Test Report No. 7191148554-EEC16/04
dated 21 Nov 2016

PSB Singapore

Choose certainty. Add value.

Note: This report is issued subject to the Testing and Certification Regulations of the TÜV SÜD Group and the General Terms and Conditions of Business of TÜV SÜD PSB Pte Ltd. In addition, this report is governed by the terms set out within this report.

FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 2, 15, and 25
OF A
SATELLITE TERMINAL
[Model : SABRE RANGER 5000]
[FCC ID : QO4-WESBR5K]

TEST FACILITY	TÜV SÜD PSB Pte Ltd Electrical & Electronics Centre (EEC), Product Services, No. 1 Science Park Drive, Singapore 118221
FCC REG. NO.	99142 (3m and 10m Semi-Anechoic Chamber, Science Park)
IND. CANADA REG. NO.	2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park)
PREPARED FOR	Addvalue Innovation Pte Ltd 8 Tai Seng Link, Level 5 (Wing 2) Singapore 534158 Tel: +65 6509 5700 Tel: +65 6509 5701
QUOTATION NUMBER	2191049935
JOB NUMBER	7191148554
TEST PERIOD	13 Oct 2016 – 08 Nov 2016

PREPARED BY

Quek Keng Huat
Higher Associate Engineer

APPROVED BY

Foo Kai Maun
Executive Engineer

TÜV SÜD PSB

ilac-MRA

ACCREDITED LABORATORY SAC-SINGLAS

LA-2007-0380-A LA-2007-0381-F LA-2007-0382-B LA-2007-0383-G	LA-2007-0384-G LA-2007-0385-E LA-2007-0386-C LA-2010-0464-D

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

Laboratory:
TÜV SÜD PSB Pte. Ltd.
No.1 Science Park Drive
Singapore 118221

Phone : +65-6885 1333
Fax : +65-6776 8670
E-mail: enquiries@tuv-sud-psb.sg
www.tuv-sud-psb.sg
Co. Reg : 199002667R

Regional Head Office:
TÜV SÜD Asia Pacific Pte. Ltd.
1 Science Park Drive, #02-01
Singapore 118221

TABLE OF CONTENTS

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		
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 156 for details

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.

Transmit Channel	Frequency (GHz)	Receive Channel	Frequency (GHz)
Lower Channel	1.6266	Lower Channel	1.5250
Middle Channel	1.6435	Middle Channel	1.5421
Upper Channel	1.6604	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-D-2010.

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 **SATELLITE TERMINAL.**
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
Factory (ies)	:	Beyonics Technology (Senai) Sdn Bhd No. 96 (Plot 128), Jalan i-Park 1/10, Kawasan Perindustrian i-Park, 81000 Bandar Indahpura, Kulaijaya, Johor, Malaysia
Brand	:	Wideye
Model Number	:	SABRE RANGER 5000
FCC ID	:	QO4-WESBR5K
Serial Number	:	Nil
Microprocessor	:	OMAP L138
Operating / Transmitting Frequency	:	Satellite Transmitting 1626.5 MHz – 1660.5 MHz Satellite Receiving 1525.0 MHz – 1559.0 MHz GPS Receiving 1575.42MHz
Clock / Oscillator Frequency	:	Baseband Board 32.768KHz, 4.9152MHz,24MHz,25MHz RF Board 4.0MHz
Modulation / Emissions Designator	:	π/4 QPSK and 16 QAM / 189KG1D
Antenna Gain	:	12.0dBi
Port / Connectors	:	2xRJ45 LAN Port 1XSIM card Connector 2x10pin I/O Connector port for External devices 1x2pin power input connector
Rated Input Power	:	DC 10.8V ~ DC 31.2V

SUPPORTING EQUIPMENT DESCRIPTION

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
IBM Laptop Thinkpad R50e	M/N: 1834-A58 S/N: LV-AV926 06/01 FCC ID: DoC	Nil
IBM AC Adapter	M/N: 08K8206 S/N: 11S08K8206Z1Z9M94B 52WF FCC ID: Nil	1.80m unshielded power cable

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, "prodTestMainExecute" Satellite Transmission Mode - Continuous maximum 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

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
R&S Test Receiver (20Hz –26.5GHz) – ESMI1(Ref)	ESMI	849182/003 848926/007	22 Apr 2017
Schaffner Bilog Antenna –(30MHz-2GHz) BL3 (Ref)	CBL6112D	2549	11 Feb 2017
EMCO Horn Antenna(1GHz-18GHz)	3115	0003-6088	20 Apr 2017
R&S Preamplifier (1GHz -18GHz)	SCU18	102191	11 Mar 2017
Com-Power Preamplifier (1MHz-1GHz)	PAM-103	441056	22 Jul 2017
K&L Microwave Tunable Band Reject Filter	3TNF-1000/2000-N/N	436	13 Aug 2017

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 10th 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 dBµV/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 31.0 dBµV/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

47 CFR FCC Part 15.109 Radiated Emission Results

Operating Mode	Continuous Satellite Transmission	Temperature	24°C
Test Input Power	12Vdc	Relative Humidity	60%
Test Distance	3m	Atmospheric Pressure	1030mbar
Type Bearer	6 – 20T45X (Worst)	Tested By	Chang Wai Kit

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 (Worst)
30.2210	33.2	40.0	6.8	100	0	V	Mid
37.9460	22.3	40.0	17.7	100	350	V	Mid
88.3040	20.1	43.5	23.4	390	35	H	Mid
92.3940	19.5	43.5	24.0	108	148	H	Mid
149.9740	19.4	43.5	24.1	100	226	V	Mid
249.9860	26.9	46.0	19.1	168	107	V	Mid

Spurious Emissions above 1GHz – 18GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m) *Note 3	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch (Worst)
1.9202	38.9	74.0	35.1	--	54.0	15.1	100	351	V	Mid
1.9932	37.7	74.0	36.3	--	54.0	16.3	400	327	V	Mid
1.8641	36.1	74.0	37.9	--	54.0	17.9	100	38	V	Mid
1.8136	35.2	74.0	38.8	--	54.0	18.8	400	342	V	Mid
1.7463	34.8	74.0	39.2	--	54.0	19.2	300	353	V	Mid
2.3354	34.5	74.0	39.5	--	54.0	19.5	400	308	V	Mid

Notes

1. 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.
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. As the measured peak shows compliance to the average limit, as such no average measurement was required.
4. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 3MHz
5. 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.

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:

   +40dBW in any 4kHz band for θ: 0^O

   +40dBW + 3.θdBW in any 4kHz band for $0^O < \theta \leq 5^O$

   where θ 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^O 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	10 Dec 2017

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 power meter.
4. The spectrum analyser was then calibrated to the power meter level as shown by the power meter 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.

47 CFR FCC Parts 2.1046 and 25.204 RF Output Power Results

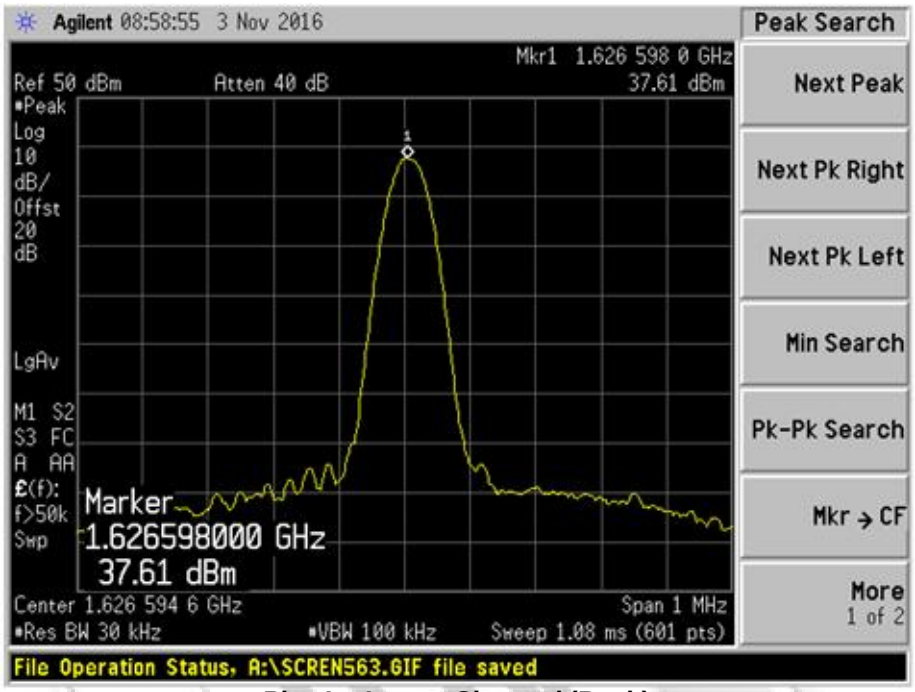
Operating Mode	Continuous Satellite Transmission	Temperature	24°C
Test Input Power	12Vdc	Relative Humidity	60%
Antenna Gain	12.0dBi	Atmospheric Pressure	1030mbar
Attached Plots	1 – 72	Tested By	Chang Wai Kit

Frequency (GHz)	Channel	Type Bearer	Peak Output Power (dBm)		Average Output Power (dBm)	
			EIRP	ERP	EIRP	ERP
1.6266	Lower	R20T05Q	49.6	47.5	43.4	41.2
1.6435	Middle		50.0	47.9	43.7	41.6
1.6604	Upper		49.1	47.0	42.4	40.3
1.6266	Lower	R20T1Q	49.4	47.2	42.7	40.6
1.6435	Middle		49.6	47.4	42.9	40.7
1.6604	Upper		48.8	46.6	42.7	40.5
1.6266	Lower	R20T2Q	47.8	45.7	40.9	38.8
1.6435	Middle		47.8	45.6	41.2	39.1
1.6604	Upper		47.0	44.9	40.4	38.2
1.6266	Lower	R20T45Q	47.4	45.2	38.3	36.1
1.6435	Middle		47.4	45.2	38.6	36.5
1.6604	Upper		46.4	44.2	37.8	35.7
1.6266	Lower	R20T1X	50.3	48.2	42.6	40.5
1.6435	Middle		50.6	48.5	42.8	40.6
1.6604	Upper		50.2	48.1	41.7	39.5
1.6266	Lower	R20T2X	49.4	47.2	40.3	38.2
1.6435	Middle		49.7	47.6	40.6	38.4
1.6604	Upper		48.8	46.7	41.0	38.9
1.6266	Lower	R20T45X	48.6	46.4	38.1	35.9
1.6435	Middle		48.0	45.9	37.4	35.2
1.6604	Upper		48.5	46.3	37.5	35.4
1.6266	Lower	R5T2Q	47.6	45.5	38.4	36.2
1.6435	Middle		48.1	46.0	37.4	35.3
1.6604	Upper		47.2	45.1	35.9	33.7
1.6266	Lower	R5T45Q	47.2	45.1	33.1	31.0
1.6435	Middle		47.8	45.6	34.8	32.7
1.6604	Upper		46.6	44.4	33.5	31.4
1.6266	Lower	R5T1X	50.1	47.9	40.1	37.9
1.6435	Middle		51.3	49.1	38.8	36.6
1.6604	Upper		50.4	48.3	38.9	36.7
1.6266	Lower	R5T2X	49.4	47.3	37.1	35.0
1.6435	Middle		50.1	48.0	38.0	35.8
1.6604	Upper		49.0	46.8	35.6	33.5
1.6266	Lower	R5T45X	49.1	46.9	34.5	32.3
1.6435	Middle		49.7	47.5	34.9	32.7
1.6604	Upper		48.6	46.4	34.3	32.2

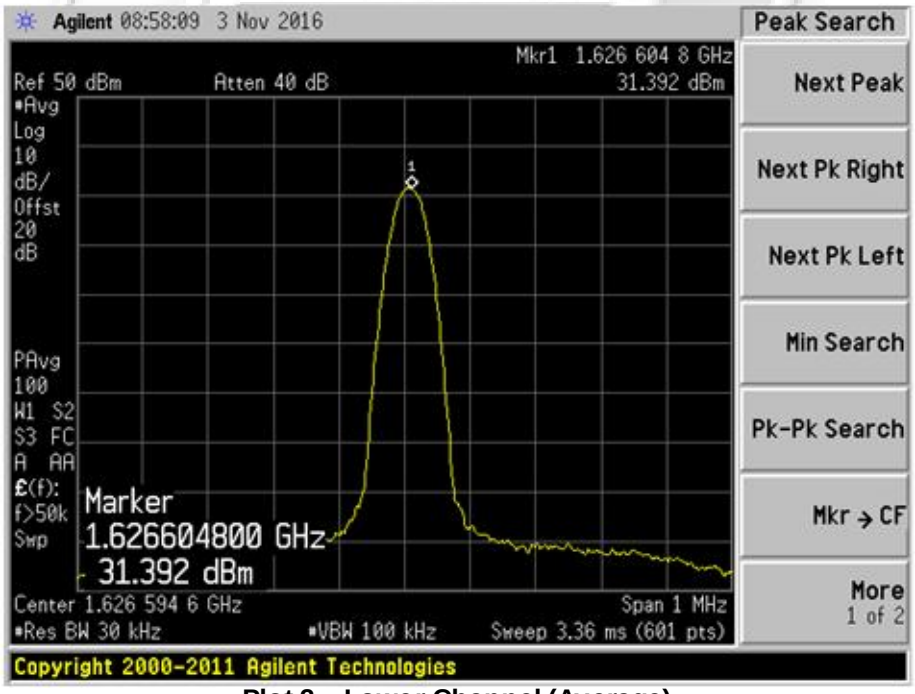
Notes

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 ±1.0dB.

Output Power Plots – Bearer 0

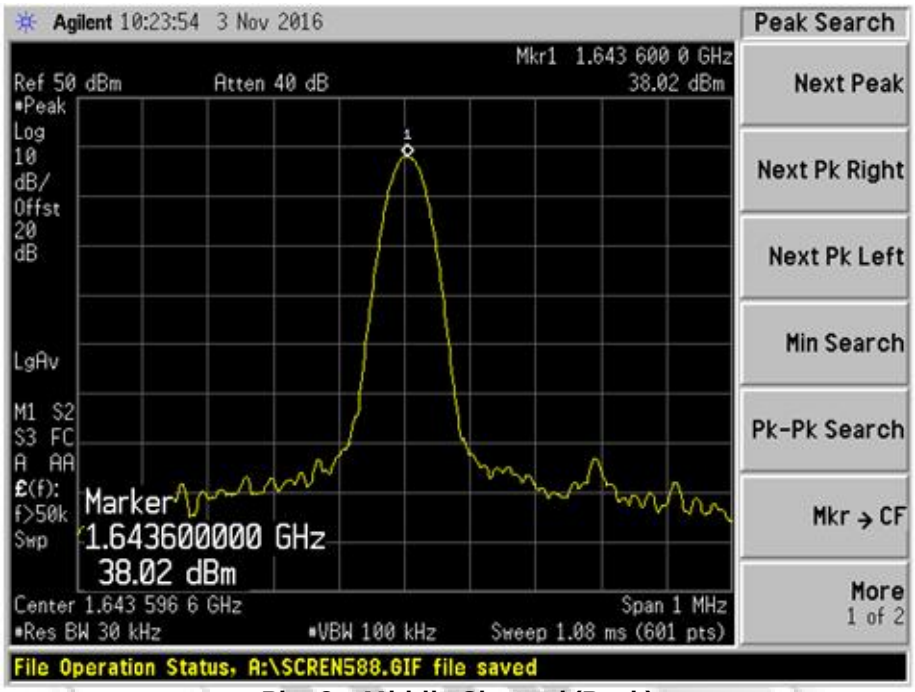


Plot 1 – Lower Channel (Peak)

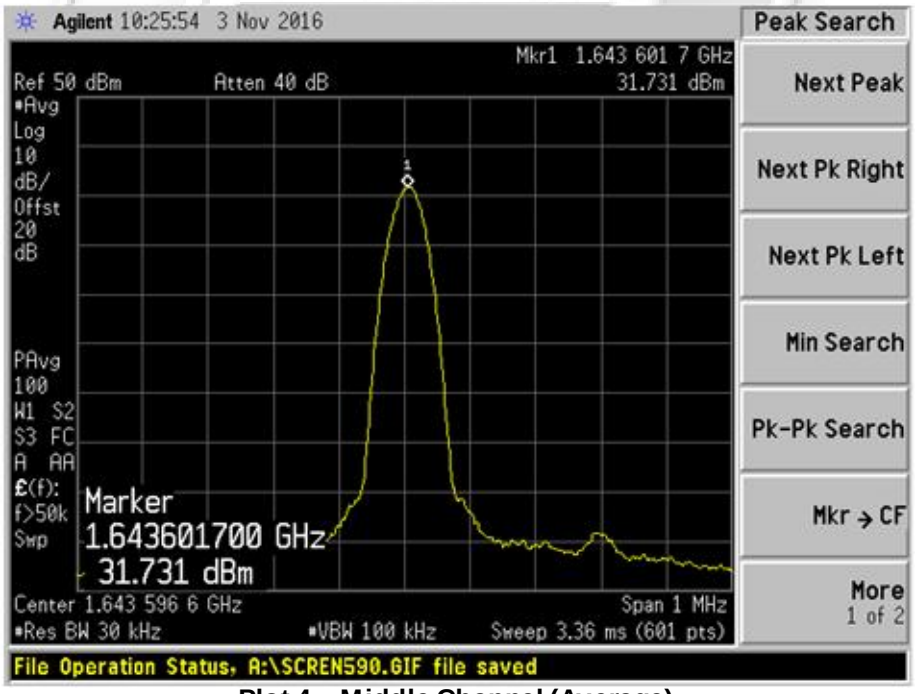


Plot 2 – Lower Channel (Average)

Output Power Plots – Bearer 0

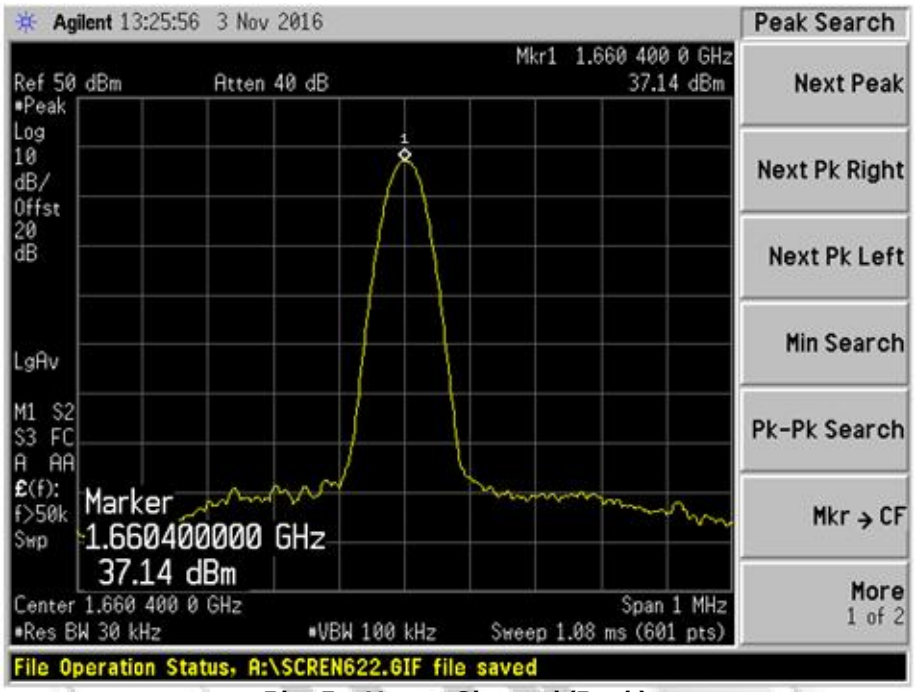


Plot 3 – Middle Channel (Peak)

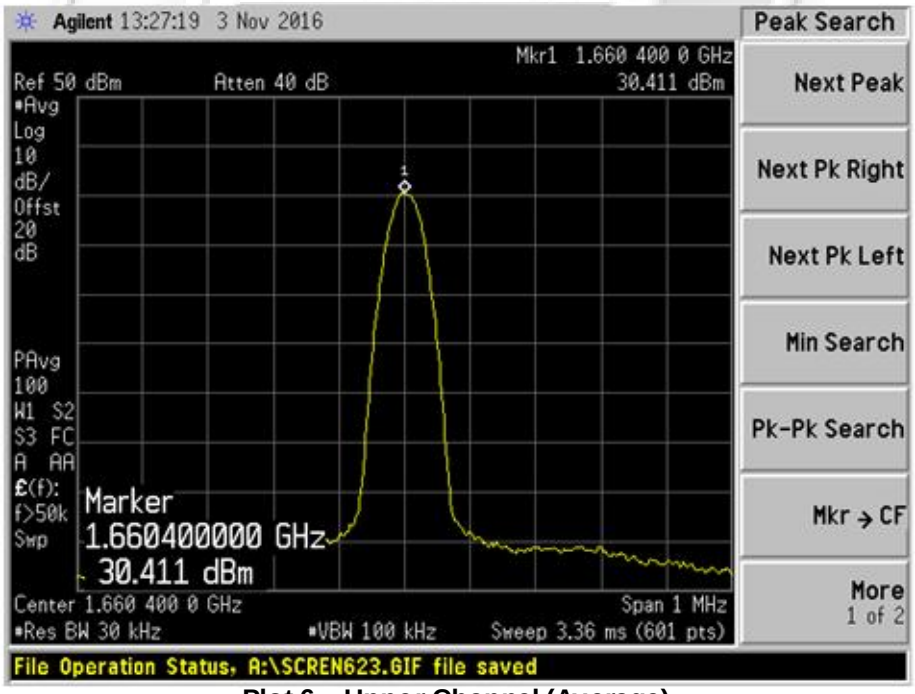


Plot 4 – Middle Channel (Average)

Output Power Plots – Bearer 0

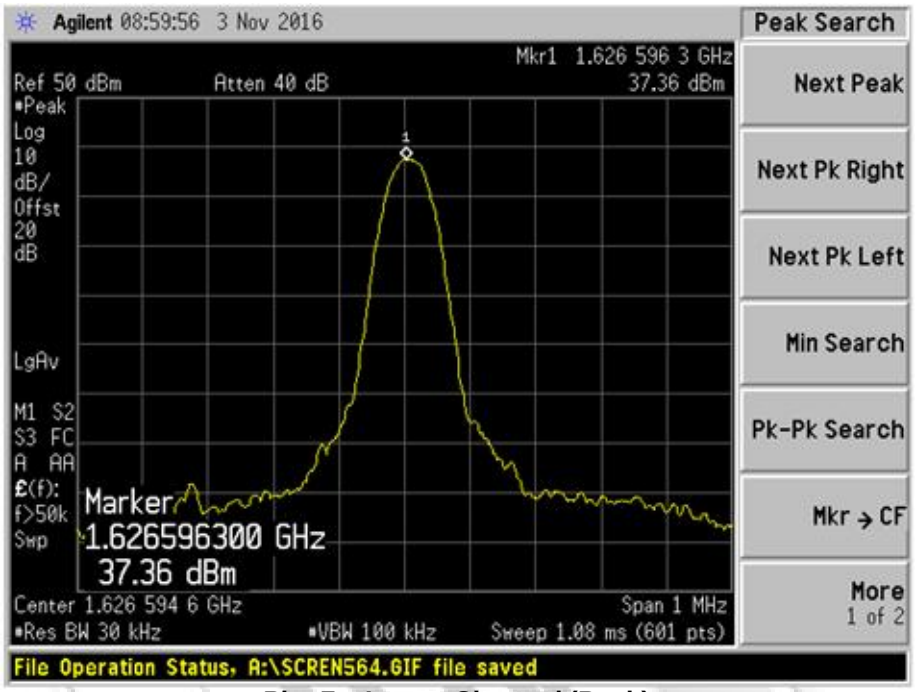


Plot 5 – Upper Channel (Peak)

