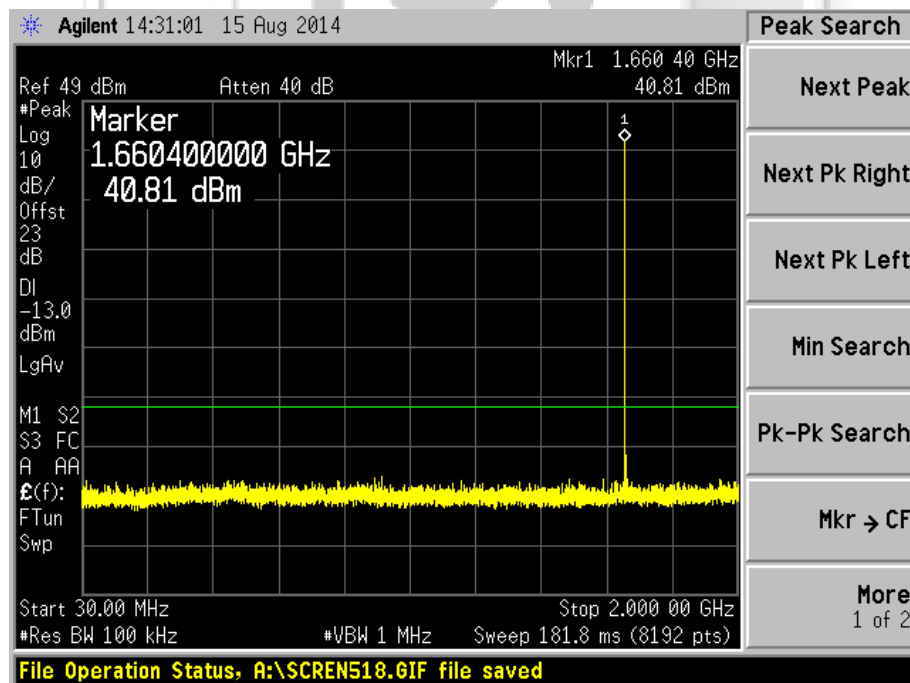
Plot 438 – Middle Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_910\_QPSK



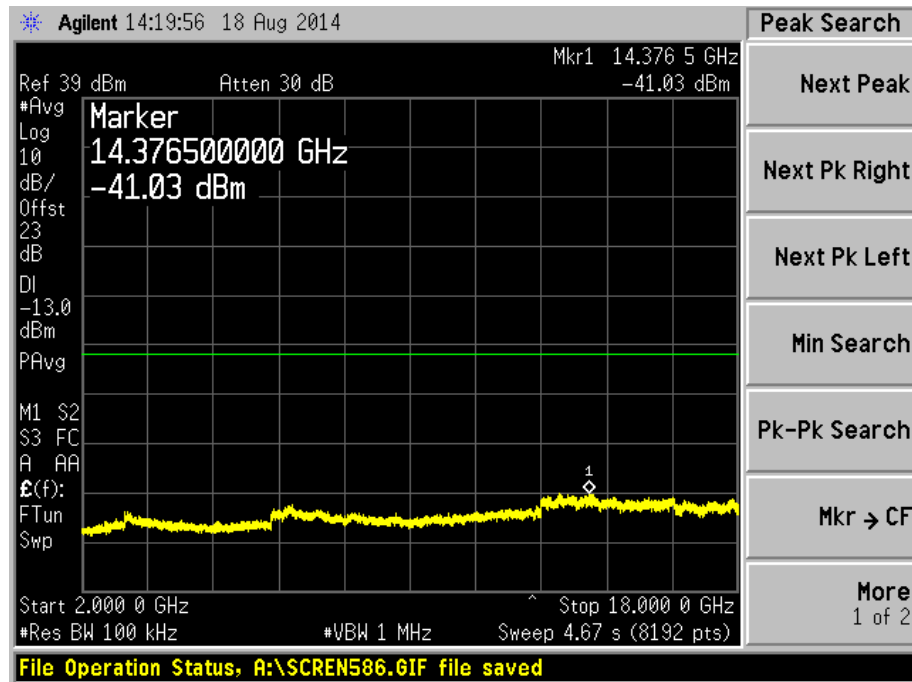
Plot 439 – Upper Channel



Plot 440 – Upper Channel

UNWANTED EMISSIONS AT ANTENNA TERMINAL TEST

Out of Band Spurious Plots - PNB53\_910\_QPSK



Plot 441 – Upper Channel

## RADIATED SPURIOUS EMISSION TEST

### 47 CFR FCC Parts 2.1053 and 25.202(f) Radiated Spurious Emission Limits

1. 25.202 Emissions Limitations
  - (f) The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:
    - (1) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 50% up to and including 100% of the authorized bandwidth: 25 decibels;
    - (2) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 100% up to and including 250% of the authorized bandwidth: 35 decibels;
    - (3) In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 250% of the authorized bandwidth: an amount equal to 43 decibels plus 10 times logarithm (to the base 10) of the transmitter power in watts.
2. 2.1053 Measurements Required: Field Strength of Spurious Emissions
  - (a) Measurement shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of 2.1049, as appropriate. For equipment operating on frequencies below 890MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.
  - (b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:
    - (1) Those in which the spurious emission are required to be 60dB or more below the mean power of the transmitter.
    - (2) All equipment operating on frequencies higher than 25MHz.
    - (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
    - (4) Other types of equipment as required, when deemed necessary by the Commission.

### 47 CFR FCC Parts 2.1053 and 25.202(f) Radiated Spurious Emission Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	19 Mar 2015
Schaffner Bilog Antenna -(30MHz-2GHz) BL4	CBL6112B	2593	13 Dec 2014
Com-Power Preamplifier (1MHz-1GHz)	PAM-103	441056	15 Aug 2015
EMCO Horn Antenna(1GHz-18GHz)	3115	0003-6088	13 Mar 2015
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	04 Oct 2015
K&L Microwave Bandreject Filter	3TNF- 1000/2000-N/N	436	Output Monitor



## RADIATED SPURIOUS EMISSION TEST

### 47 CFR FCC Parts 2.1053 and 25.202(f) Radiated Spurious Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant antenna was set at the required test distance away from the EUT and supporting equipment boundary

### 47 CFR FCC Parts 2.1053 and 25.202(f) Radiated Spurious Emission Test Method

1. The EUT was set to transmit at the maximum power at the lower channel with the modulation on at normal test condition.
2. The receiving antenna (test antenna) was set at vertical polarization with the height of 1m.
3. With the spectrum analyser was set to max hold enabled (peak detector mode), the spurious emissions were searched and recorded. For EUT which is a portable device, the spurious emission search was carried out by rotating the EUT through three orthogonal axes to determine which attitude and equipment arrangement produces worst emissions.
4. For each spurious emission found, the test antenna was raised or lowered through the specified range of heights (1m – 4m) until a maximum signal level was detected on the test receiver.
5. The EUT was then rotated through 360° in the horizontal plane until the maximum signal was received. The maximum received signal level was recorded as A (in dBm).
6. The EUT was replaced with the substitution antenna with the antenna input was connected to the signal generator via a 10dB attenuator (if required).
7. The signal generator was set to the found spurious frequency. The output level of the signal generator was adjusted until the test receiver was at least 20dB above the level when the signal generator was switched off.
8. The test antenna was raised and lowered through the specified range of heights (1m – 4m) until the maximum signal level was received on the test receiver.
9. The substitution antenna was rotated until the maximum level was detected on the test receiver.
10. The output level of the signal generator was adjusted until the received signal level at the test receiver was equal to the level recorded in step 5 (A dBm). The signal generator output level was recorded as B (in dBm).
11. The spurious emission level, P (e.i.r.p) was computed as followed:  
$$P(e.i.r.p) = B - C - D + E$$

where	C	=	cable loss between the signal generator and the substitution
	D	=	attenuation level if attenuator is used
	E	=	substitution antenna gain
12. The steps 2 to 11 were repeated with the receiving antenna was set to horizontal polarization.
13. Comparison was made on both measured results with vertical and horizontal polarizations. The highest value out of vertical and horizontal polarizations was recorded.
14. The steps 2 to 13 were repeated until all the spurious emissions (up to 10<sup>th</sup> harmonics of the carrier frequency) were measured.
15. The steps 1 to 14 were repeated with the EUT was set to operate at the middle and upper channels respectively.