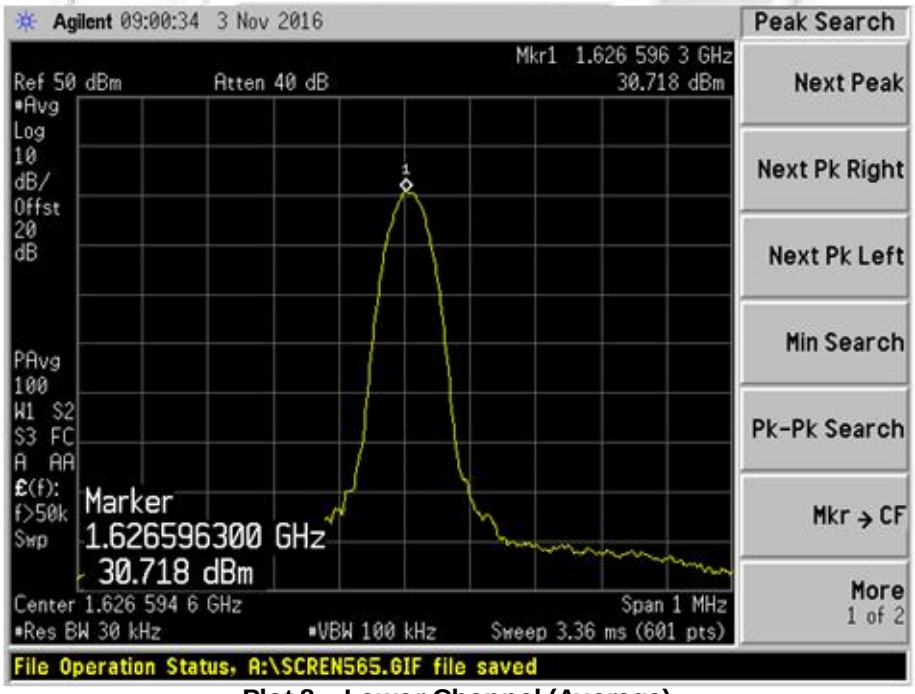


Plot 6 – Upper Channel (Average)

Output Power Plots – Bearer 1

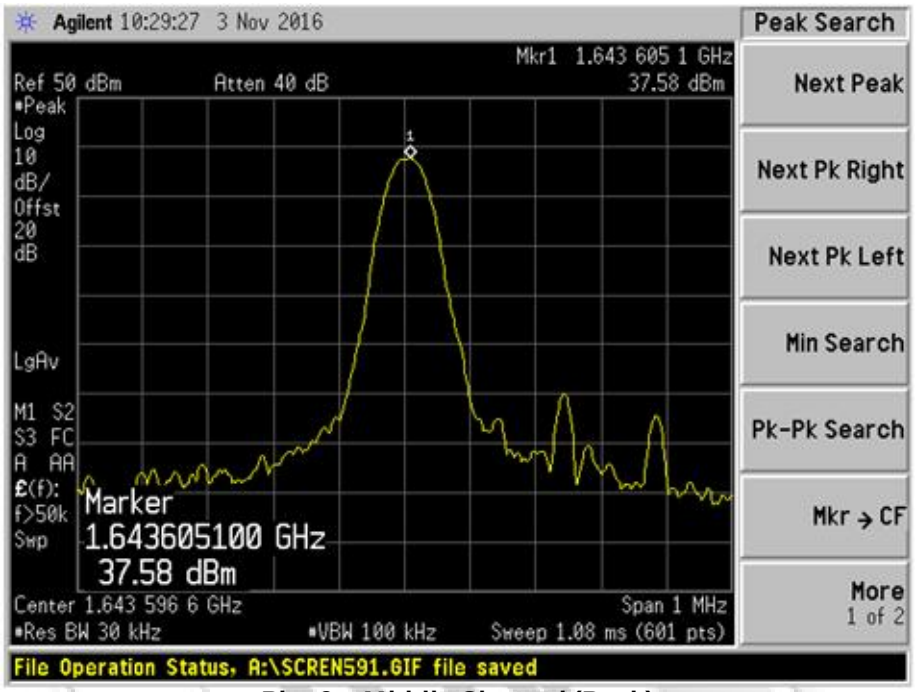


Plot 7 – Lower Channel (Peak)

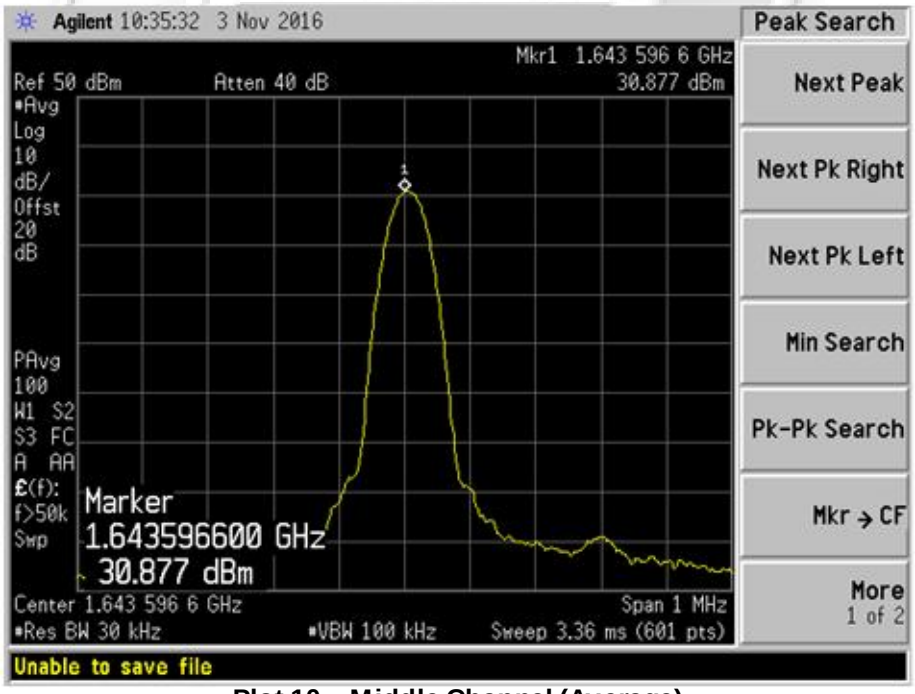


Plot 8 – Lower Channel (Average)

Output Power Plots – Bearer 1

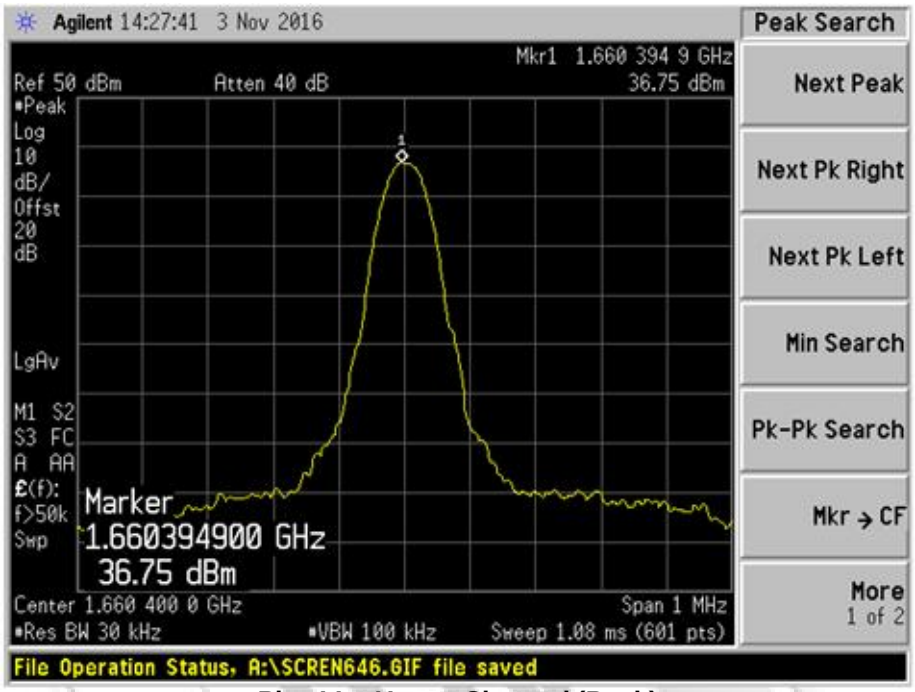


Plot 9 – Middle Channel (Peak)

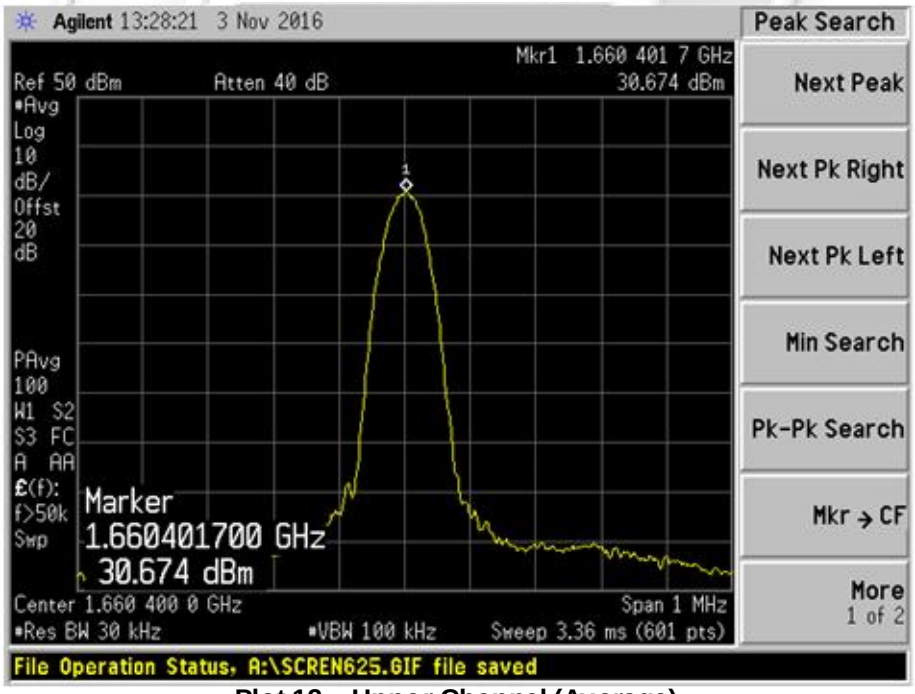


Plot 10 – Middle Channel (Average)

Output Power Plots – Bearer 1

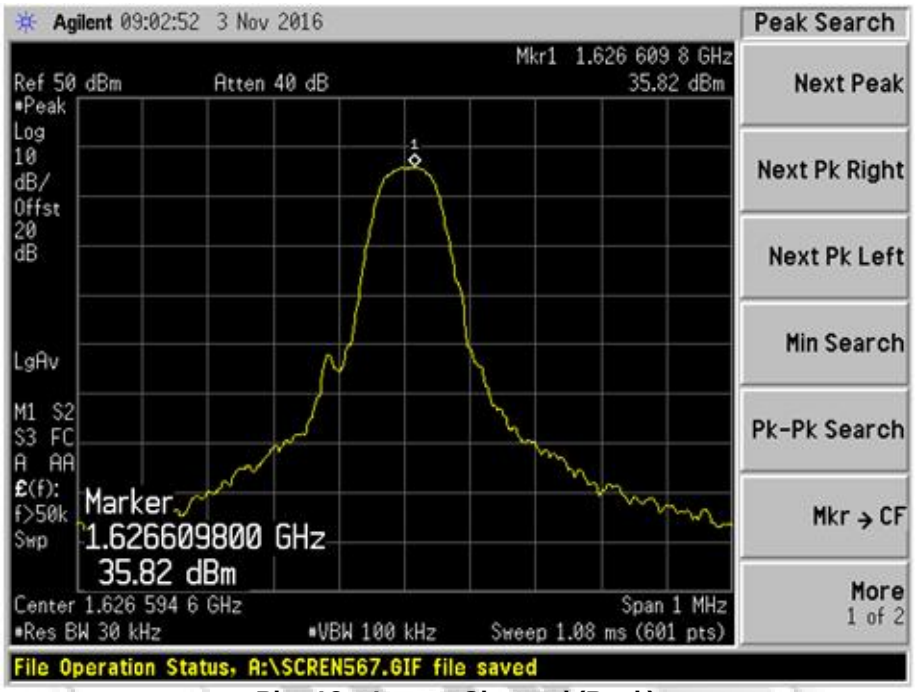


Plot 11 – Upper Channel (Peak)

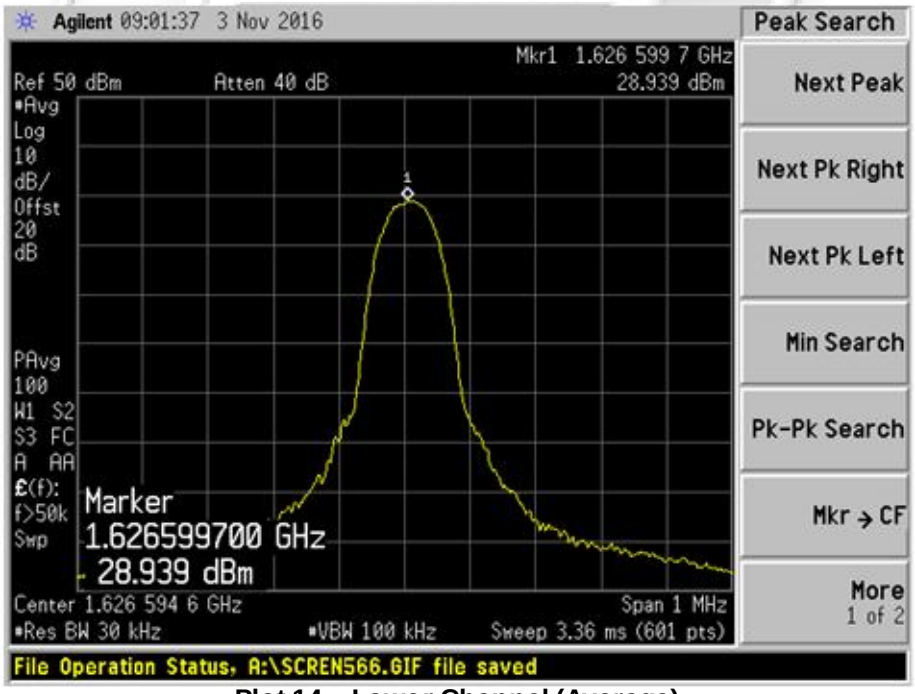


Plot 12 – Upper Channel (Average)

Output Power Plots – Bearer 2

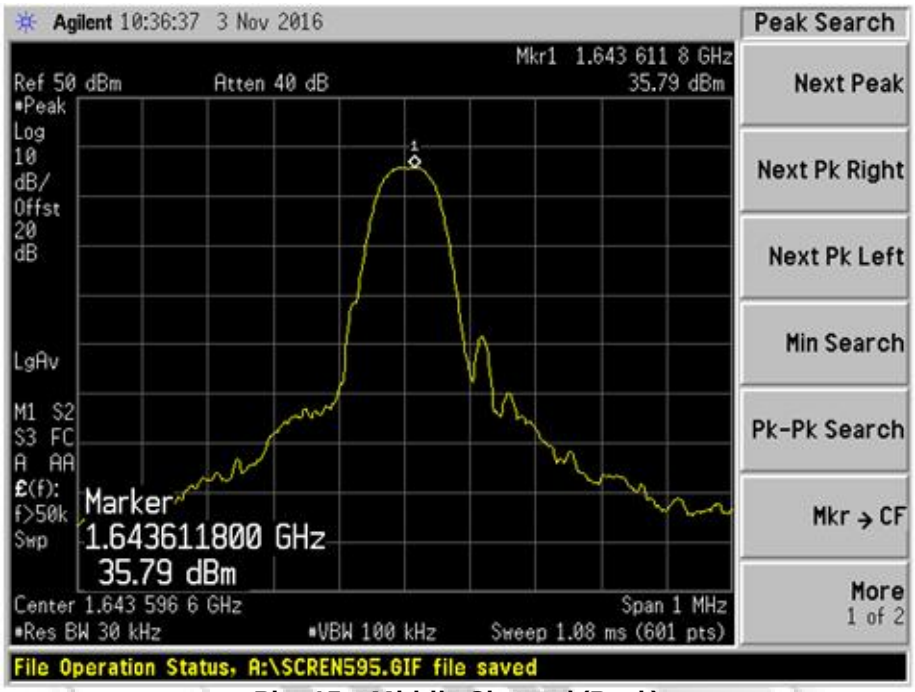


Plot 13 – Lower Channel (Peak)

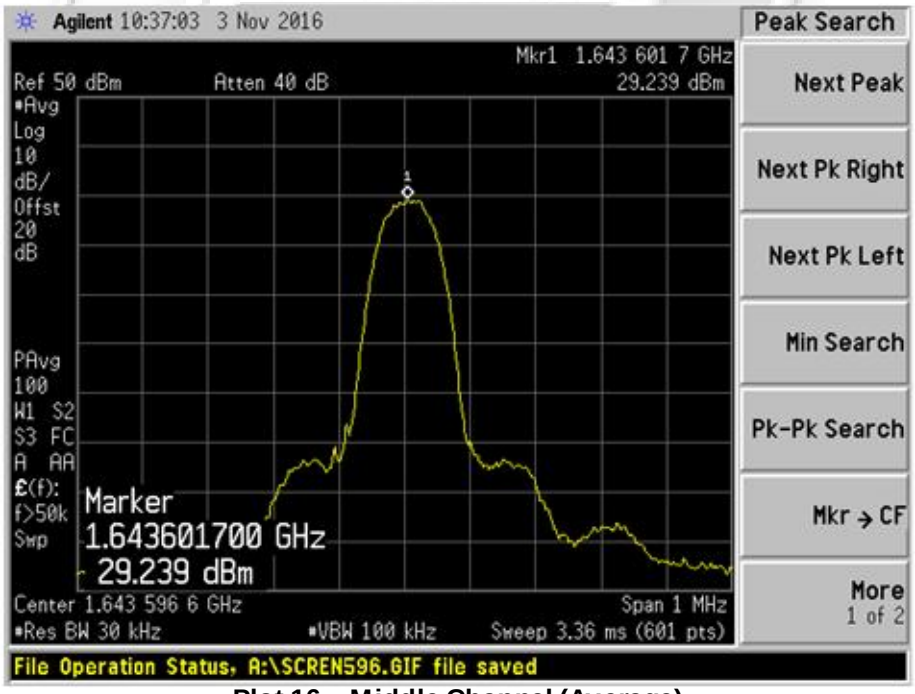


Plot 14 – Lower Channel (Average)

Output Power Plots – Bearer 2

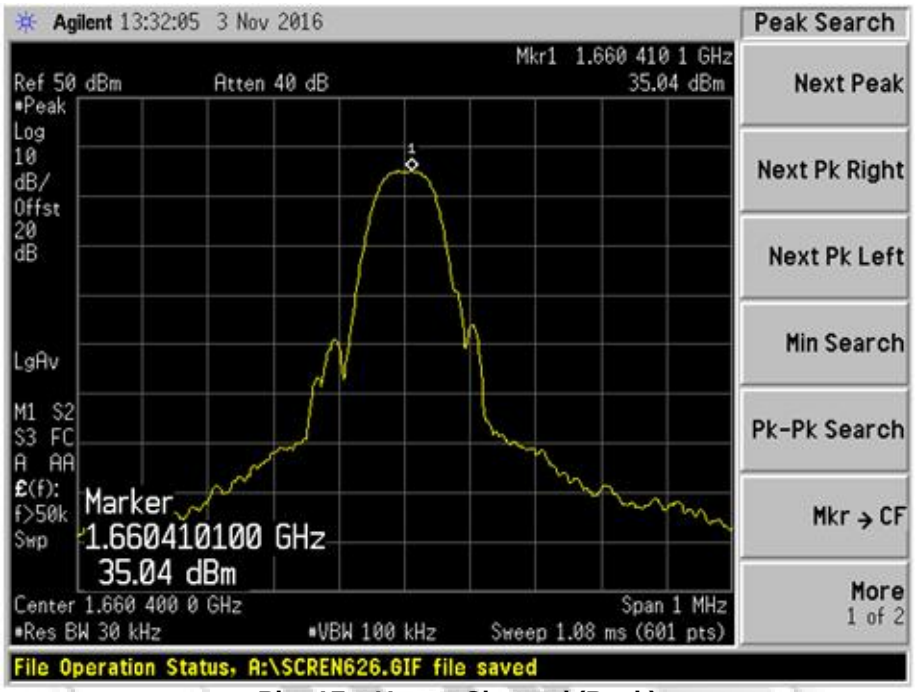


Plot 15 – Middle Channel (Peak)

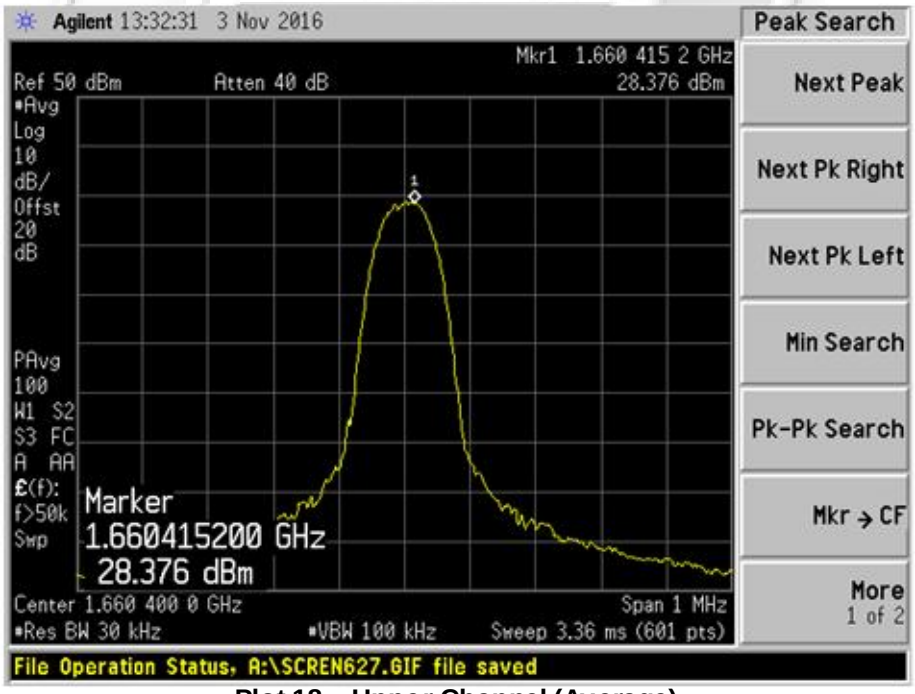


Plot 16 – Middle Channel (Average)