**RADIATED SPURIOUS EMISSION TEST**

**47 CFR FCC Parts 2.1053 and 25.202(f) Radiated Spurious Emission Results**

Operating Mode	Transmit mode	Temperature	21°C
Test Input Power	12Vdc	Relative Humidity	51%
Test Distance	3m	Atmospheric Pressure	1030mbar
Type Bearer	PNB512_23_16APSK (Worst)	Tested By	Dylan Lin

**30MHz – 1GHz**

**Lower Channel**

Frequency (GHz)	Amplitude (dBm)	Limit (dBm)
88.9660	-54.2	-13.0
96.0230	-54.4	-13.0
479.9610	-59.6	-13.0
516.0820	-59.1	-13.0
672.0500	-62.2	-13.0
725.4090	-36.1	-13.0

**Middle Channel**

Frequency (GHz)	Amplitude (dBm)	Limit (dBm)
89.4450	-58.2	-13.0
96.0230	-56.0	-13.0
109.8970	-63.6	-13.0
479.9610	-57.3	-13.0
516.0820	-60.5	-13.0
744.1220	-34.3	-13.0

**Upper Channel**

Frequency (GHz)	Amplitude (dBm)	Limit (dBm)
88.9660	-56.3	-13.0
96.0230	-55.0	-13.0
480.0810	-61.4	-13.0
516.2020	-63.1	-13.0
551.9640	-63.9	-13.0
744.1220	-33.9	-13.0

**RADIATED SPURIOUS EMISSION TEST**

**1GHz – 18GHz**

**Lower Channel**

Frequency (GHz)	Amplitude (dBm)	Limit (dBm)
1.0252	-67.6	-13.0
1.0757	-68.0	-13.0
1.1262	-65.2	-13.0
1.1767	-64.9	-13.0
1.9216	-59.1	-13.0
2.4140	-59.9	-13.0

**Middle Channel**

Frequency (GHz)	Amplitude (dBm)	Limit (dBm)
1.1262	-65.7	-13.0
1.1767	-63.8	-13.0
1.9216	-59.4	-13.0
2.4140	-64.1	-13.0
3.6133	-61.5	-13.0
4.8253	-55.0	-13.0

**Upper Channel**

Frequency (GHz)	Amplitude (dBm)	Limit (dBm)
1.0252	-67.9	-13.0
1.1010	-68.7	-13.0
1.1262	-66.4	-13.0
1.1767	-63.7	-13.0
1.9216	-58.6	-13.0
4.8253	-54.8	-13.0

## RADIATED SPURIOUS EMISSION TEST

### Notes

1. All possible modes of operation were investigated. Only the worst case emissions measured. All other emissions were relatively insignificant.
2. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
3. The Resolution Bandwidth (RBW) was corrected from 4kHz by  $10\log_{10}[(\text{used RBW}) / 4\text{kHz}]$ .
4. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
30MHz - 20GHz  
RBW: 100kHz      VBW: 300kHz
5. Emission limits are computed based on following:
  - a. Emissions Limits (dBm) (50% - 100% authorised bandwidth) =  $P - 25 + CF$
  - b. Emissions Limits (dBm) (100% - 250% authorised bandwidth) =  $P - 35 + CF$
  - c. Emissions Limits (dBm) (> 250% authorised bandwidth) =  $P - [43 + 10 \log_{10} P_w] + 30 + CF$where  
 $P$  = Measured mean power in dBm  
 $P_w$  = Measured mean power in W  
 $CF$  = RBW correction factor (see Note 4)
6. Radiated Spurious Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz is  $\pm 4.0\text{dB}$ .

**PROTECTION OF AERONAUTICAL RADIO NAVIGATION SATELLITE SERVICE TEST**

**47 CFR FCC Part 25.216(h)(i)(j) Protection of Aeronautical Radio Navigation Satellite Service Limits**

25.216(h)(i)(j) Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service

- (h) Mobile earth stations manufactured more than six months after Federal Register publication of the rule changes adopted in FC 03-283 (from November 6, 2003) with assigned uplink frequencies in the 1626.5MHz - 1660.5MHz band shall suppress the power density of emissions in the 1605MHz - 1610MHz band-segment to an extent determined by linear interoperation from -70dBW/MHz at 1605MHz to -46dBW/MHz at 1610MHz, averaged over any 2ms active transmission interval. The e.i.r.p of discrete emissions of less than 700Hz bandwidth from such stations shall not exceed a level determined by linear interoperation from -80dBW at 1605MHz to -56dBW at 1610MHz, averaged over any 2ms active transmission interval.
- (i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03-283 with assigned uplink frequencies between 1GHz and 3GHz shall not exceed -80dBW/MHz in the 1559MHz - 1610MHz band averaged over any 2ms interval.
- (j) A Root-Mean-Square detector shall be used for all power density measurements.

**47 CFR FCC Part 25.216(h)(i)(j) Protection of Aeronautical Radio Navigation Satellite Service Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	19 Mar 2015
EMCO Horn Antenna(1GHz-18GHz)	3115	0003-6088	13 Mar 2015
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	04 Oct 2015
K&L Microwave Bandreject Filter	3TNF- 1000/2000-N/N	436	Output Monitor

**PROTECTION OF AERONAUTICAL RADIO NAVIGATION SATELLITE SERVICE TEST**

**47 CFR FCC Part 25.216(h)(i)(j) Protection of Aeronautical Radio Navigation Satellite Service Test Setup**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant antenna was set at the required test distance away from the EUT and supporting equipment boundary

**47 CFR FCC Part 25.216(h)(i)(j) Protection of Aeronautical Radio Navigation Satellite Service Test Method**

1. The EUT was set to transmit at the maximum power at the lower channel with the modulation on at normal test condition.
2. The receiving antenna (test antenna) was set at vertical polarization with the height of 1m.
3. A prescan was carried out in the frequency range under investigations with the EMI receiver set to max hold mode. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which attitude and equipment arrangement produces such emissions.
4. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
5. The maximized emissions were plotted with inclusion of corrector factor of measured radiated emissions to EIRP.
6. The steps 1 to 5 were repeated with the EUT was set to operate at the middle and upper channels respectively.
7. The measurements were repeated with the EUT in carrier off state (standby).

**PROTECTION OF AERONAUTICAL RADIO NAVIGATION SATELLITE SERVICE TEST**

**47 CFR FCC Part 25.216(h)(i)(j) Protection of Aeronautical Radio Navigation Satellite Service Results**

Operating Mode	Transmit mode	Temperature	21°C
Test Input Power	12Vdc	Relative Humidity	51%
Test Distance	3m	Atmospheric Pressure	1030mbar
Type Bearer	PNB512_23_16APSK (Worst)	Tested By	Dylan Lin
Attached Plots	442 – 444		

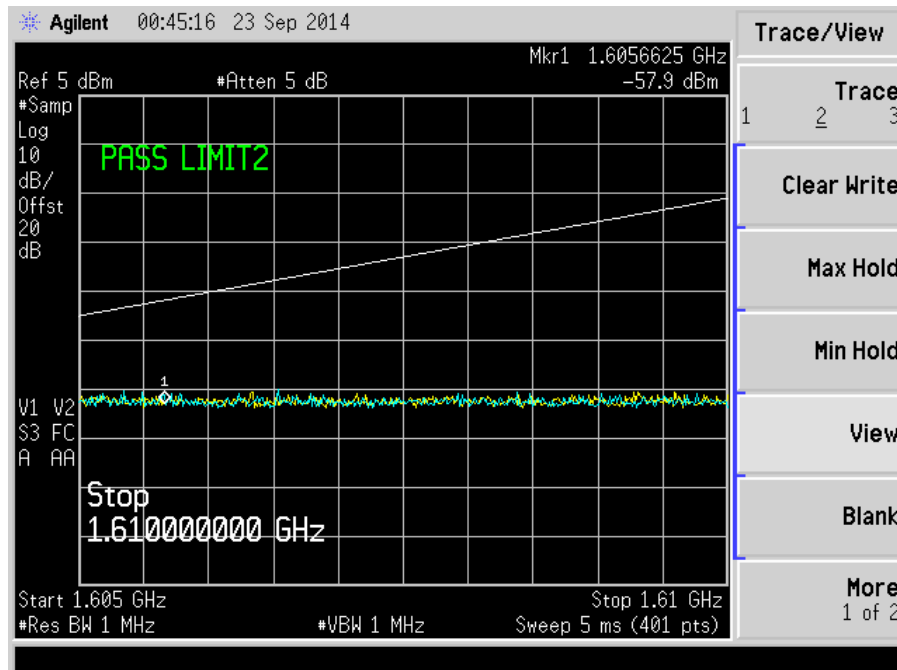
Operating Mode	Standby mode	Temperature	21°C
Test Input Power	12Vdc	Relative Humidity	51%
Test Distance	3m	Atmospheric Pressure	1030mbar
Type Bearer	PNB512_23_16APSK (Worst)	Tested By	Dylan Lin
Attached Plots	445		

All spurious signals found were below the specified limit. Please refer to the attached plots.