Output Power Plots – Bearer 2

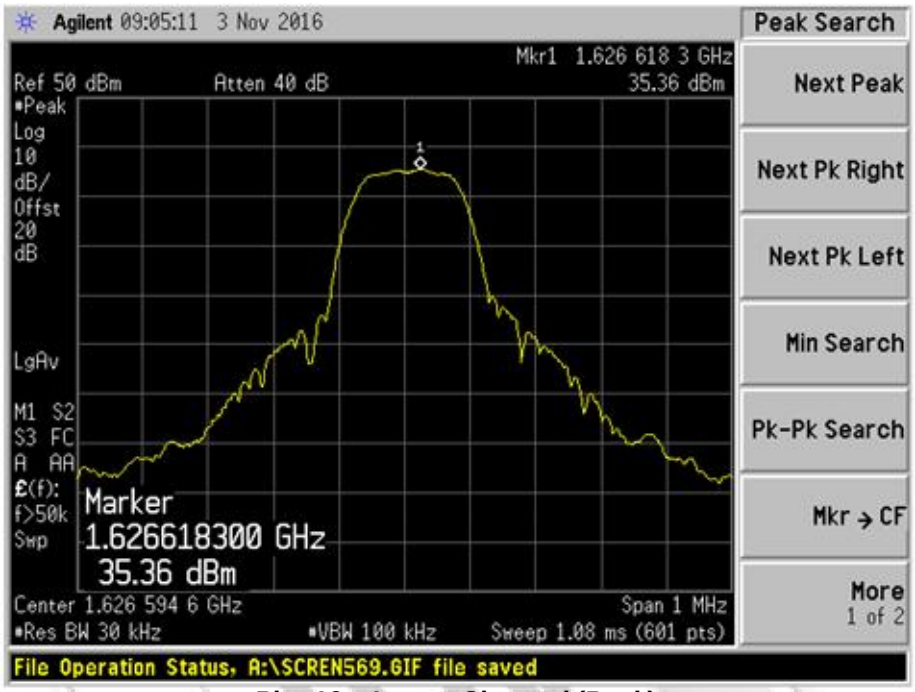


Plot 17 – Upper Channel (Peak)

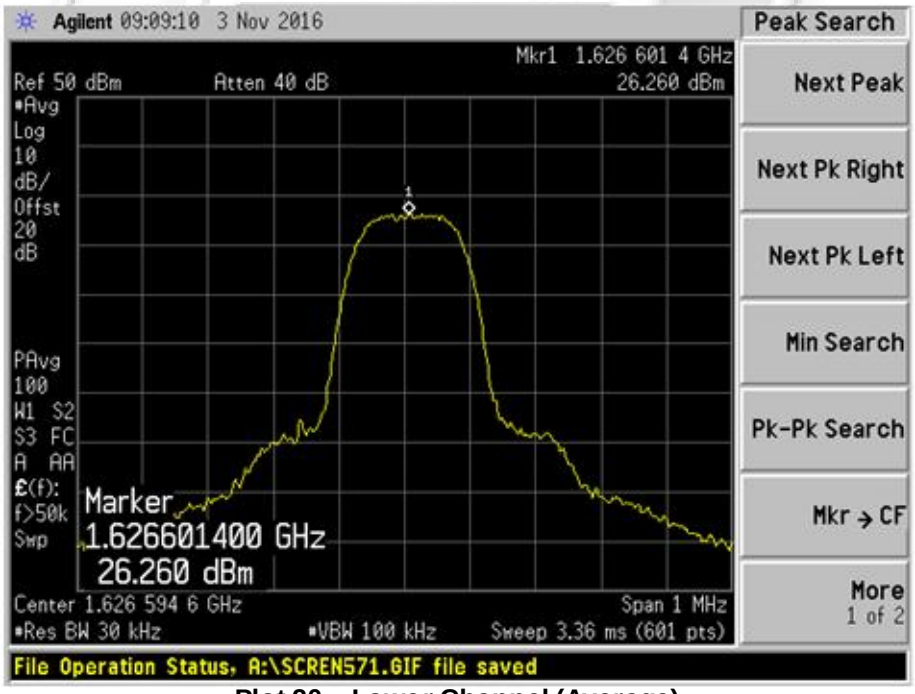


Plot 18 – Upper Channel (Average)

Output Power Plots – Bearer 3

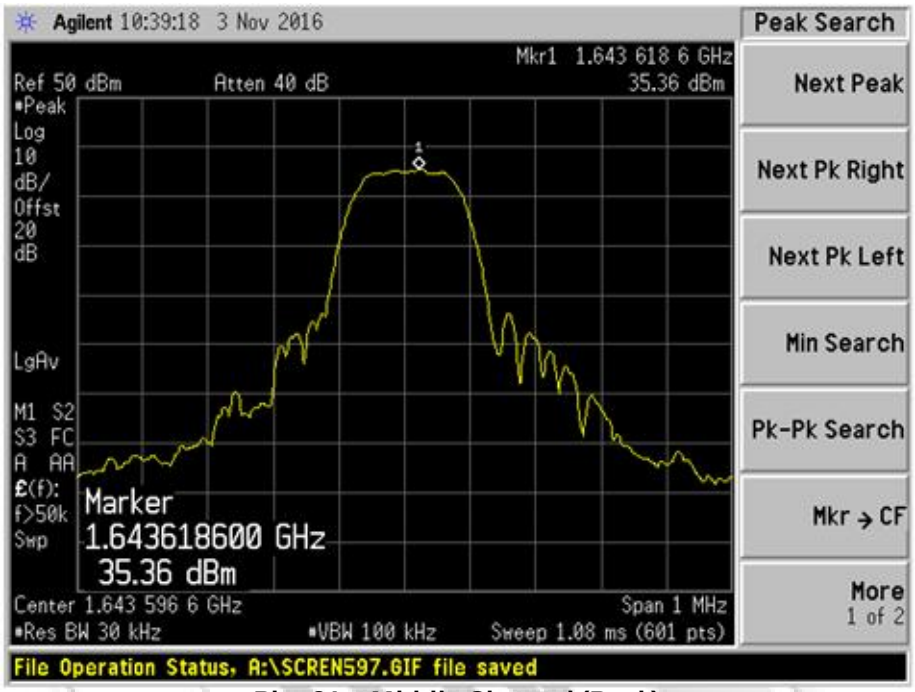


Plot 19 – Lower Channel (Peak)

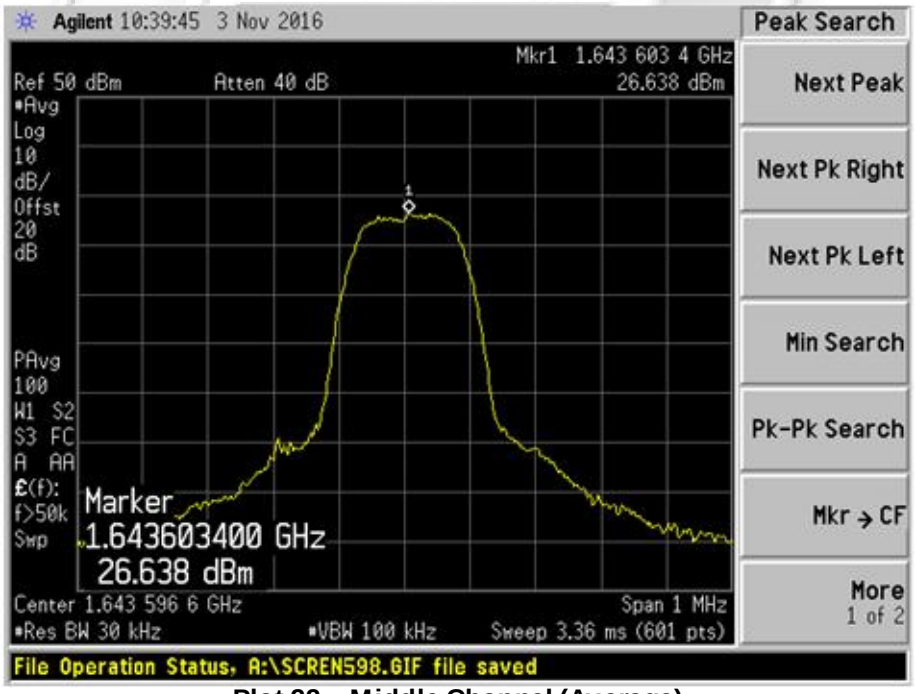


Plot 20 – Lower Channel (Average)

Output Power Plots – Bearer 3

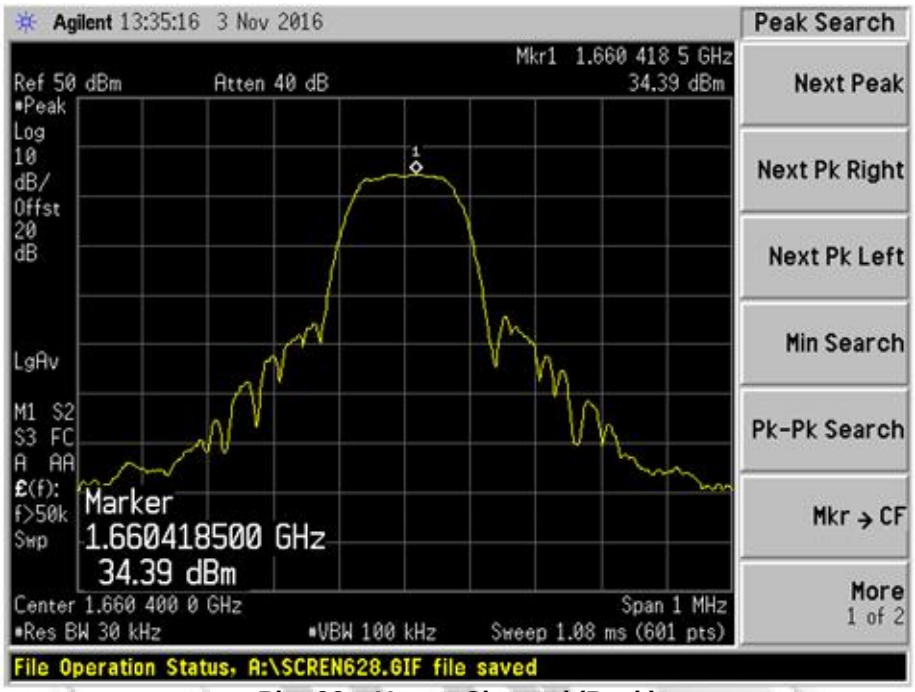


Plot 21 – Middle Channel (Peak)

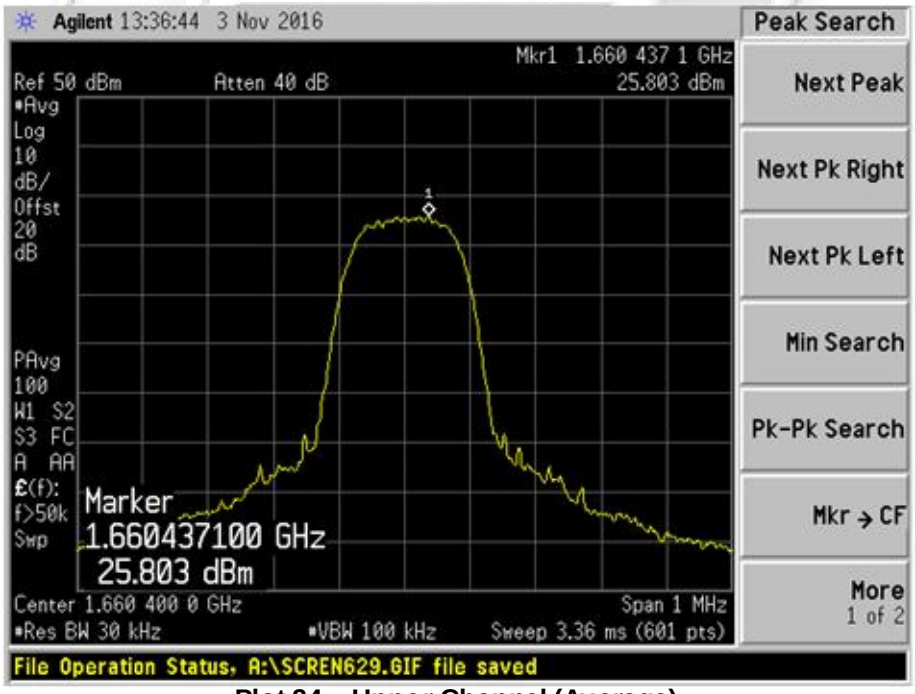


Plot 22 – Middle Channel (Average)

Output Power Plots – Bearer 3

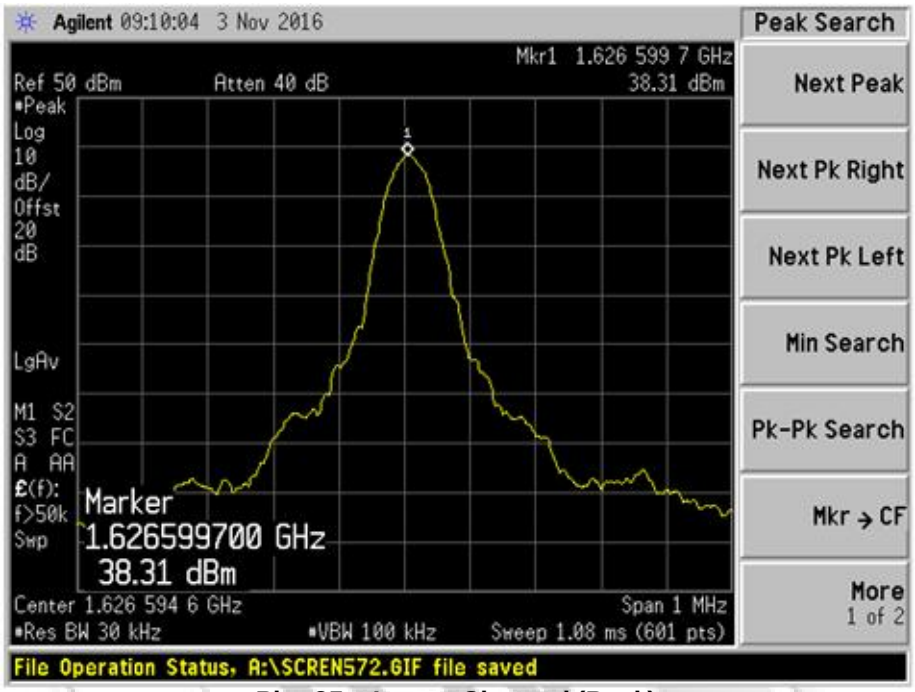


Plot 23 – Upper Channel (Peak)

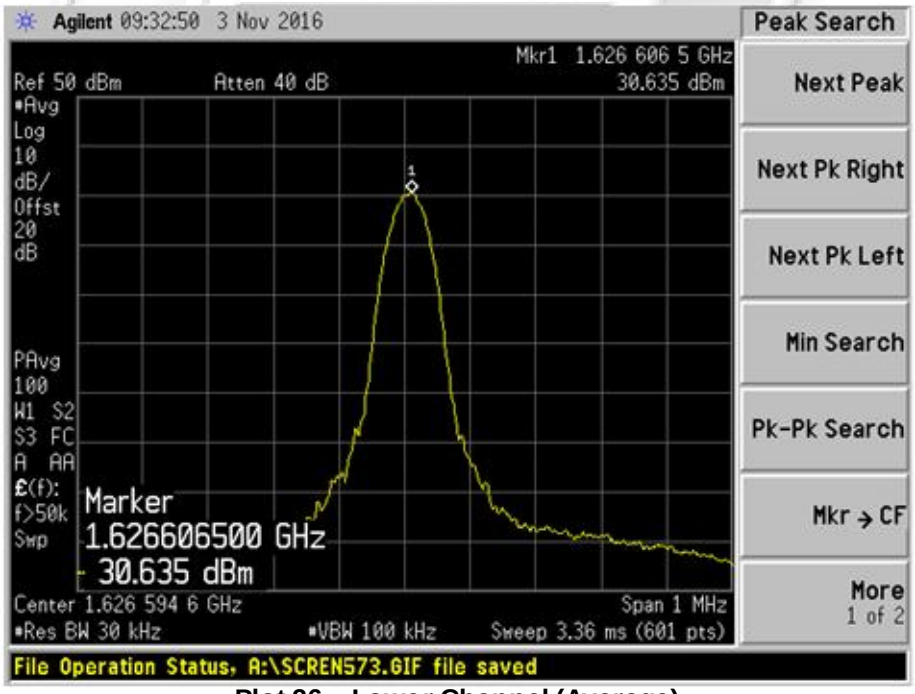


Plot 24 – Upper Channel (Average)

Output Power Plots – Bearer 4

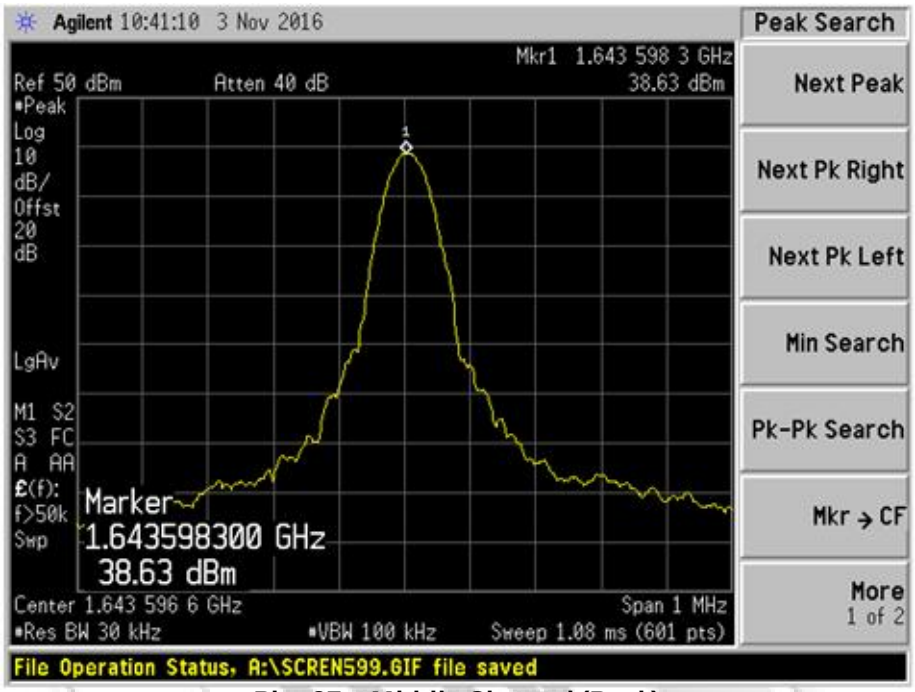


Plot 25 – Lower Channel (Peak)

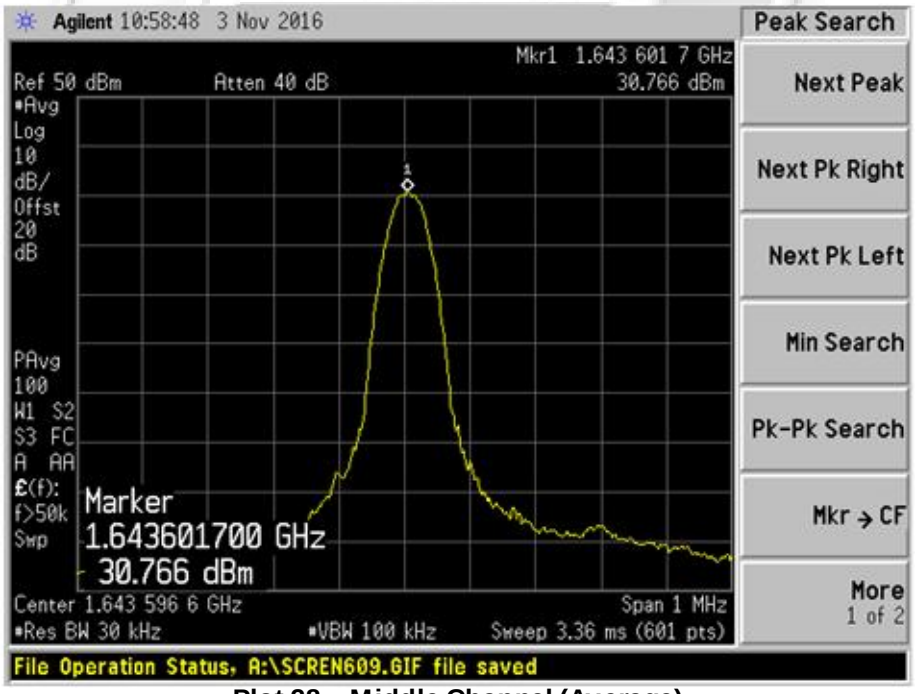


Plot 26 – Lower Channel (Average)

Output Power Plots – Bearer 4

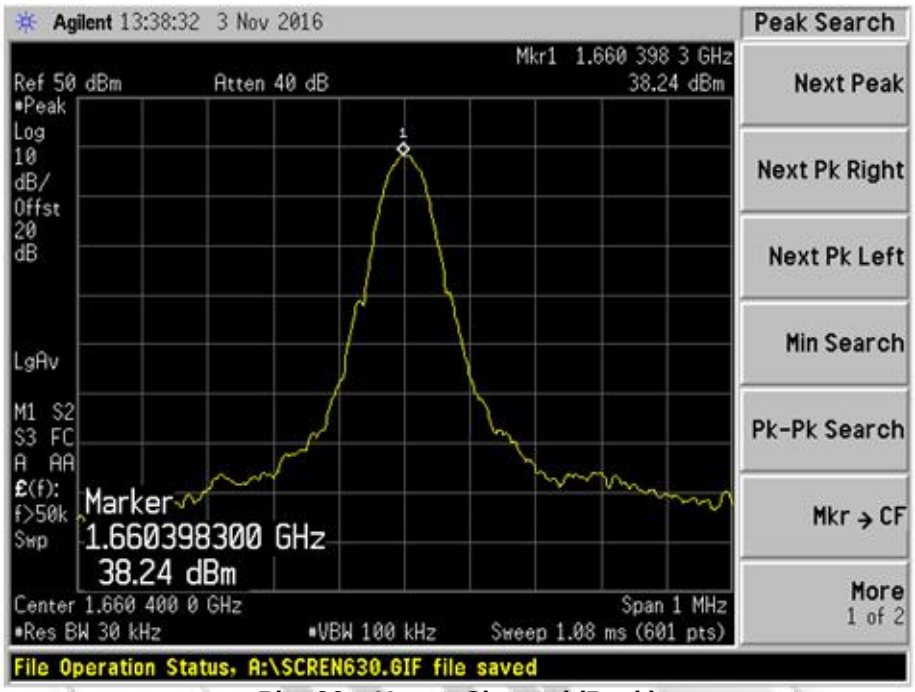


Plot 27 – Middle Channel (Peak)

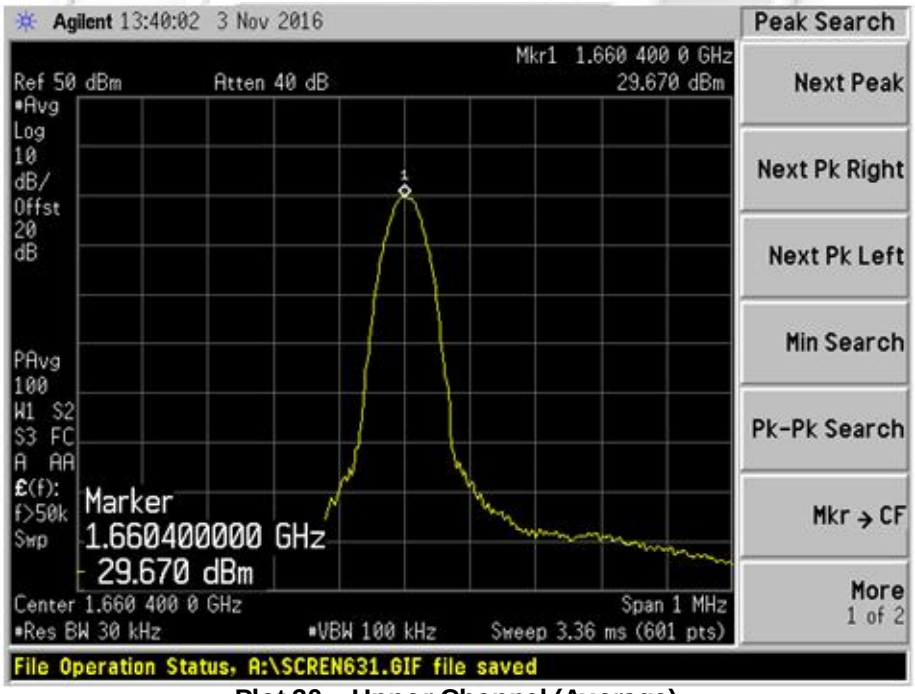


Plot 28 – Middle Channel (Average)

Output Power Plots – Bearer 4

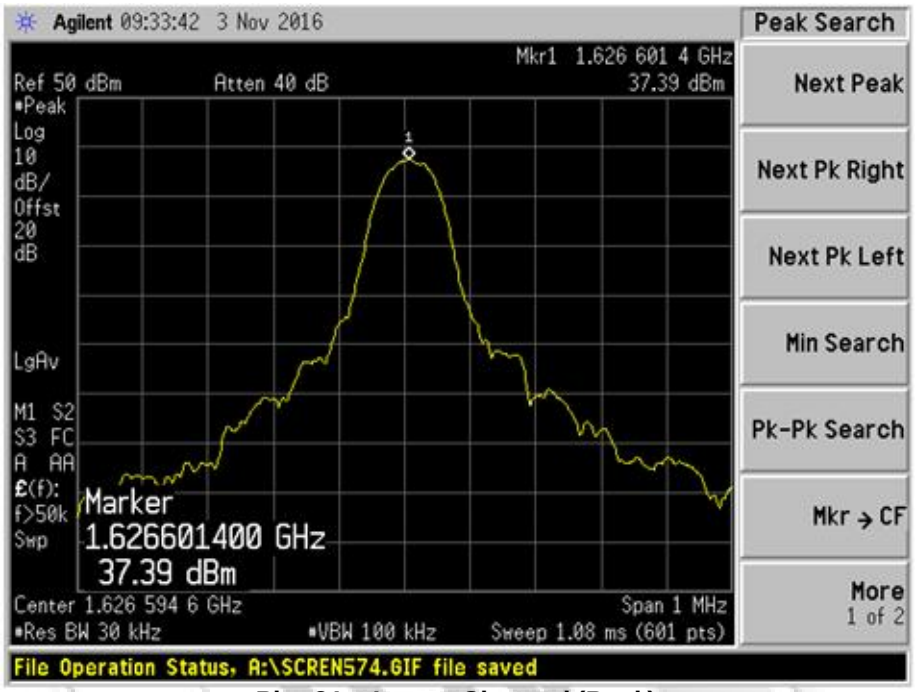


Plot 29 – Upper Channel (Peak)

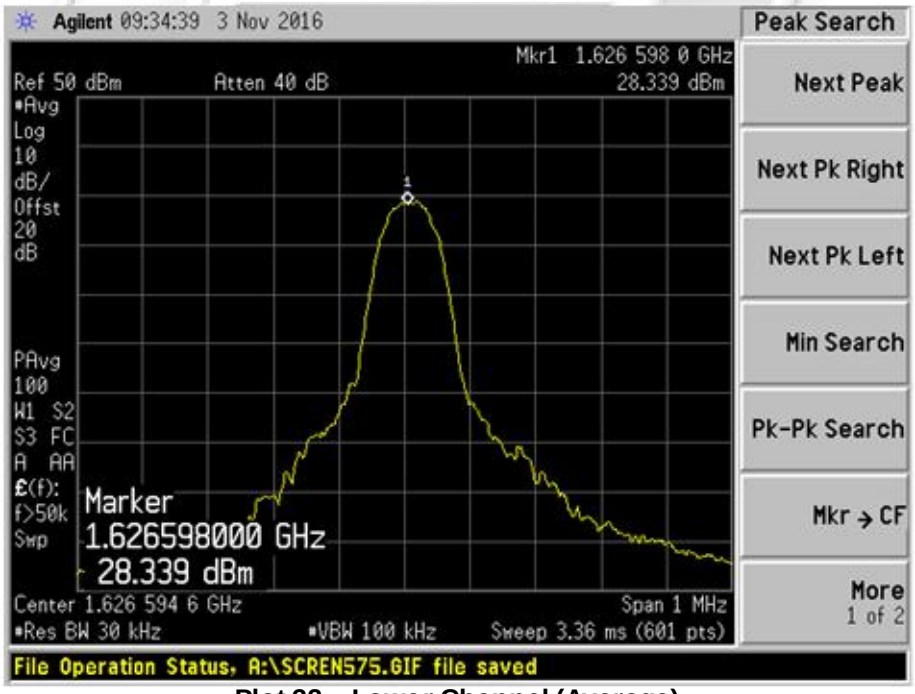


Plot 30 – Upper Channel (Average)

Output Power Plots – Bearer 5

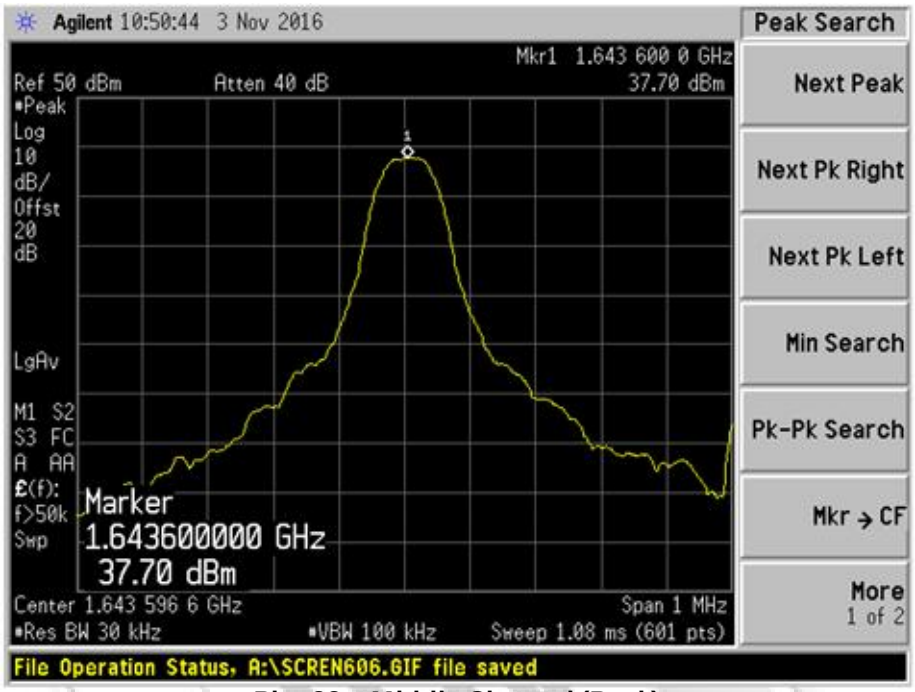


Plot 31 – Lower Channel (Peak)

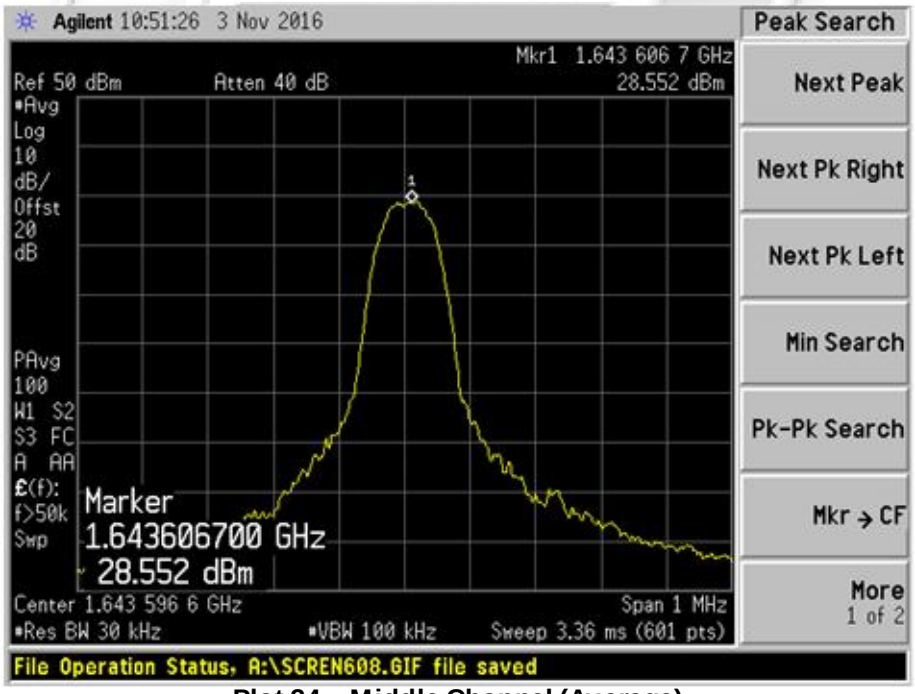


Plot 32 – Lower Channel (Average)

Output Power Plots – Bearer 5

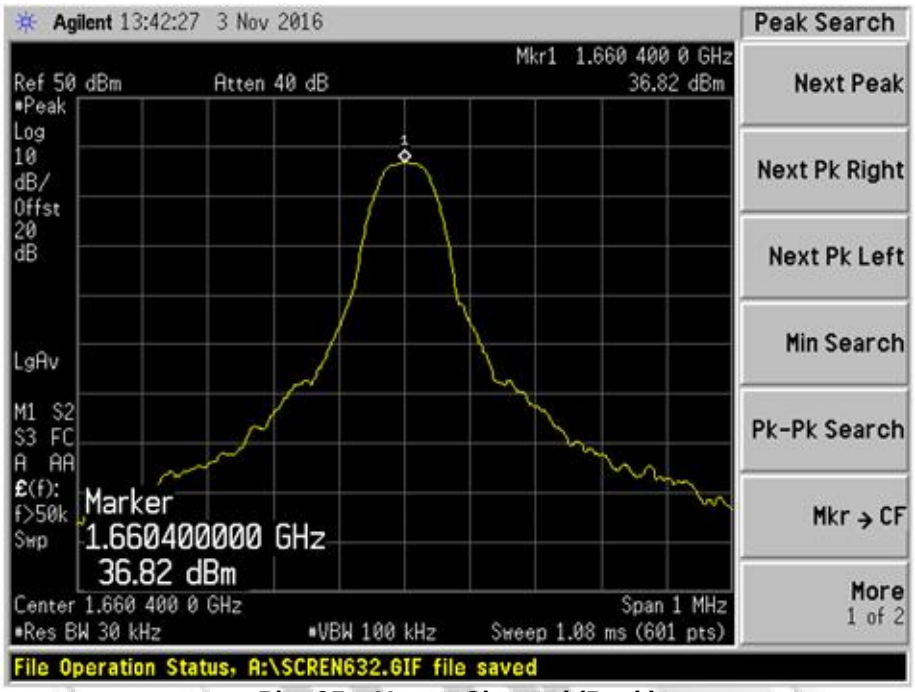


Plot 33 – Middle Channel (Peak)

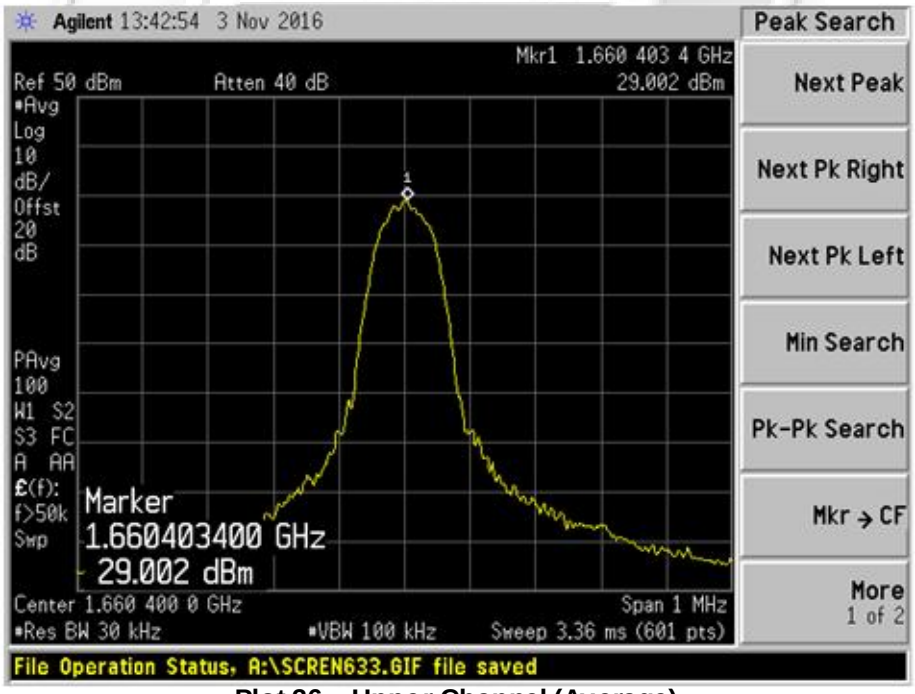


Plot 34 – Middle Channel (Average)

Output Power Plots – Bearer 5

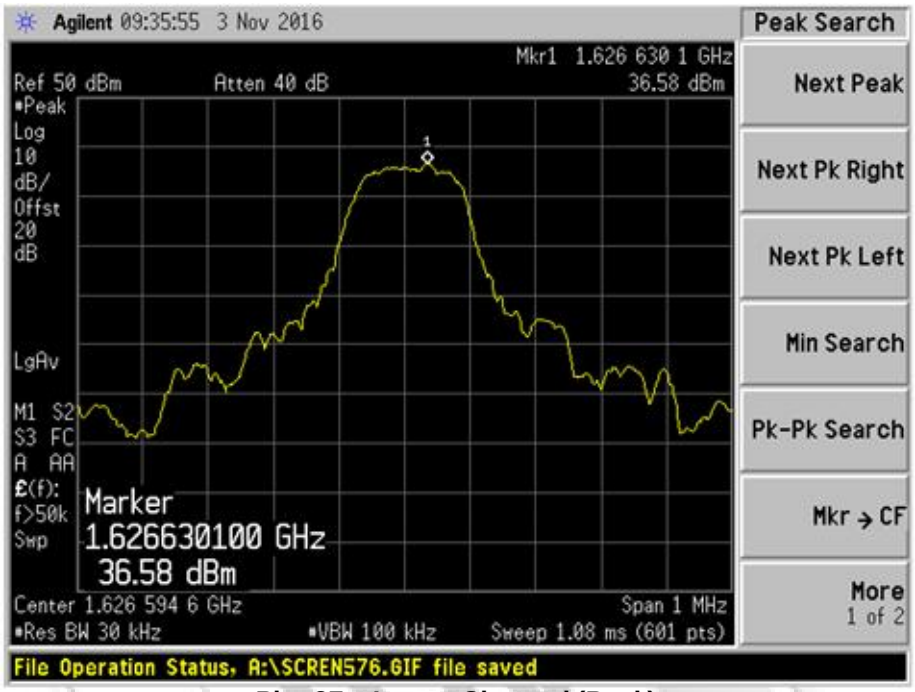


Plot 35 – Upper Channel (Peak)

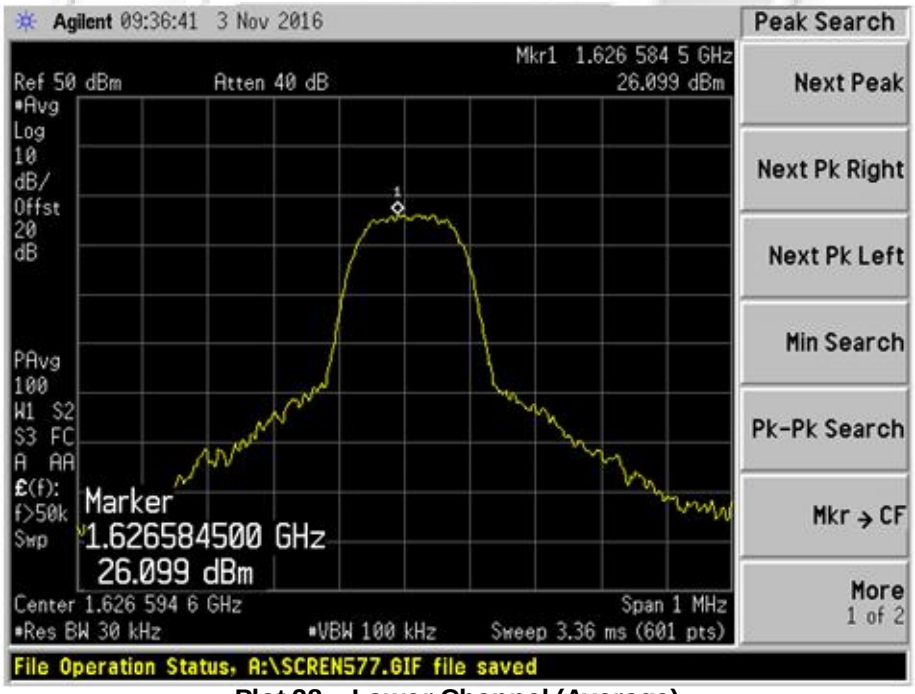


Plot 36 – Upper Channel (Average)

Output Power Plots – Bearer 6

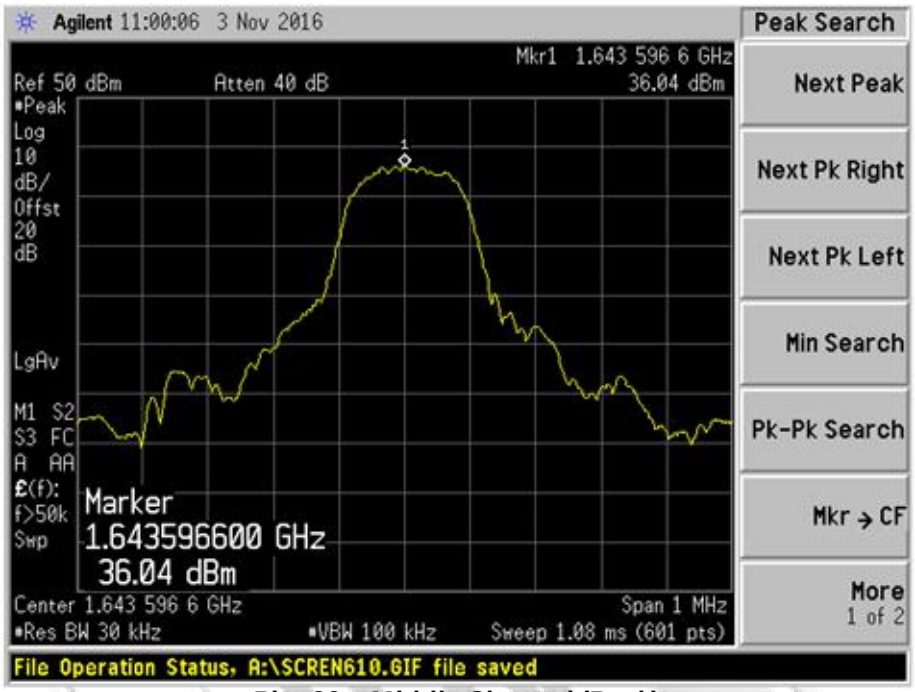


Plot 37 – Lower Channel (Peak)

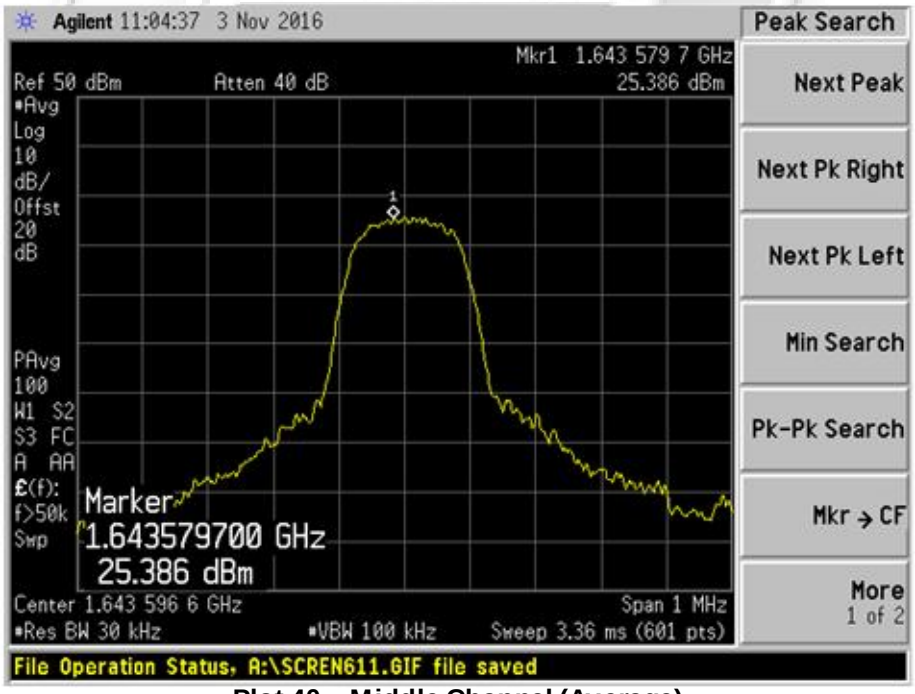


Plot 38 – Lower Channel (Average)

Output Power Plots – Bearer 6

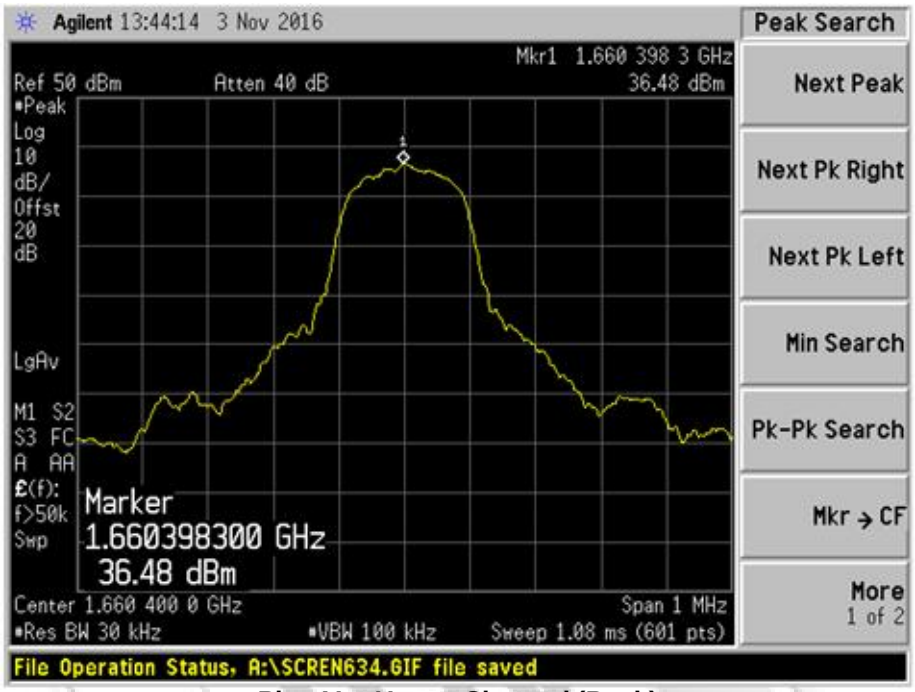


Plot 39 – Middle Channel (Peak)