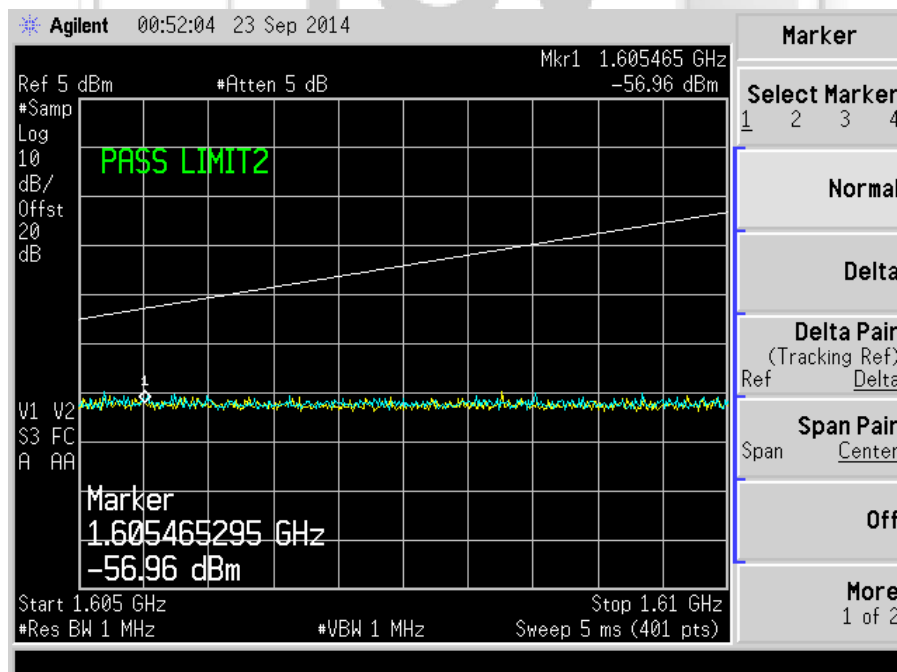


PROTECTION OF AERONAUTICAL RADIO NAVIGATION SATELLITE SERVICE TEST

Type Bearer: PNB512\_23\_16APSK - Transmitter On



Plot 442 - Lower Channel

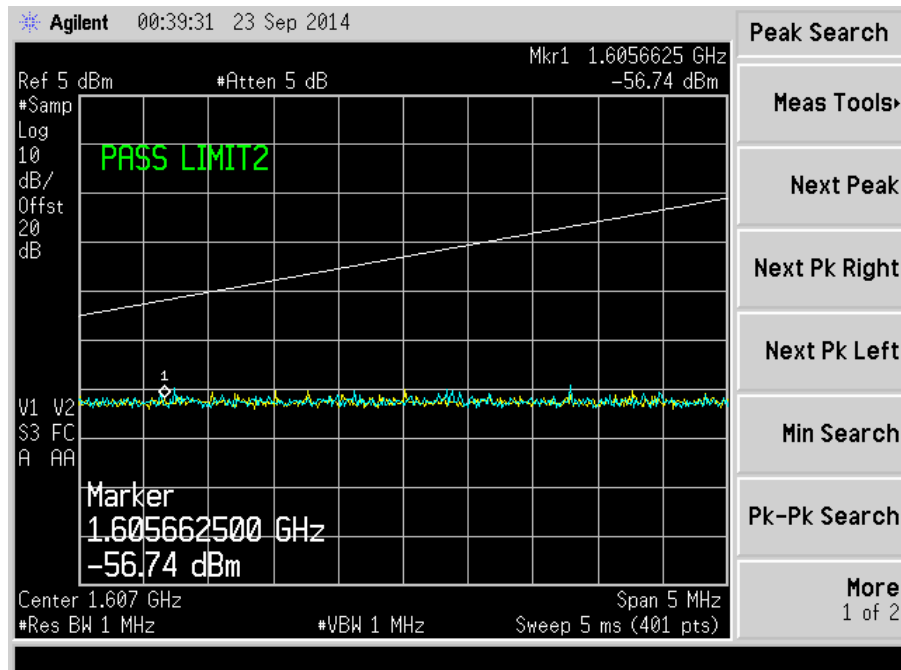


Plot 443 - Middle Channel



PROTECTION OF AERONAUTICAL RADIO NAVIGATION SATELLITE SERVICE TEST

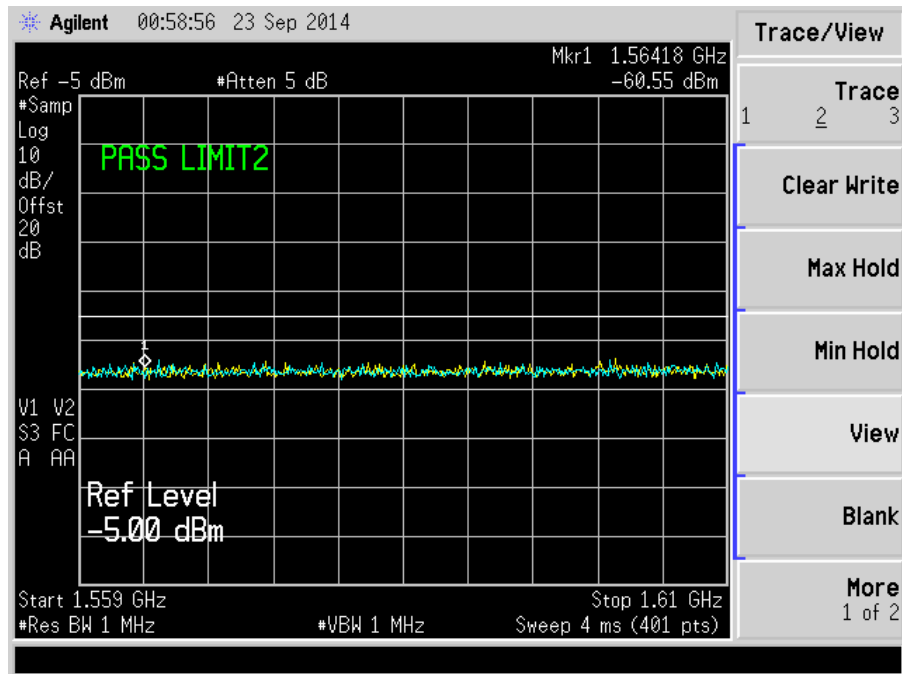
Type Bearer: PNB512\_23\_16APSK - Transmitter On



Plot 444 – Upper Channel

PROTECTION OF AERONAUTICAL RADIO NAVIGATION SATELLITE SERVICE TEST

Carrier Off



Plot 445

## FREQUENCY STABILITY (TEMPERATURE VARIATION) TEST

### 47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Temperature Variation) Test Limits

1. 25.202(d) Frequency Tolerance, Earth Stations  
The carrier frequency of each earth station transmitter authorised in these services shall be maintained within 0.001% (10ppm) of the reference frequency.
2. 2.1055 Measurements Required: Frequency Stability
  - (a) The frequency stability shall be measured with variation of ambient temperature as follows:
    - (1) From -30°C to +50°C for all equipment except that specified in paragraphs (a)(2) and (3) of this section.
    - (b) Frequency measurements shall be made at the extremes of the specified temperature range and at interval of not more than 10°C throughout the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion of portions of the transmitter containing the frequency determining and stabilizing circuitry need to be subjected to the temperature variation test.
    - (d) The frequency stability shall be measured with variation of primary supply voltage as follows:
      - (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
      - (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.
      - (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