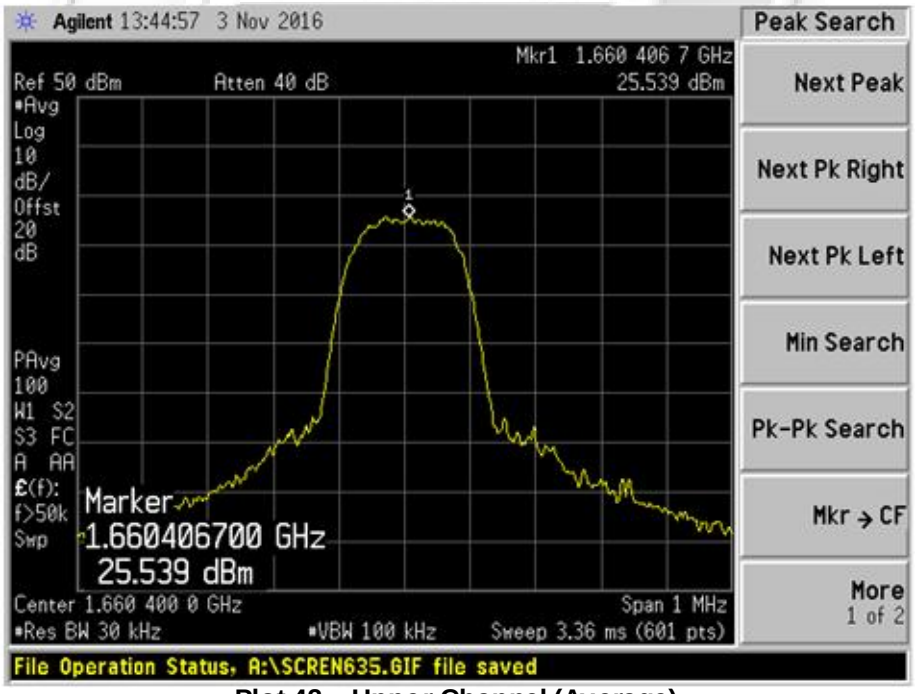


Plot 40 – Middle Channel (Average)

Output Power Plots – Bearer 6

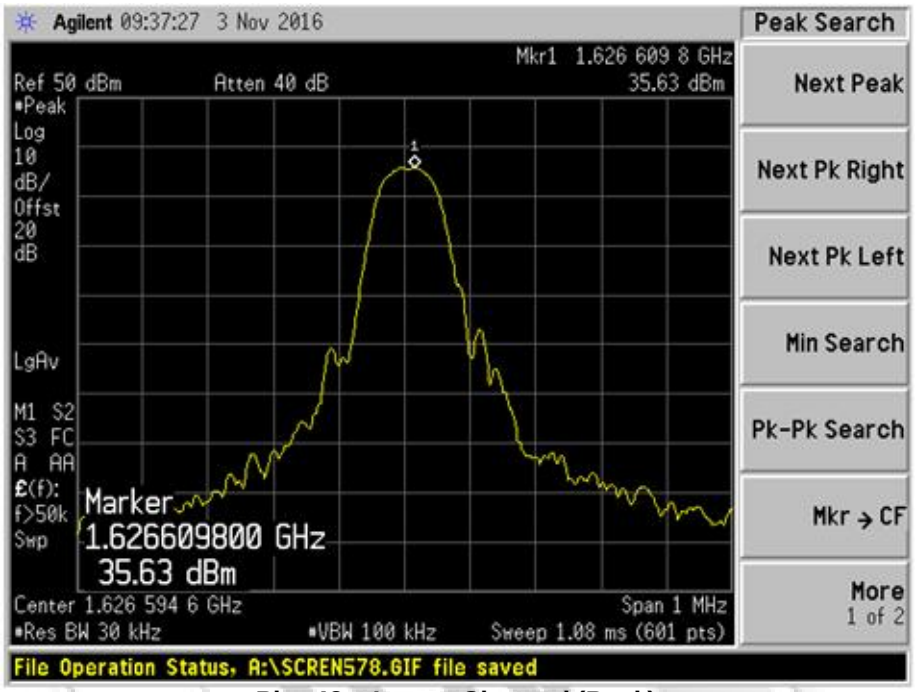


Plot 41 – Upper Channel (Peak)

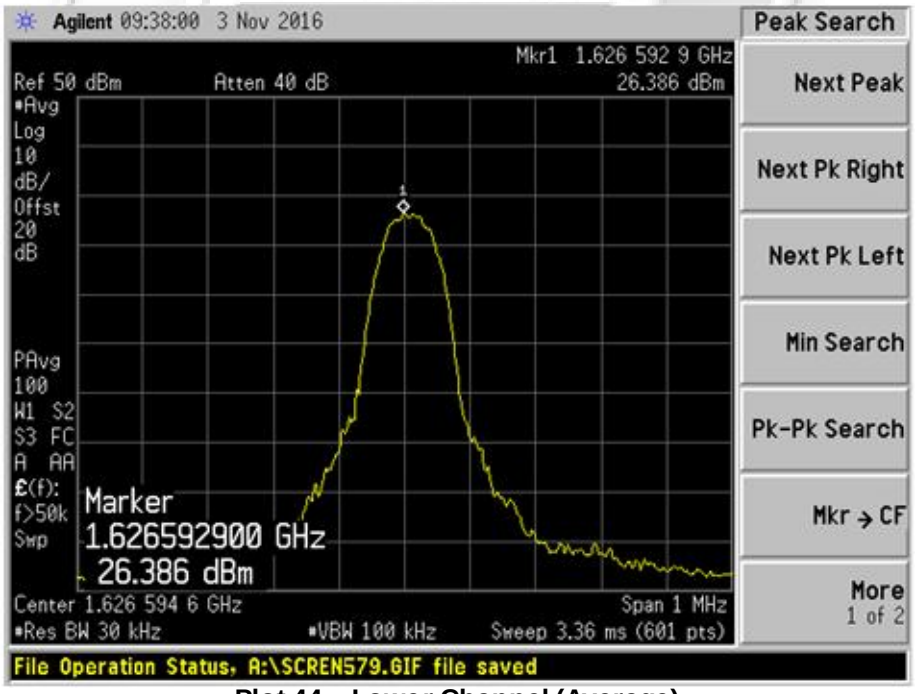


Plot 42 – Upper Channel (Average)

Output Power Plots – Bearer 7

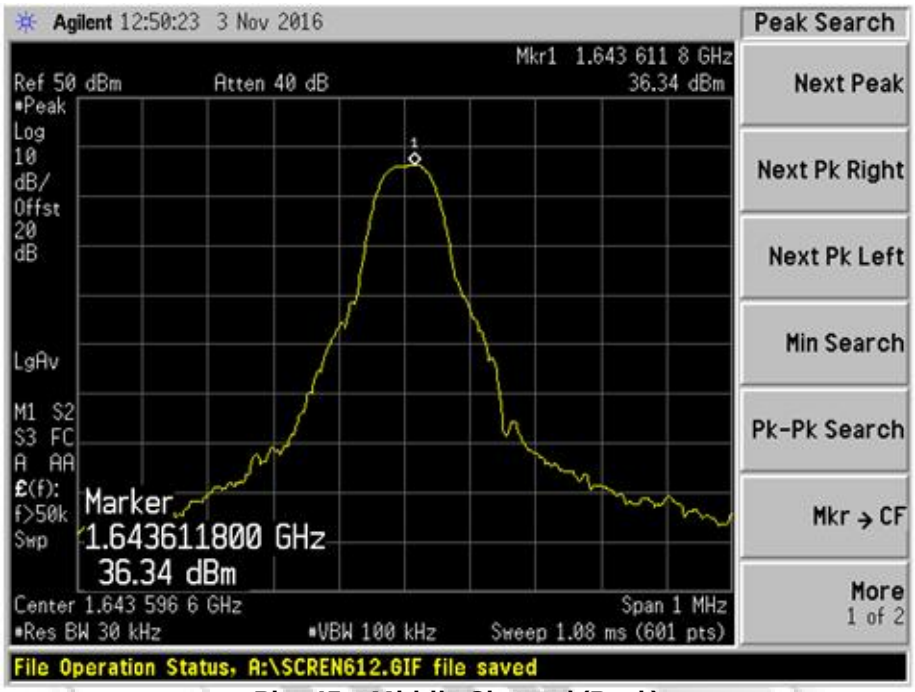


Plot 43 – Lower Channel (Peak)

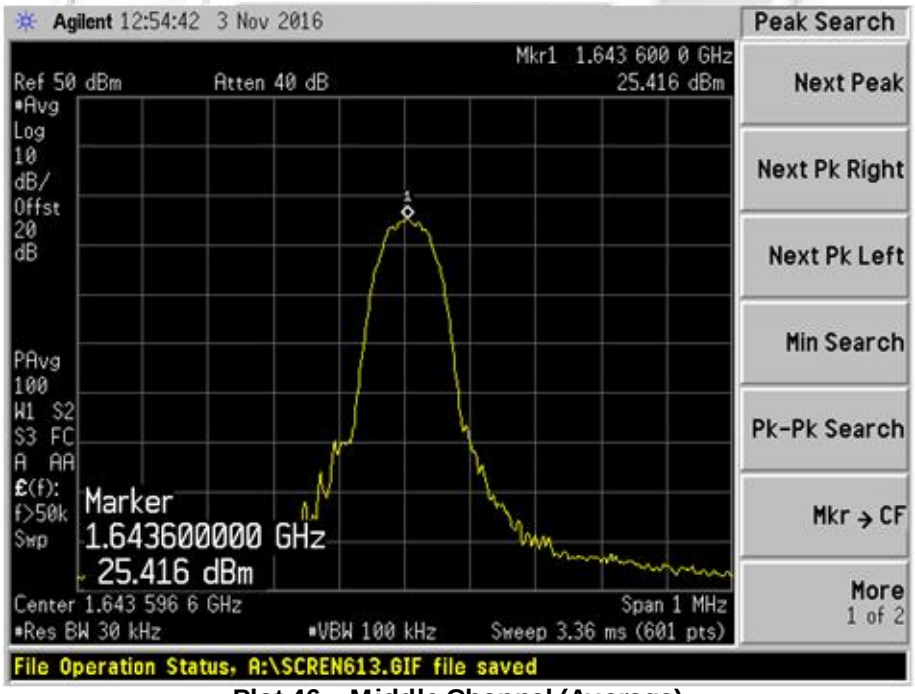


Plot 44 – Lower Channel (Average)

Output Power Plots – Bearer 7

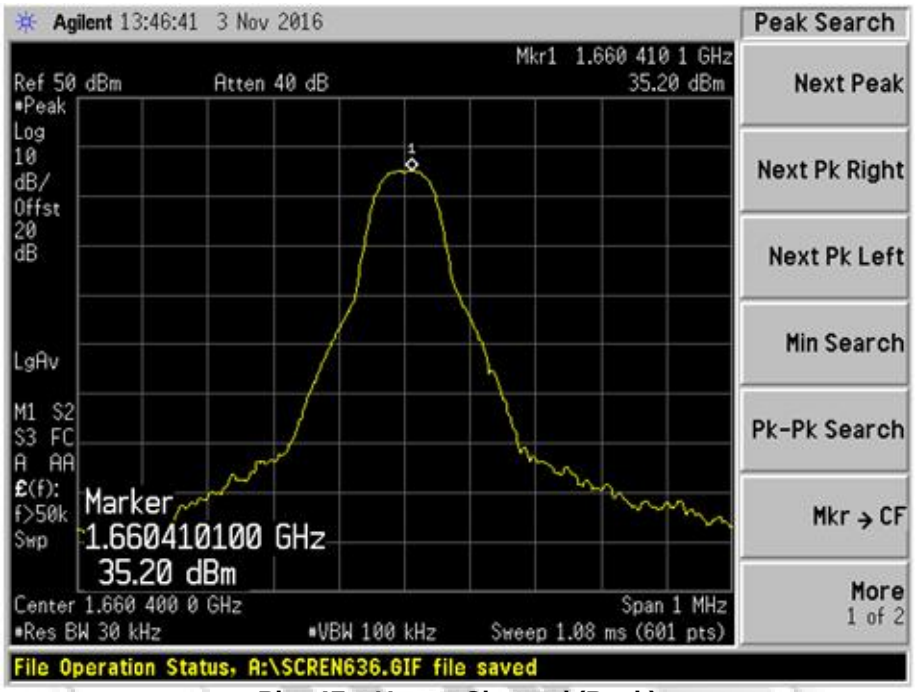


Plot 45 – Middle Channel (Peak)

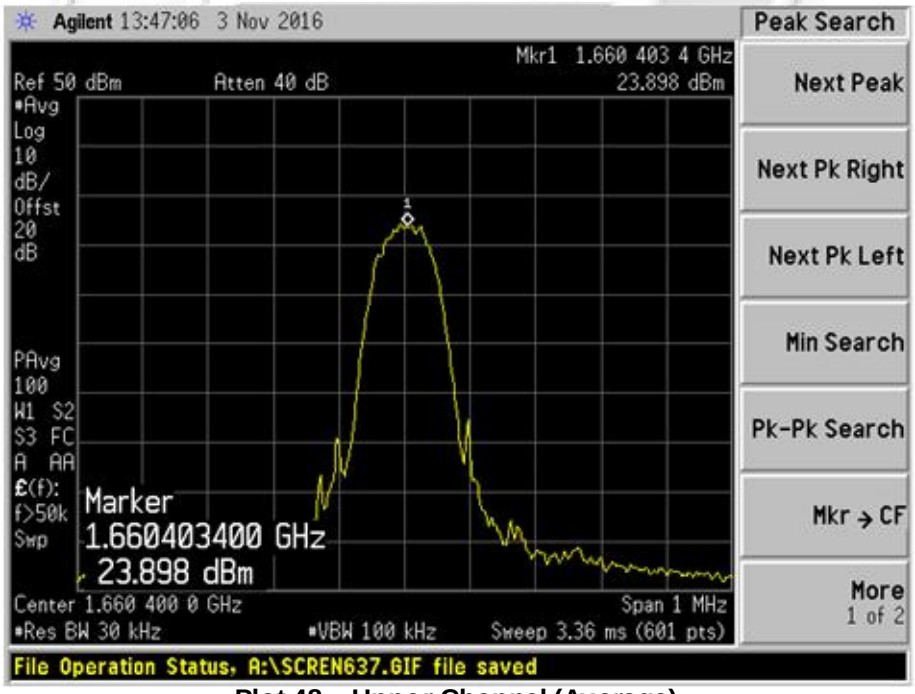


Plot 46 – Middle Channel (Average)

Output Power Plots – Bearer 7

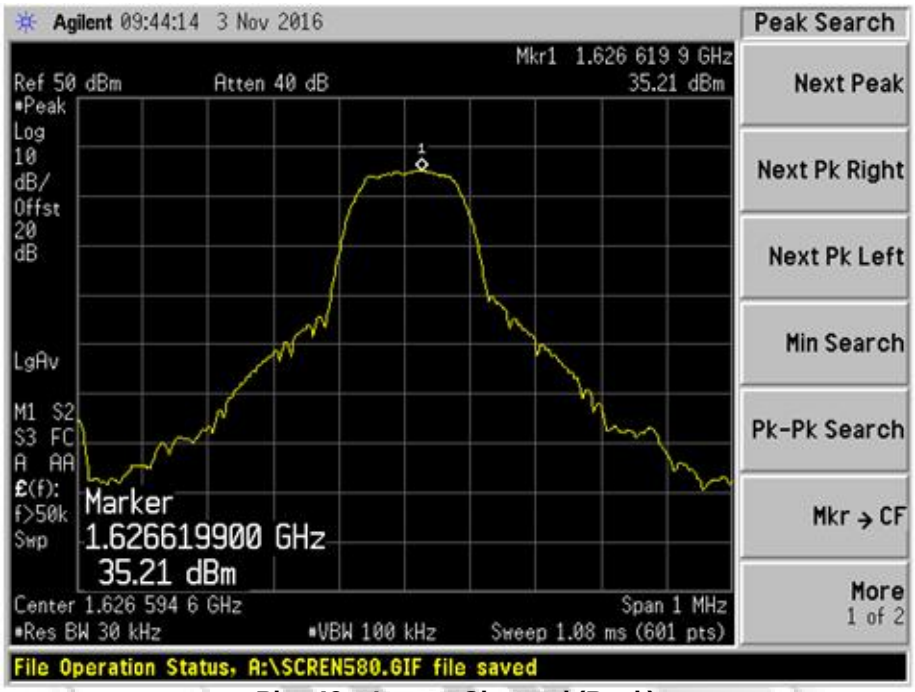


Plot 47 – Upper Channel (Peak)

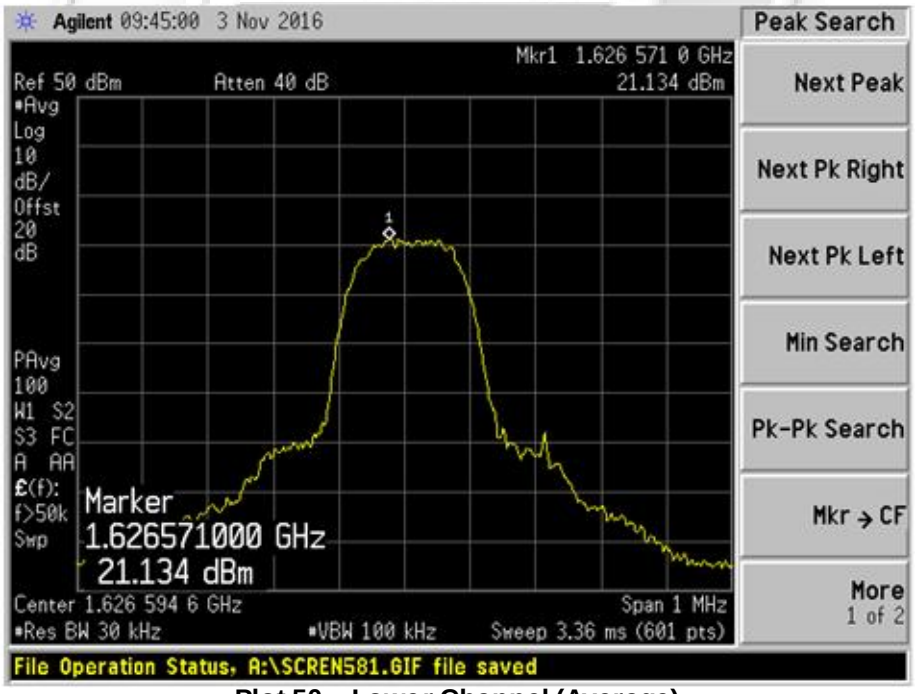


Plot 48 – Upper Channel (Average)

Output Power Plots – Bearer 8

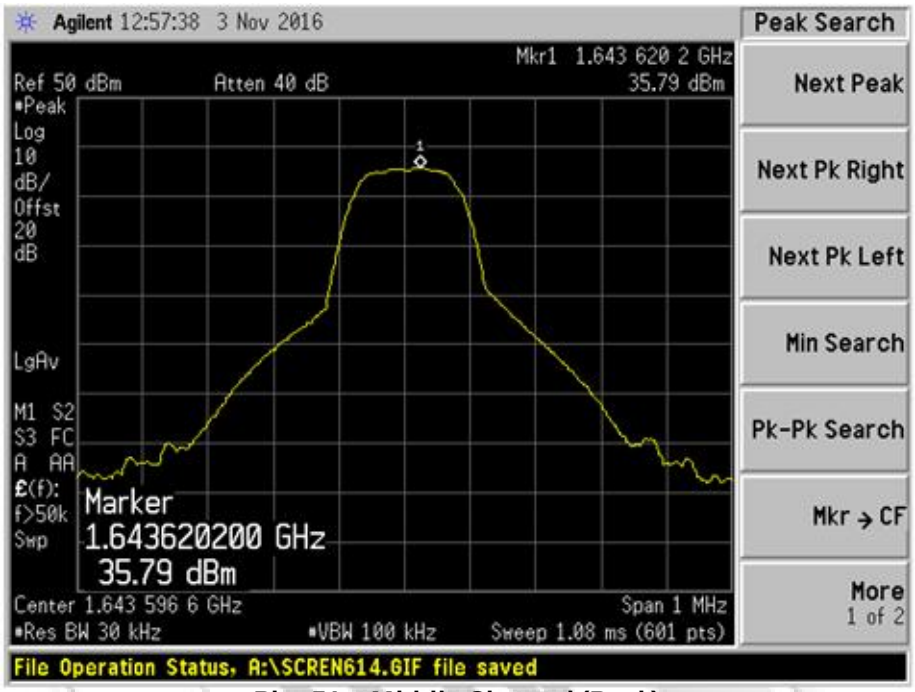


Plot 49 – Lower Channel (Peak)

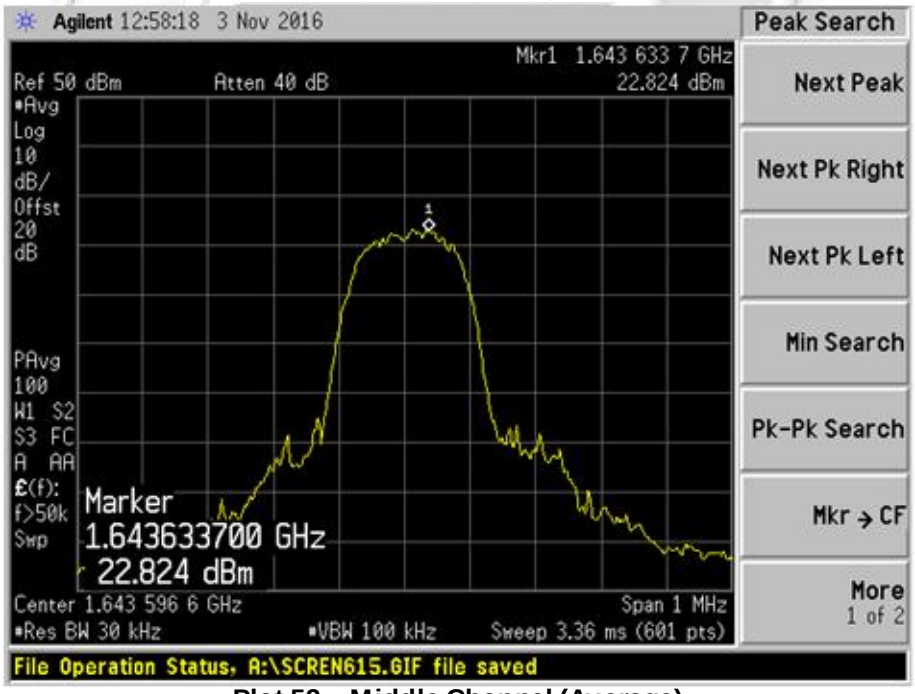


Plot 50 – Lower Channel (Average)

Output Power Plots – Bearer 8

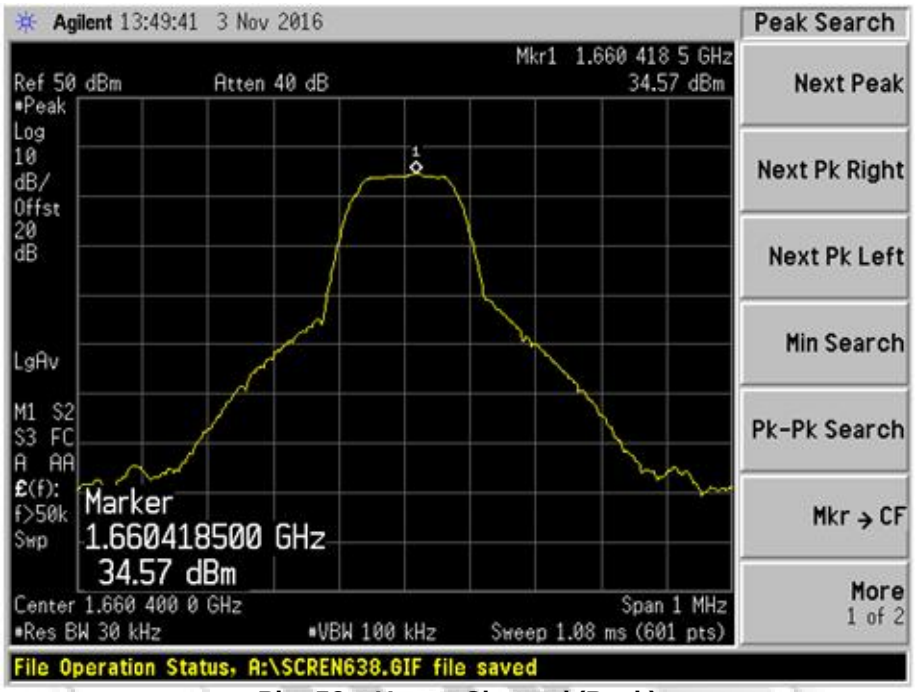


Plot 51 – Middle Channel (Peak)