### 47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Temperature Variation) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
HP Universal Counter	53132A	3736A0628	24 Dec 2014
Bird 20dB 25W RF Attenuator	25-A-MFN-20	Nil	Output Monitor
Instock Divider / Combiner	PD7120	Nil	Output Monitor

## **FREQUENCY STABILITY (TEMPERATURE VARIATION) TEST**

### **47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Temperature Variation) Test Setup**

1. The EUT and supporting equipment were set up as shown in the test setup photo. A temperature-controlled chamber was used.
2. The EUT was connected to an appropriate power source while all other supporting equipment were powered separately from another power source.
3. The RF antenna connector of the EUT was connected to the spectrum analyser via a RF attenuator and a low-loss coaxial cable.

### **47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Temperature Variation) Test Method**

1. The temperature chamber was set at 20°C and permitted to stabilize. The EUT was set to transmit at lower channel without modulation. The carrier frequency was measured as the reference frequency.
2. With the EUT power removed, the temperature of the temperature chamber was set to -30°C and permitted to stabilize.
3. The EUT was turned on and set to operate at lower channel without modulation. The maximum change in the carrier frequency was recorded within a minute.
4. The EUT was powered off and the temperature was raised to -20°C.
5. The EUT was left stabilized for at least an hour before next measurement was taken as described in step 3.
6. The steps 4 and 5 were repeated with increment of temperature in 10°C step until the temperature reached 50°C.
7. The steps 1 to 6 were repeated with the EUT was set to operate at the middle and upper channels respectively.



**FREQUENCY STABILITY (TEMPERATURE VARIATION) TEST**

**47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Temperature Variation) Results**

Operating Mode	Continuous Satellite Transmit	Temperature	See table below
Test Input Power	12Vdc	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chelmin Li

**Lower Channel**

Temperature (°C)	Measured Frequency (GHz)	Reference Channel Frequency (GHz)	Deviation (Hz)	Limit (Hz)
-30	1.6265308660	1.626500000	30.866000	+/-16265
-20	1.6265308624	1.626500000	30.862400	+/-16265
-10	1.6265308624	1.626500000	30.862400	+/-16265
0	1.6265311465	1.626500000	31.146500	+/-16265
10	1.6265312251	1.626500000	31.225100	+/-16265
20	1.6265309329	1.626500000	30.932900	+/-16265
30	1.6265310098	1.626500000	31.009800	+/-16265
40	1.6265312878	1.626500000	31.287800	+/-16265
50	1.6265312654	1.626500000	31.265400	+/-16265

**Middle Channel**

Temperature (°C)	Measured Frequency (GHz)	Reference Channel Frequency (GHz)	Deviation (Hz)	Limit (Hz)
-30	1.6434996023	1.643500000	-0.397700	+/-16435
-20	1.6434996197	1.643500000	-0.380300	+/-16435
-10	1.6434996072	1.643500000	-0.392800	+/-16435
0	1.6434999067	1.643500000	-0.093300	+/-16435
10	1.6434999662	1.643500000	-0.033800	+/-16435
20	1.6434996985	1.643500000	-0.301500	+/-16435
30	1.6434997519	1.643500000	-0.248100	+/-16435
40	1.6435000420	1.643500000	0.042000	+/-16435
50	1.6435000184	1.643500000	0.018400	+/-16435

**FREQUENCY STABILITY (TEMPERATURE VARIATION) TEST**

**Upper Channel**

Temperature (°C)	Measured Frequency (GHz)	Reference Channel Frequency (GHz)	Deviation (Hz)	Limit (Hz)
-30	1.6604683690	1.660500000	-31.631000	+/-16605
-20	1.6604683566	1.660500000	-31.643400	+/-16605
-10	1.6604683786	1.660500000	-31.621400	+/-16605
0	1.6604686343	1.660500000	-31.365700	+/-16605
10	1.6604687302	1.660500000	-31.269800	+/-16605
20	1.6604684134	1.660500000	-31.586600	+/-16605
30	1.6604685137	1.660500000	-31.486300	+/-16605
40	1.6604687630	1.660500000	-31.237000	+/-16605
50	1.6604687700	1.660500000	-31.230000	+/-16605



## FREQUENCY STABILITY (VOLTAGE VARIATION) TEST

### 47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Voltage Variation) Test Limits

1. 25.202(d) Frequency Tolerance, Earth Stations  
The carrier frequency of each earth station transmitter authorised in these services shall be maintained within 0.001% (10ppm) of the reference frequency.
2. 2.1055 Measurements Required: Frequency Stability
  - (a) The frequency stability shall be measured with variation of ambient temperature as follows:
    - (1) From -30°C to +50°C for all equipment except that specified in paragraphs (a)(2) and (3) of this section.
    - (b) Frequency measurements shall be made at the extremes of the specified temperature range and at interval of not more than 10°C throughout the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion of portions of the transmitter containing the frequency determining and stabilizing circuitry need to be subjected to the temperature variation test.
    - (d) The frequency stability shall be measured with variation of primary supply voltage as follows:
      - (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
      - (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.
      - (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

### 47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Voltage Variation) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
HP Universal Counter	53132A	3736A0628	24 Dec 2014
Bird 20dB 25W RF Attenuator	25-A-MFN-20	Nil	Output Monitor
Instock Divider / Combiner	PD7120	Nil	Output Monitor

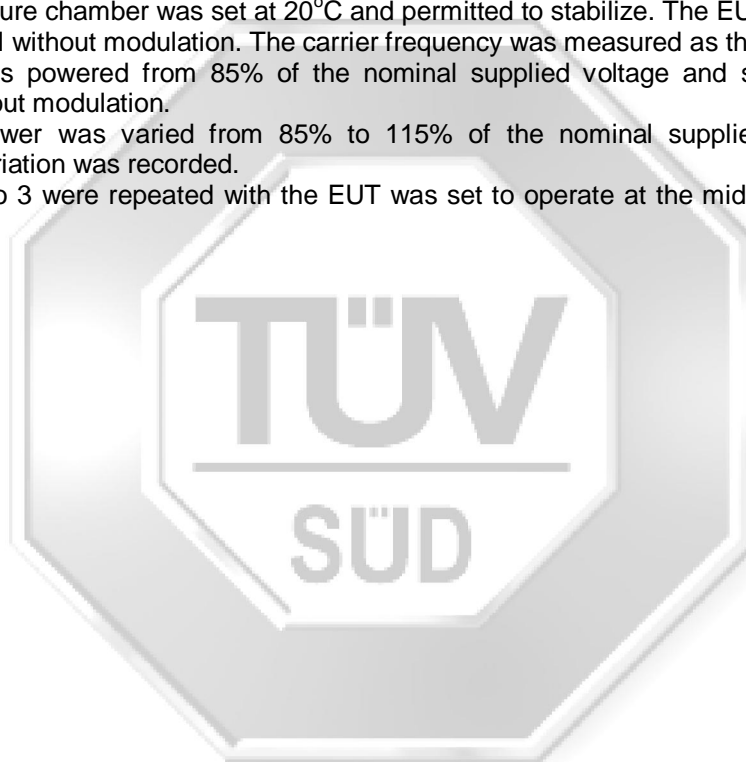
## **FREQUENCY STABILITY (VOLTAGE VARIATION) TEST**