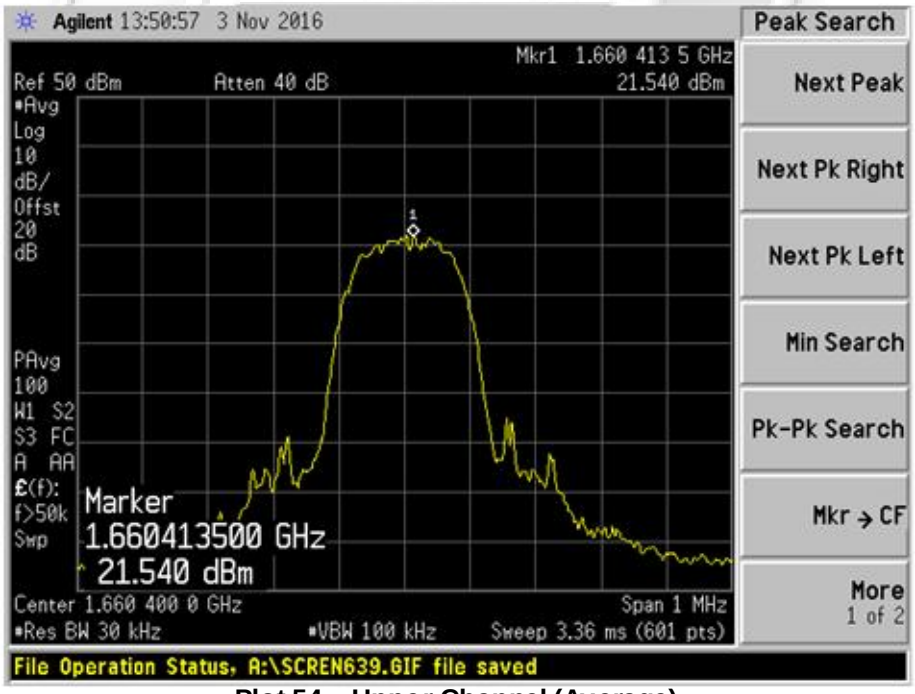


Plot 52 – Middle Channel (Average)

Output Power Plots – Bearer 8

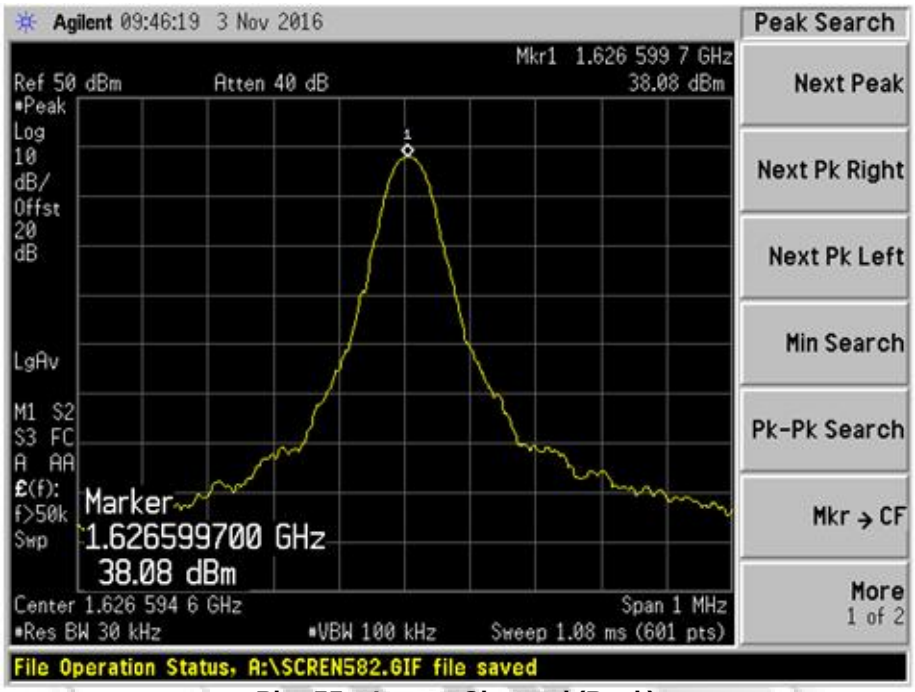


Plot 53 – Upper Channel (Peak)

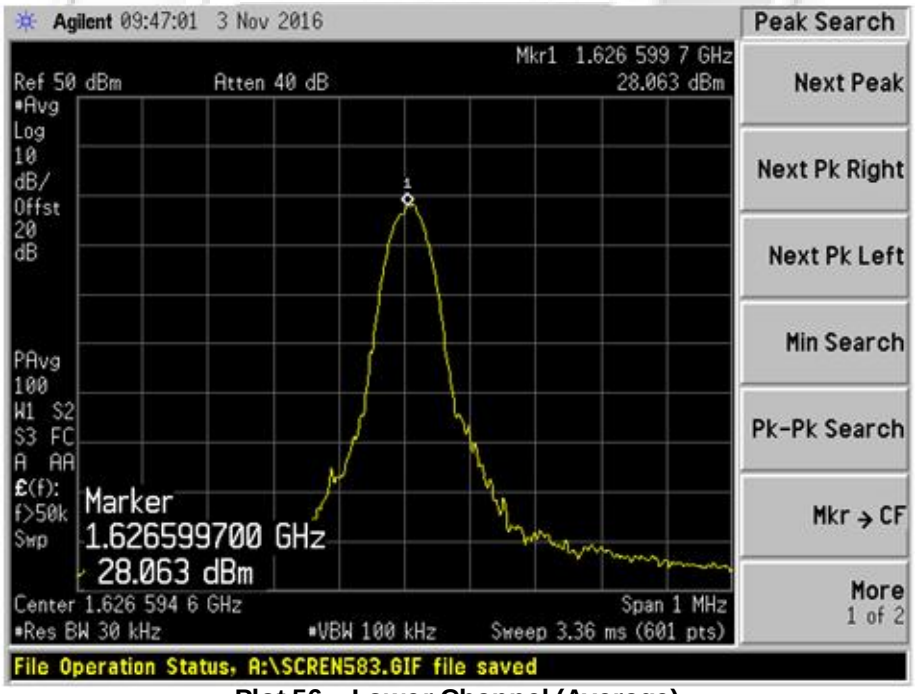


Plot 54 – Upper Channel (Average)

Output Power Plots – Bearer 9

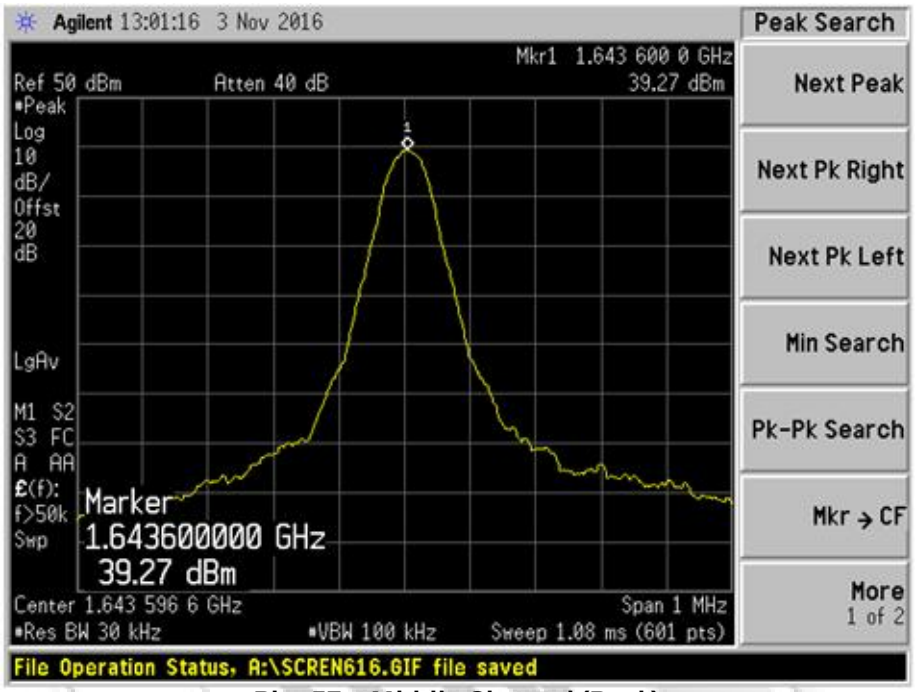


Plot 55 – Lower Channel (Peak)

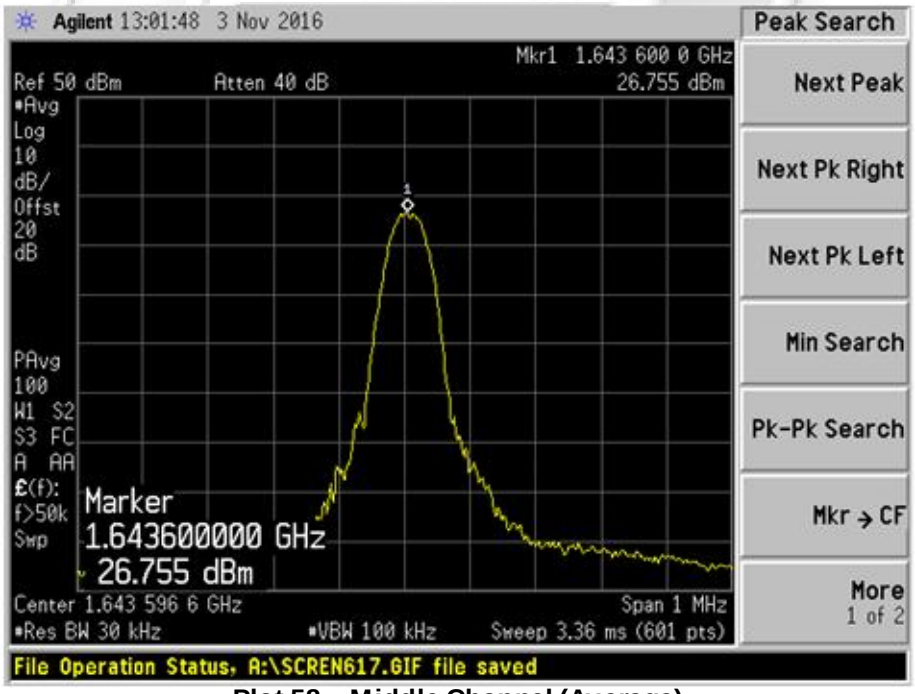


Plot 56 – Lower Channel (Average)

Output Power Plots – Bearer 9

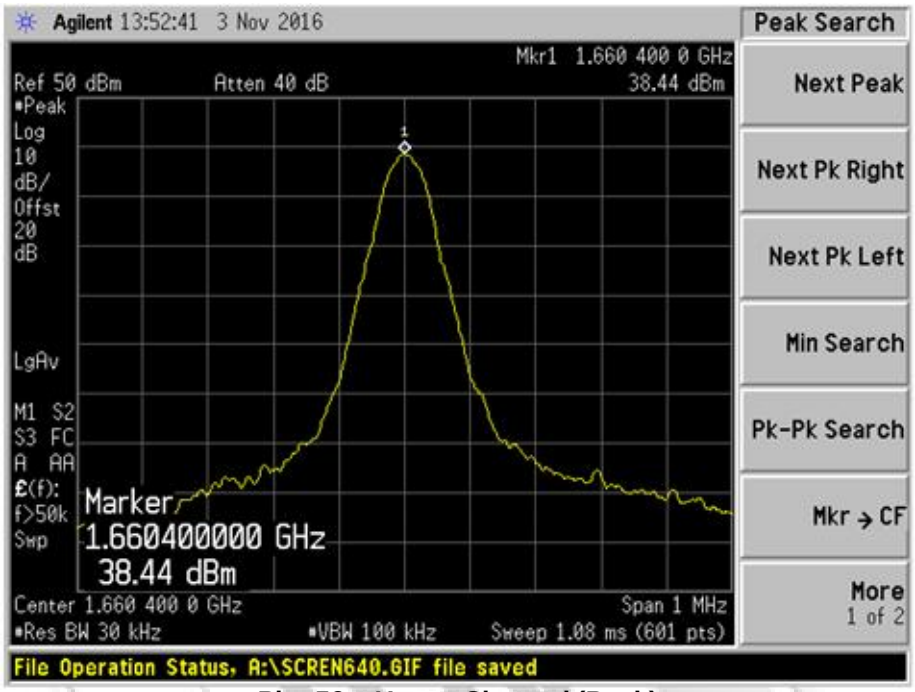


Plot 57 – Middle Channel (Peak)

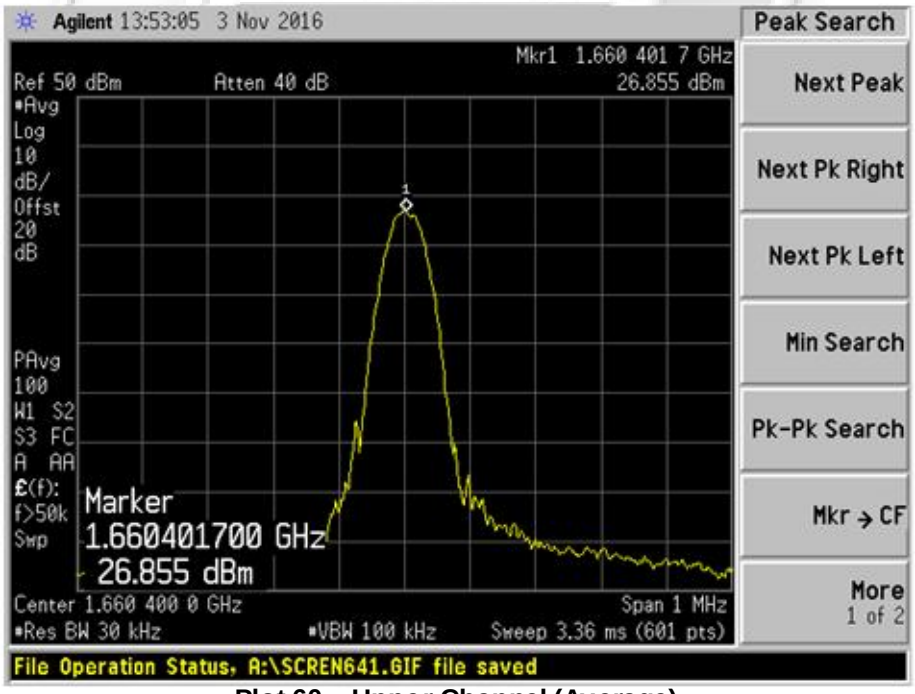


Plot 58 – Middle Channel (Average)

Output Power Plots – Bearer 9

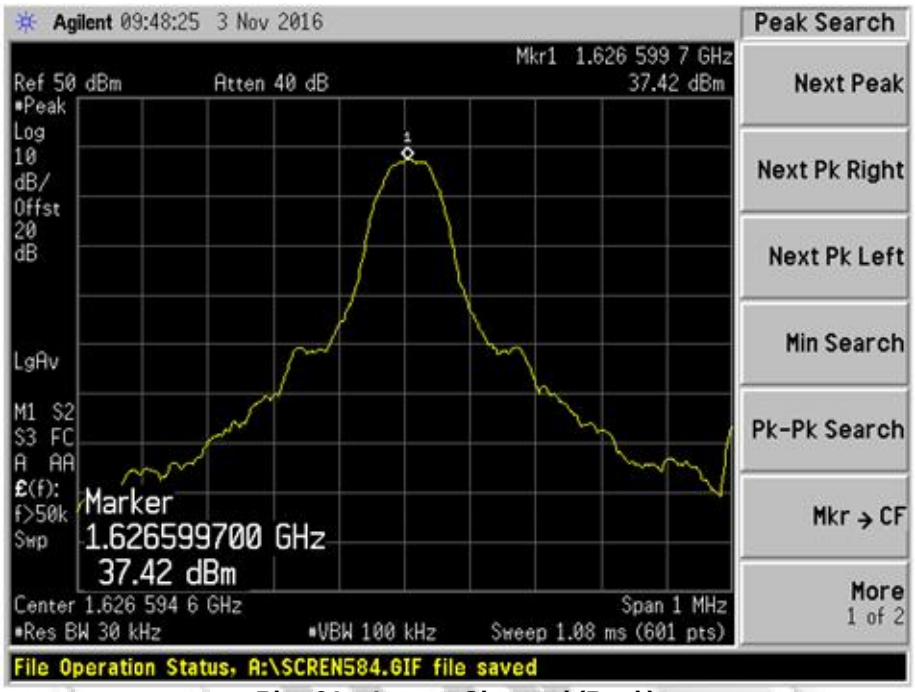


Plot 59 – Upper Channel (Peak)

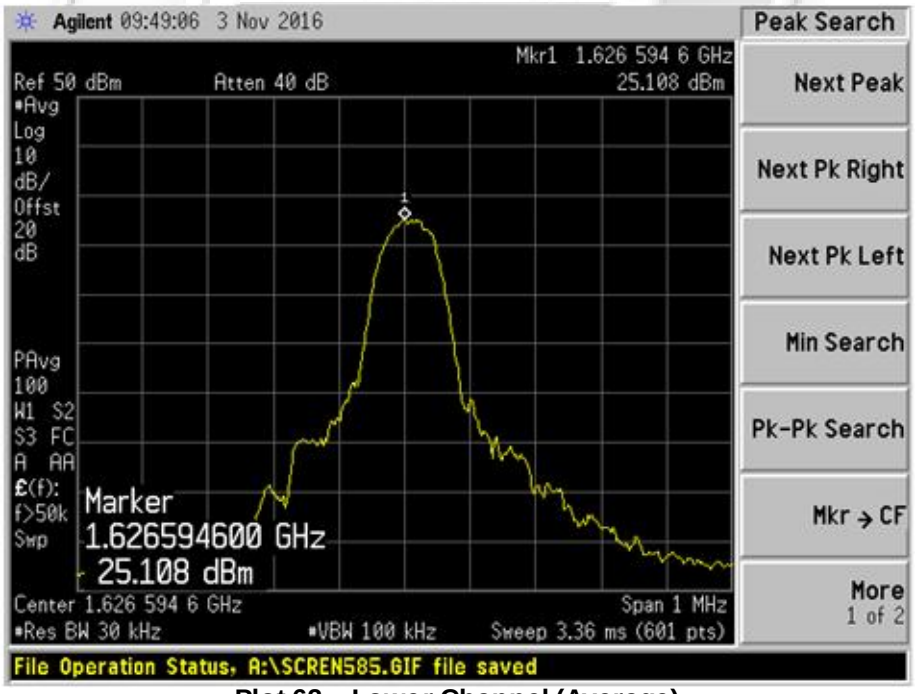


Plot 60 – Upper Channel (Average)

Output Power Plots – Bearer 10

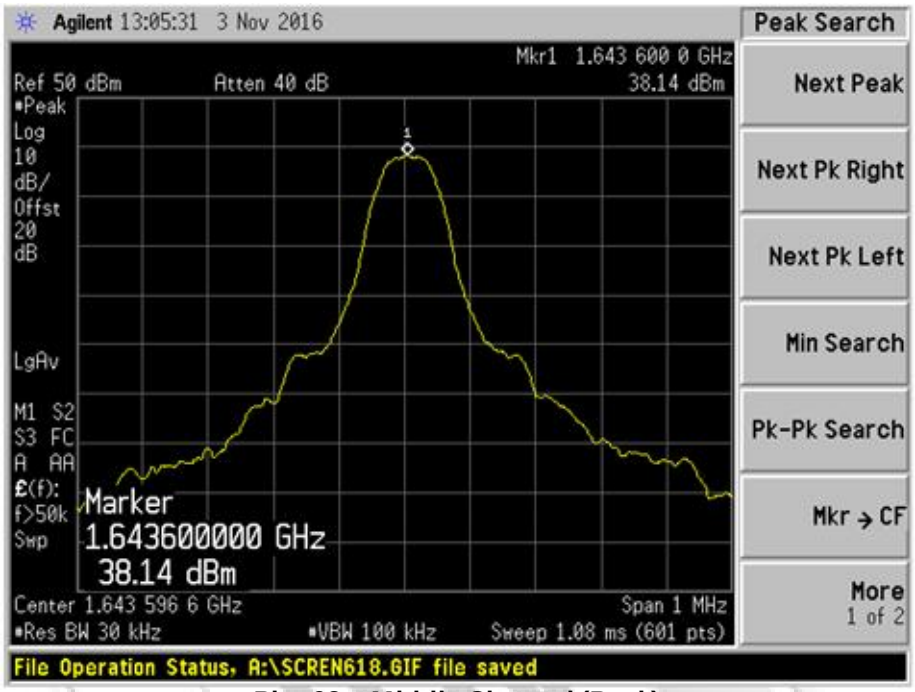


Plot 61 – Lower Channel (Peak)

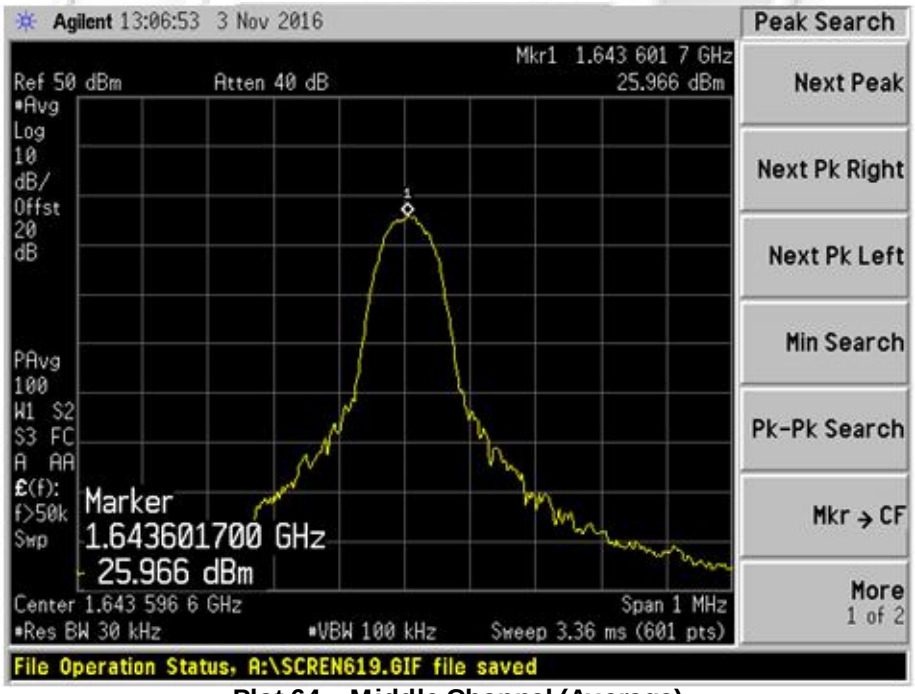


Plot 62 – Lower Channel (Average)

Output Power Plots – Bearer 10

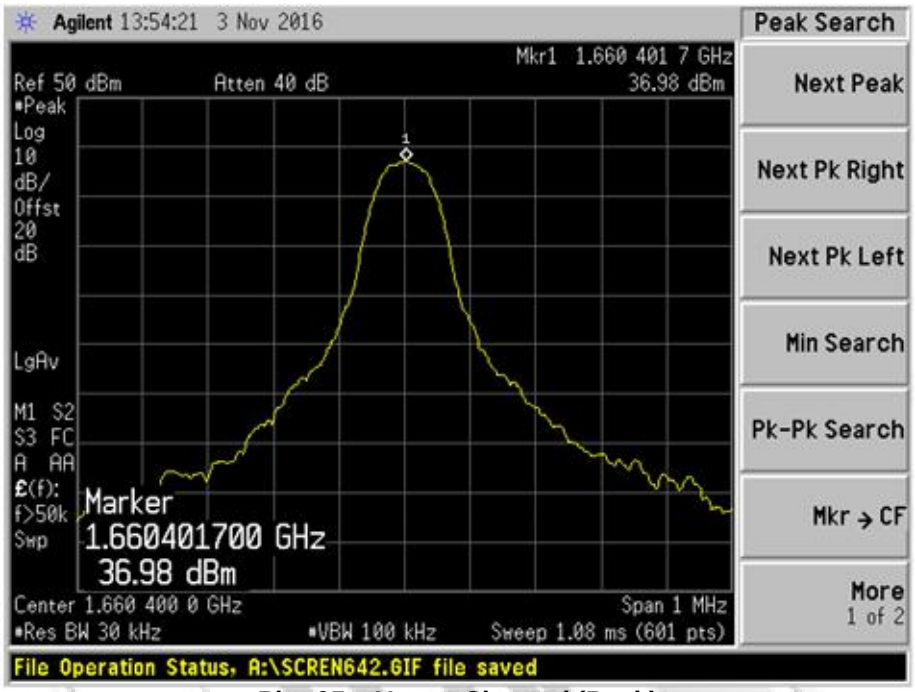


Plot 63 – Middle Channel (Peak)

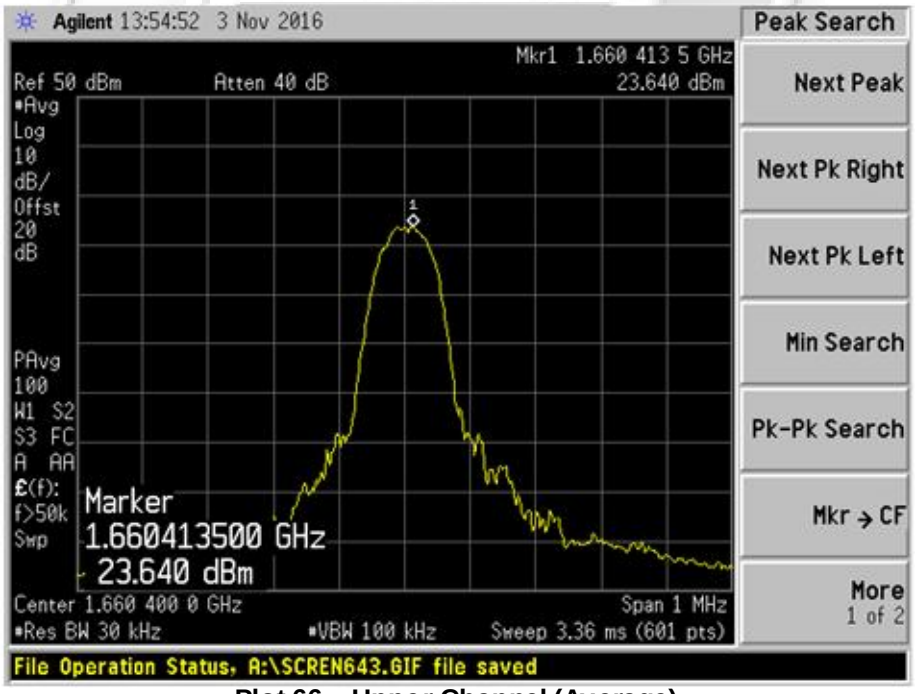


Plot 64 – Middle Channel (Average)

Output Power Plots – Bearer 10

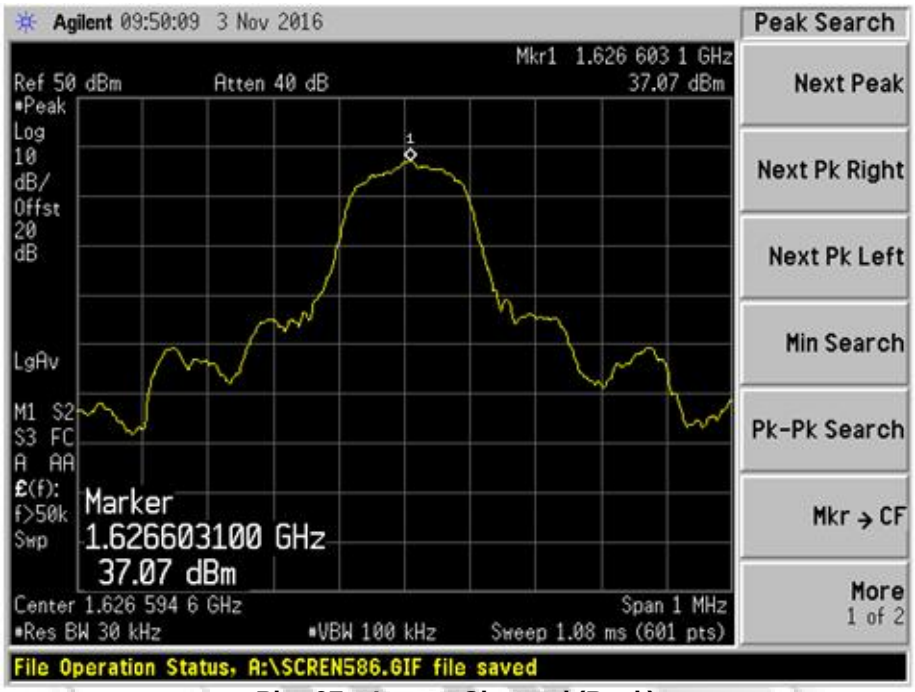


Plot 65 – Upper Channel (Peak)

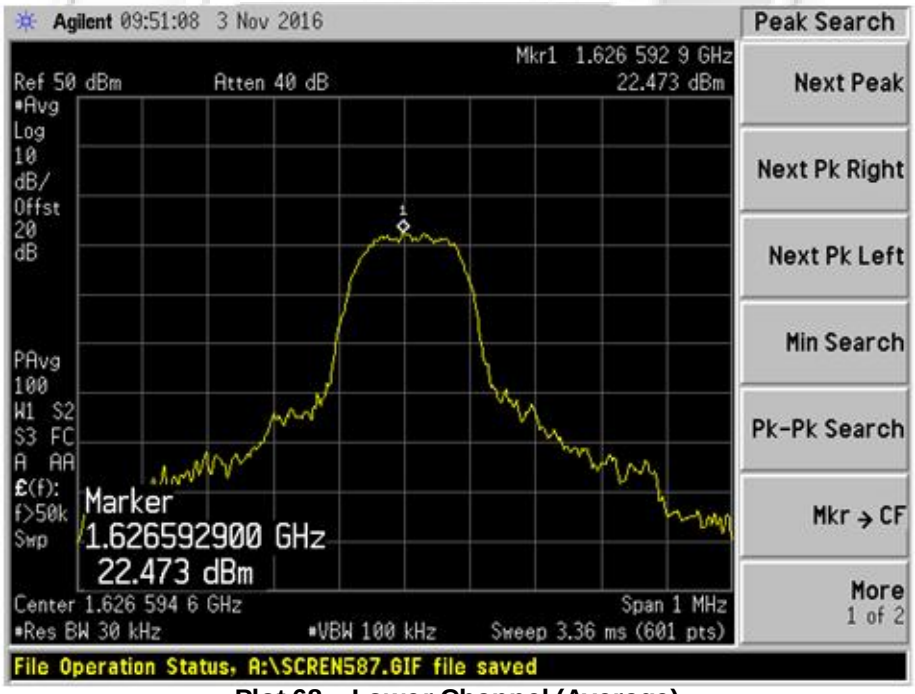


Plot 66 – Upper Channel (Average)

Output Power Plots – Bearer 11

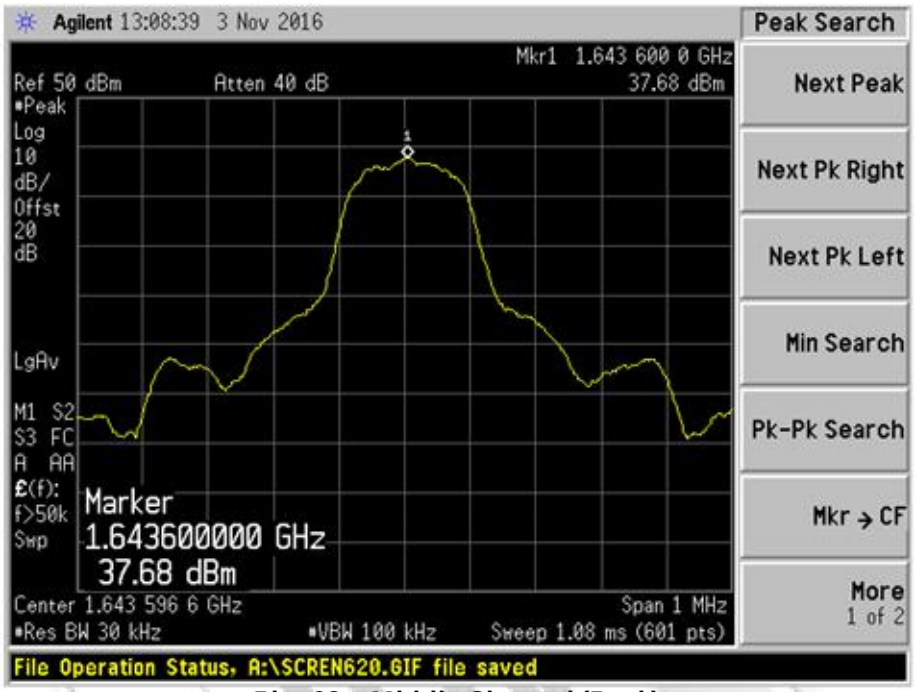


Plot 67 – Lower Channel (Peak)

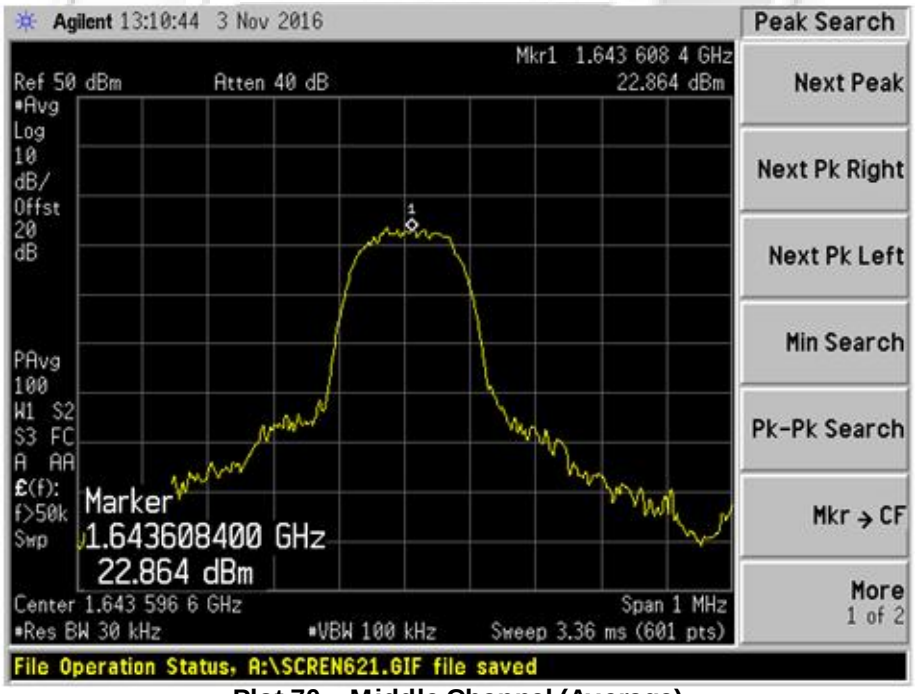


Plot 68 – Lower Channel (Average)

Output Power Plots – Bearer 11

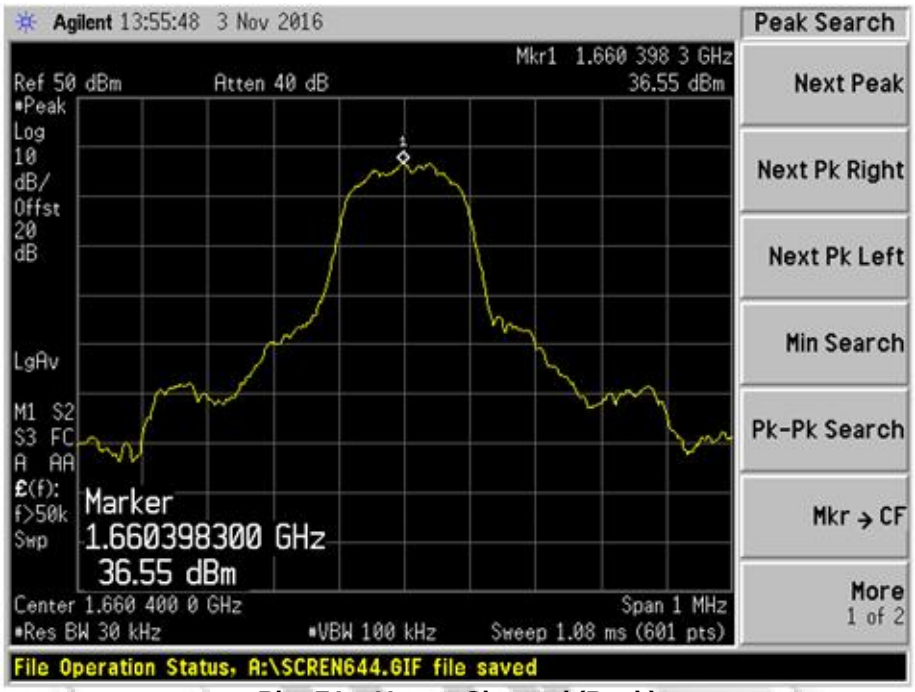


Plot 69 – Middle Channel (Peak)

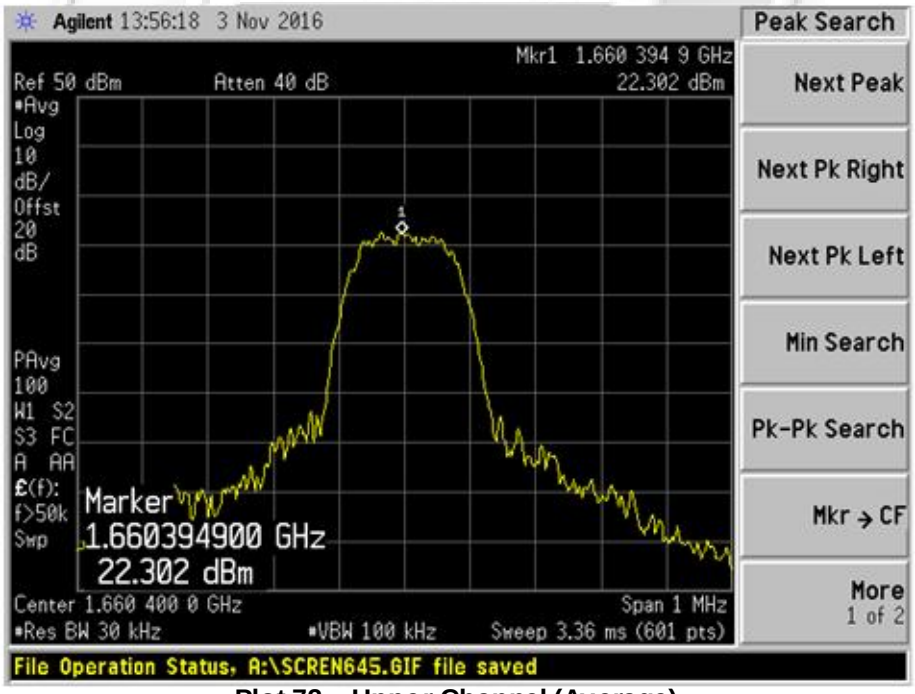


Plot 70 – Middle Channel (Average)

Output Power Plots – Bearer 11



Plot 71 – Upper Channel (Peak)



Plot 72 – 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	10 Dec 2017

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 Transmission	Temperature	24°C
Test Input Power	12Vdc	Relative Humidity	60%
Antenna Gain	12.0dBi	Atmospheric Pressure	1030mbar
Attached Plots	73 – 108 (26dB Bandwidth) 109 – 144 (In Band Emissions) 145 – 216 (Out of Band Spurious)	Tested By	Chang Wai Kit

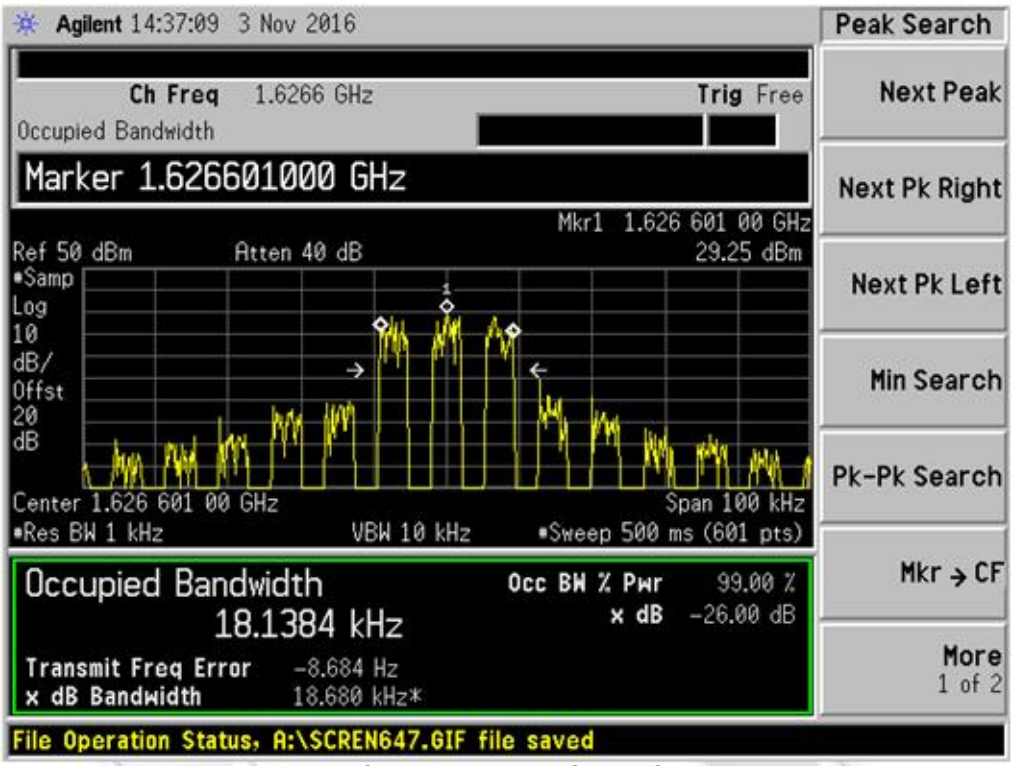
All emissions are within the emission mask. Please refer to the attached plots.

Notes

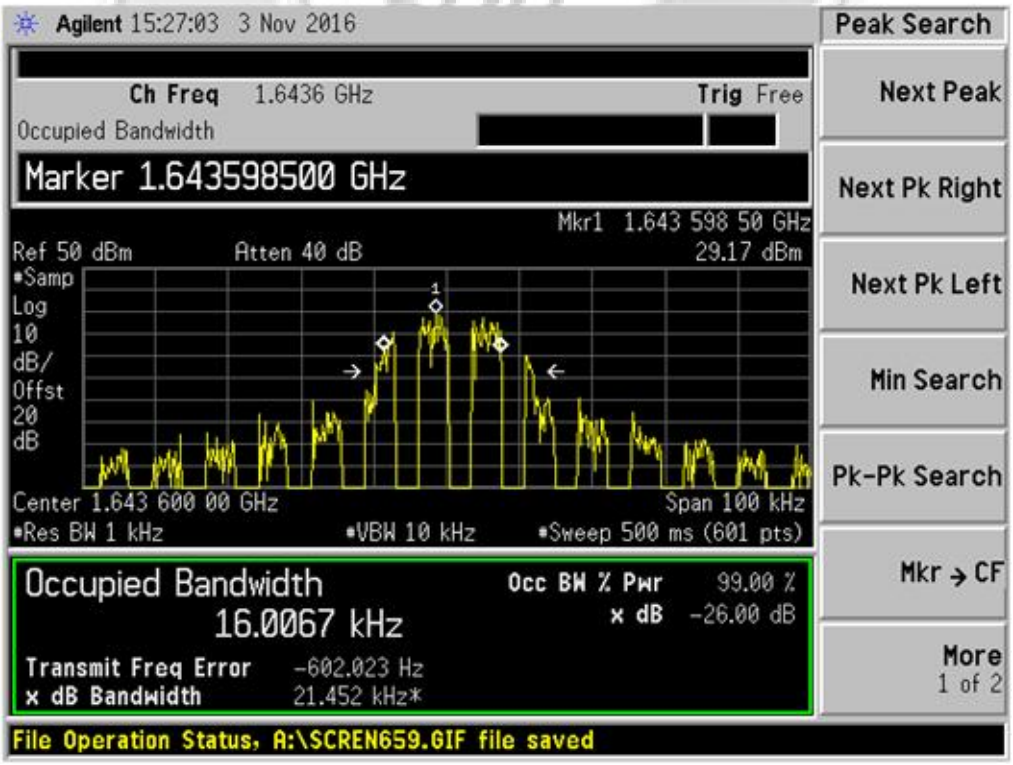
1. The Resolution Bandwidth (RBW) was corrected from 4kHz by $10\log_{10}$ [(used RBW) / 4kHz].
2. Emission limits are computed based on following:
   a. Emissions Limits (dBm) (50% - 100% authorised bandwidth) = P - 25 + CF
   b. Emissions Limits (dBm) (100% - 250% authorised bandwidth) = P - 35 + CF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

26dB Bandwidth Plots (Bearer Type: 0)