### **47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Voltage Variation) Test Setup**

1. The EUT and supporting equipment were set up as shown in the test setup photo. A temperature-controlled chamber was used.
2. The EUT was connected to an appropriate power source while all other supporting equipment were powered separately from another power source.
3. The RF antenna connector of the EUT was connected to the spectrum analyser via a RF attenuator and a low-loss coaxial cable.

### **47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Voltage Variation) Test Method**

1. The temperature chamber was set at 20°C and permitted to stabilize. The EUT was set to transmit at lower channel without modulation. The carrier frequency was measured as the reference frequency.
2. The EUT was powered from 85% of the nominal supplied voltage and set to operate at lower channel without modulation.
3. The EUT power was varied from 85% to 115% of the nominal supplied voltage. The carrier frequency variation was recorded.
4. The steps 1 to 3 were repeated with the EUT was set to operate at the middle and upper channels respectively.





**FREQUENCY STABILITY (VOLTAGE VARIATION) TEST**

**47 CFR FCC Parts 2.1055 and 25.202(d) Frequency Stability (Voltage Variation) Results**

Operating Mode	Continuous Satellite Transmit	Temperature	20°C
Test Input Power	See table below	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chelmin Li

**Lower Channel**

Voltage (V)	Measured Frequency (GHz)	Nominal Channel Frequency (GHz)	Deviation (Hz)	Limit (Hz)
10.8	1.6265312472	1.626500000	31.247200	+/-16265
12.0	1.6265312410	1.626500000	31.241000	+/-16265
31.2	1.6265312392	1.626500000	31.239200	+/-16265

**Middle Channel**

Voltage (V)	Measured Frequency (GHz)	Nominal Channel Frequency (GHz)	Deviation (Hz)	Limit (Hz)
10.8	1.6434999925	1.643500000	-0.007500	+/-16435
12.0	1.6435002701	1.643500000	0.270100	+/-16435
31.2	1.6434999940	1.643500000	-0.006000	+/-16435

**Upper Channel**

Voltage (V)	Measured Frequency (GHz)	Nominal Channel Frequency (GHz)	Deviation (Hz)	Limit (Hz)
10.8	1.6604687495	1.660500000	-31.250500	+/-16605
12.0	1.6604687092	1.660500000	-31.290800	+/-16605
31.2	1.6604687314	1.660500000	-31.268600	+/-16605

## MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

### 47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (min)
0.3 - 1.34	614	1.63	100 <sup>Note 2</sup>	30
1.34 - 30	824 / f	2.19 / f	180 / f <sup>2</sup> <sup>Note 2</sup>	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	-	-	f / 1500	30
1500 - 100000	-	-	1.0	30
Notes				
1. f = frequency in MHz				
2. Plane wave equivalent power density				

### 47 CFR FCC Part 1.1310 Maximum Permissible Exposure Computation

The minimum distance to the EUT was computed from the following formula:

$$\begin{aligned}
 \text{where } S &= (30GP) / (377d^2) \\
 S &= 10W/m^2 \\
 P &= 1.094W \text{ (maximum peak measured from Maximum Peak Power)} \\
 d &= \text{Test distance} \\
 G &= \text{Numerical isotropic gain, 10.0 (10.0dBi)}
 \end{aligned}$$

Substituting the relevant parameters into the formula:

$$\begin{aligned}
 d &= \sqrt{[(30GP) / 377S]} \\
 &= 0.295m
 \end{aligned}$$

∴ The EUT shall maintain at least 0.295m from the operators to comply with the MPE criteria.

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