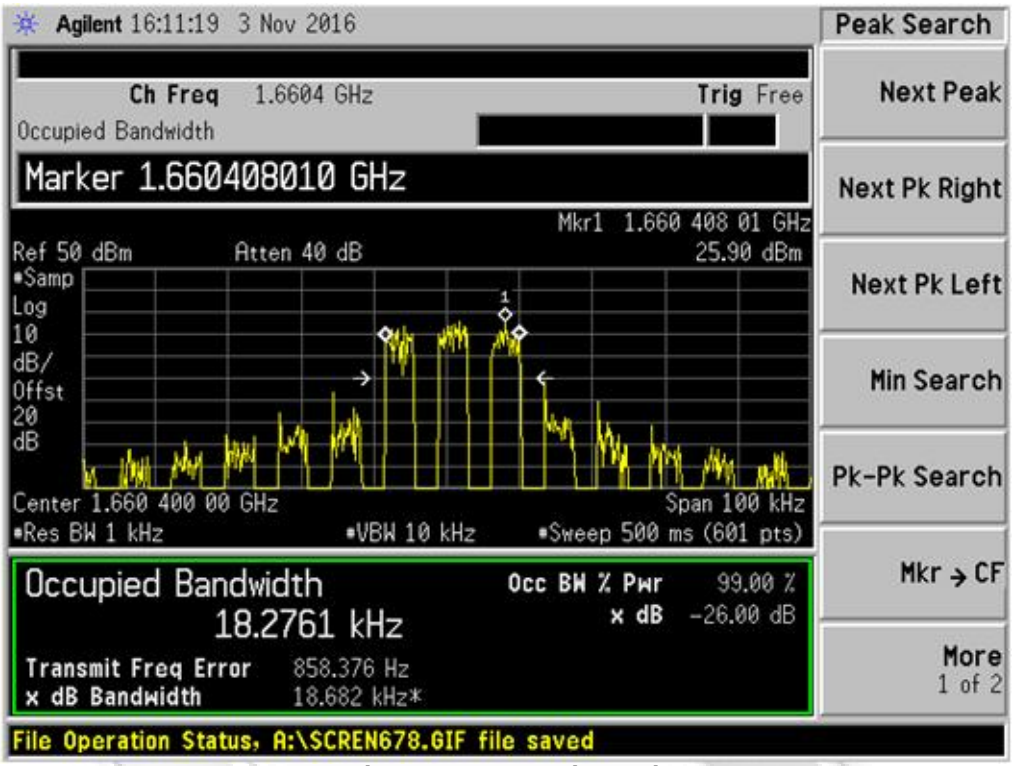


Plot 73 – Lower Channel



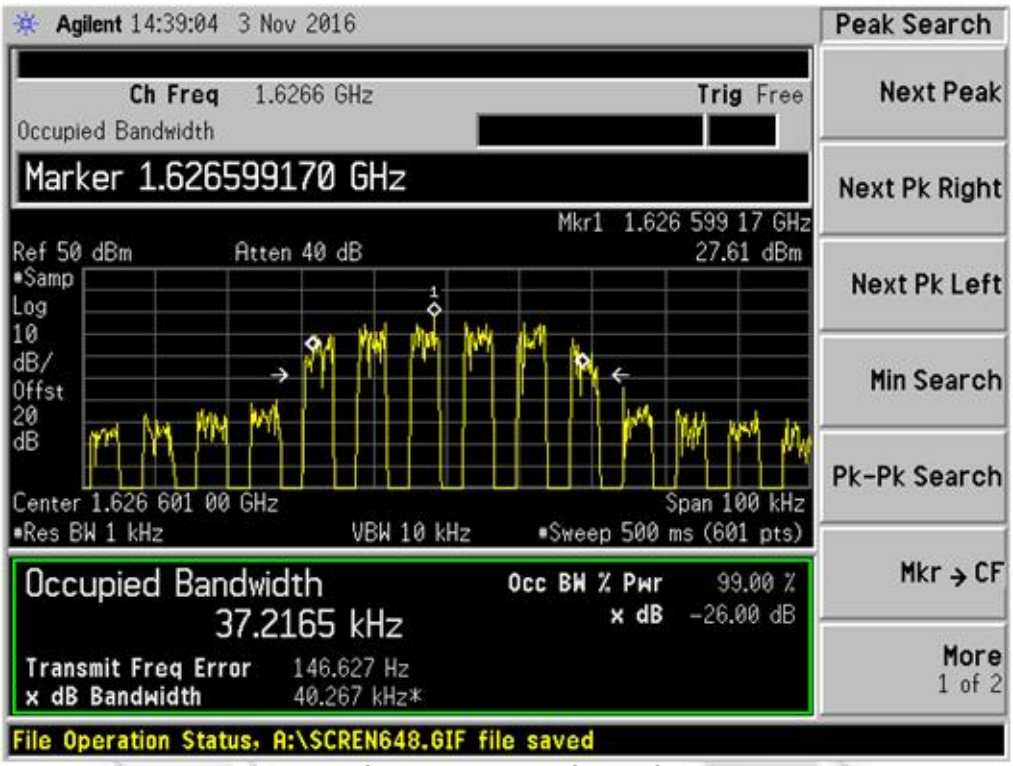
Plot 74 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 0)

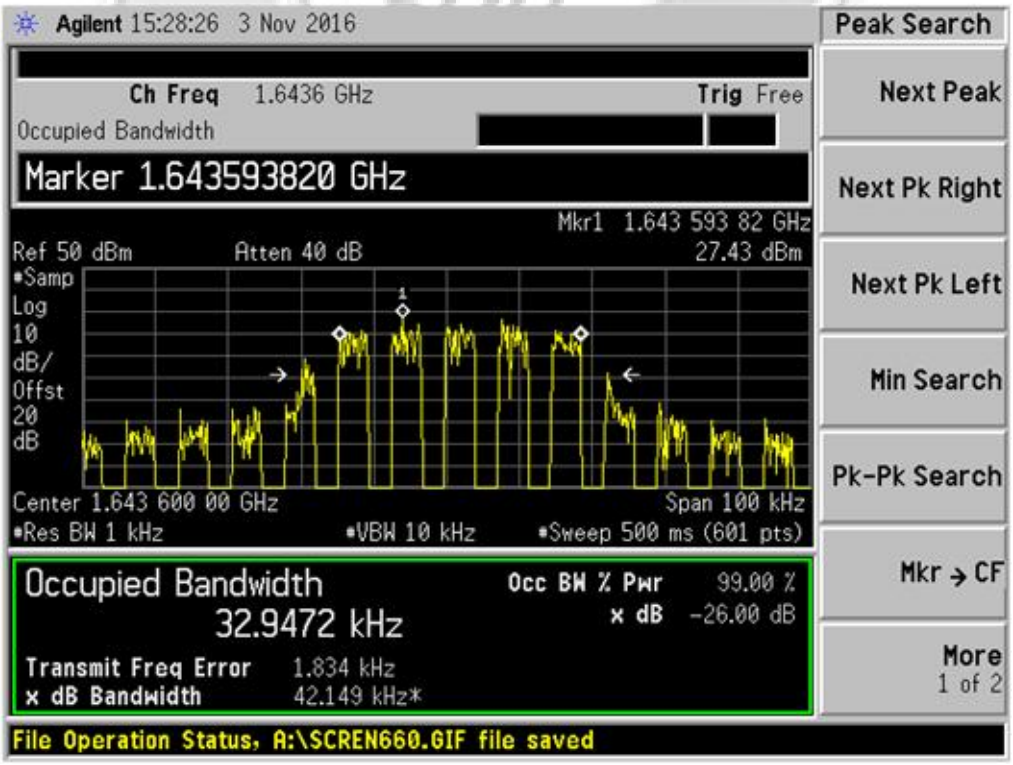


Plot 75 – Upper Channel

26dB Bandwidth Plots (Bearer Type: 1)

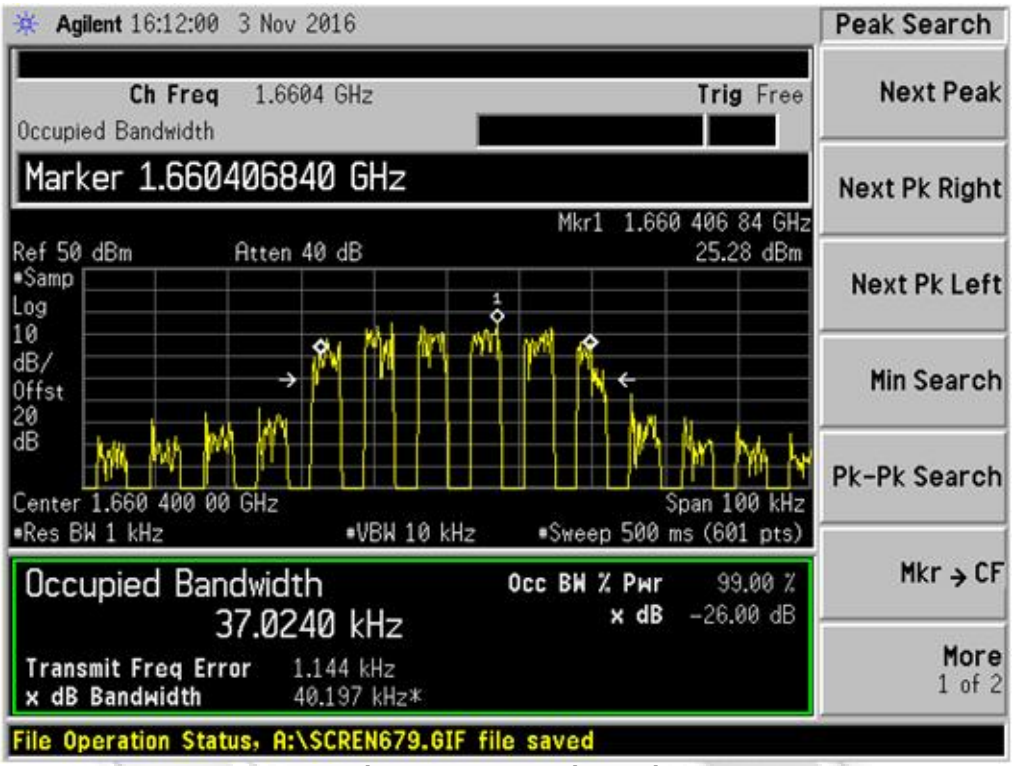


Plot 76 – Lower Channel



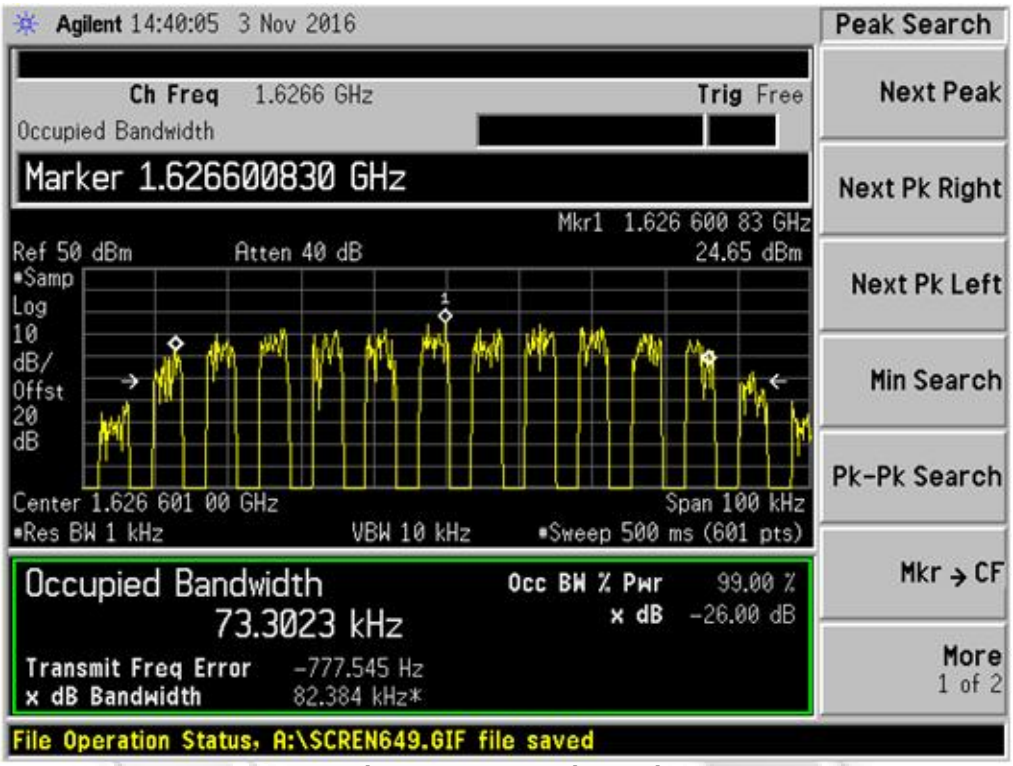
Plot 77 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 1)

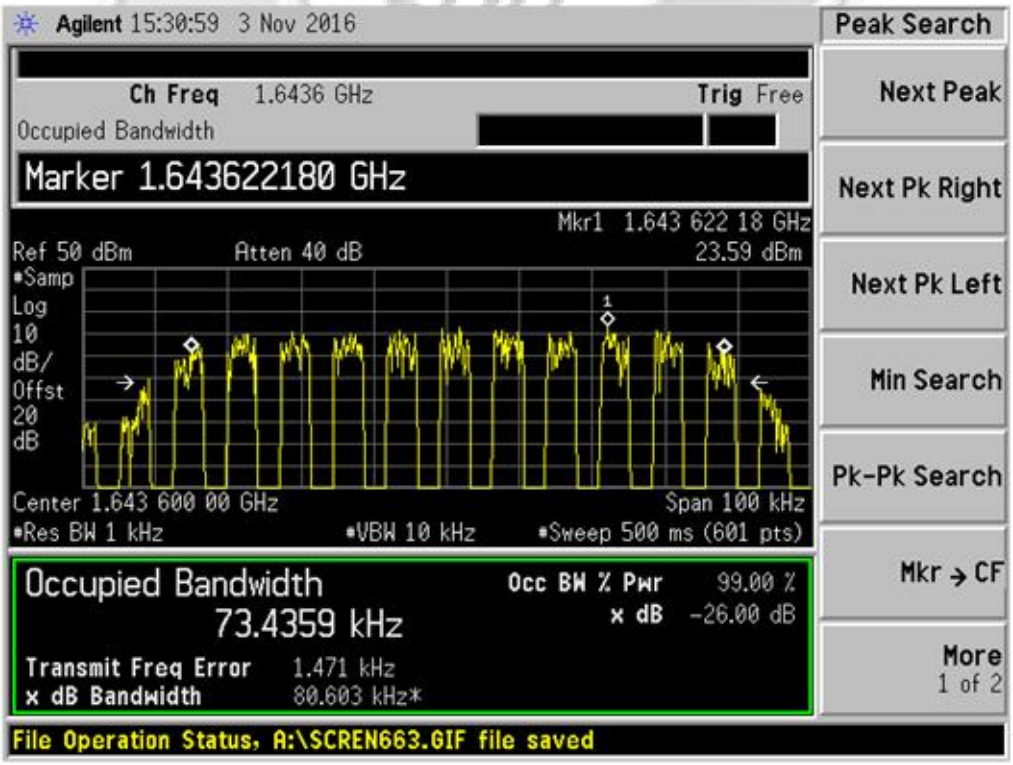


Plot 78 – Upper Channel

26dB Bandwidth Plots (Bearer Type: 2)

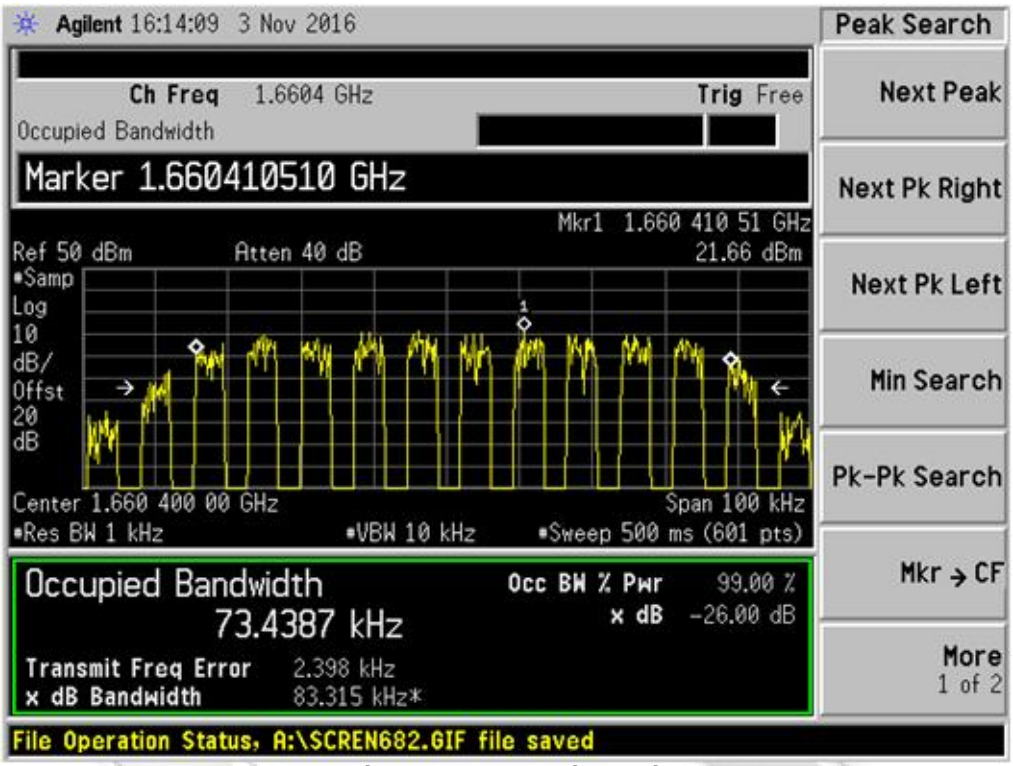


Plot 79 – Lower Channel



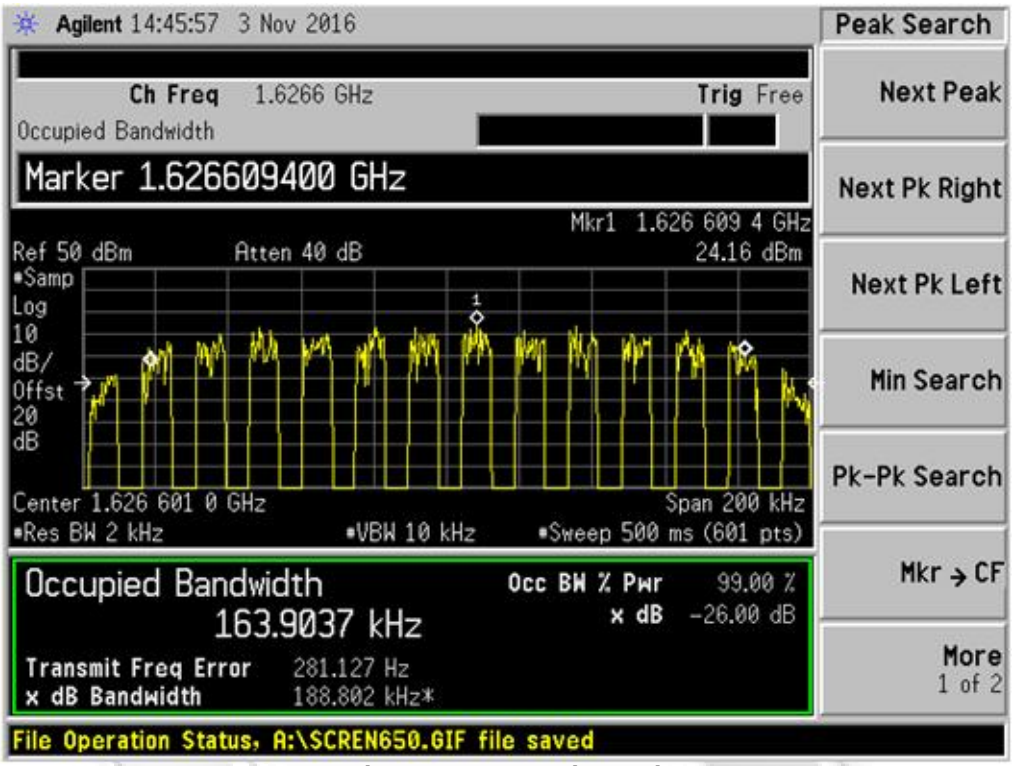
Plot 80 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 2)

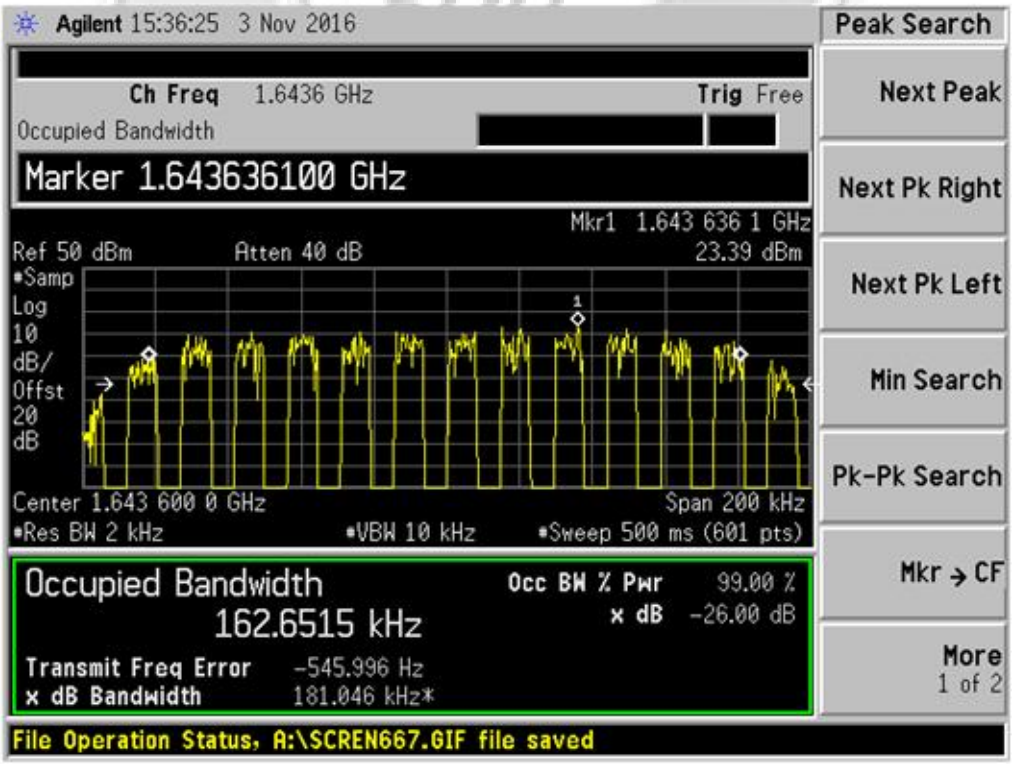


Plot 81 – Upper Channel

26dB Bandwidth Plots (Bearer Type : 3)

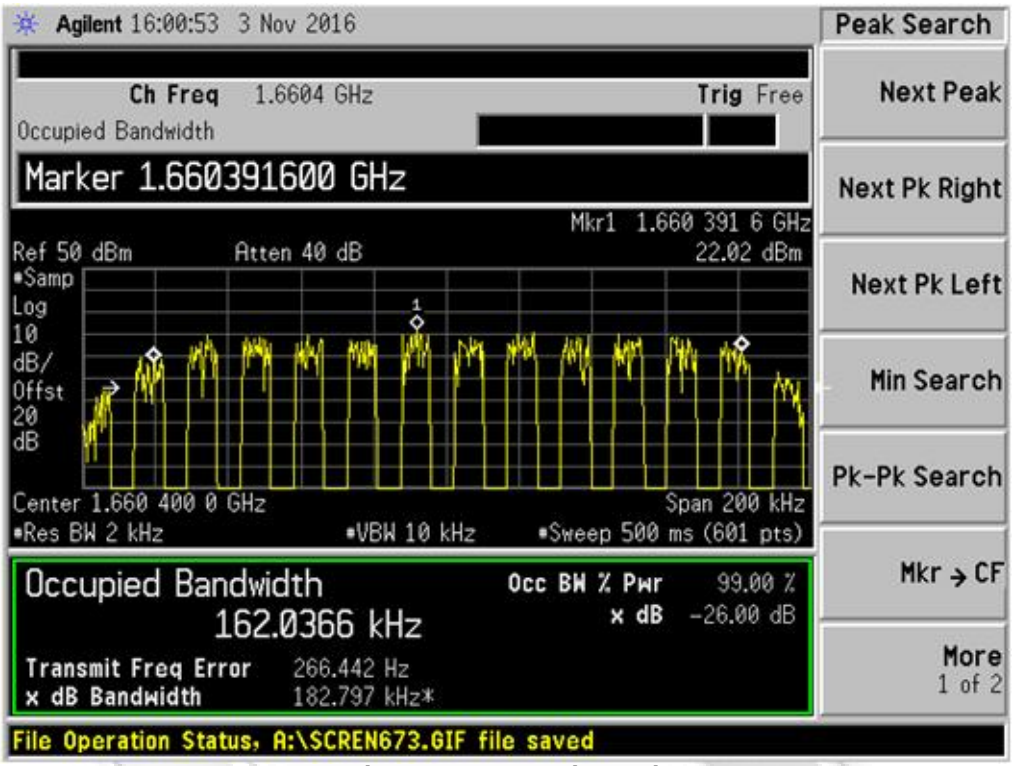


Plot 82 – Lower Channel



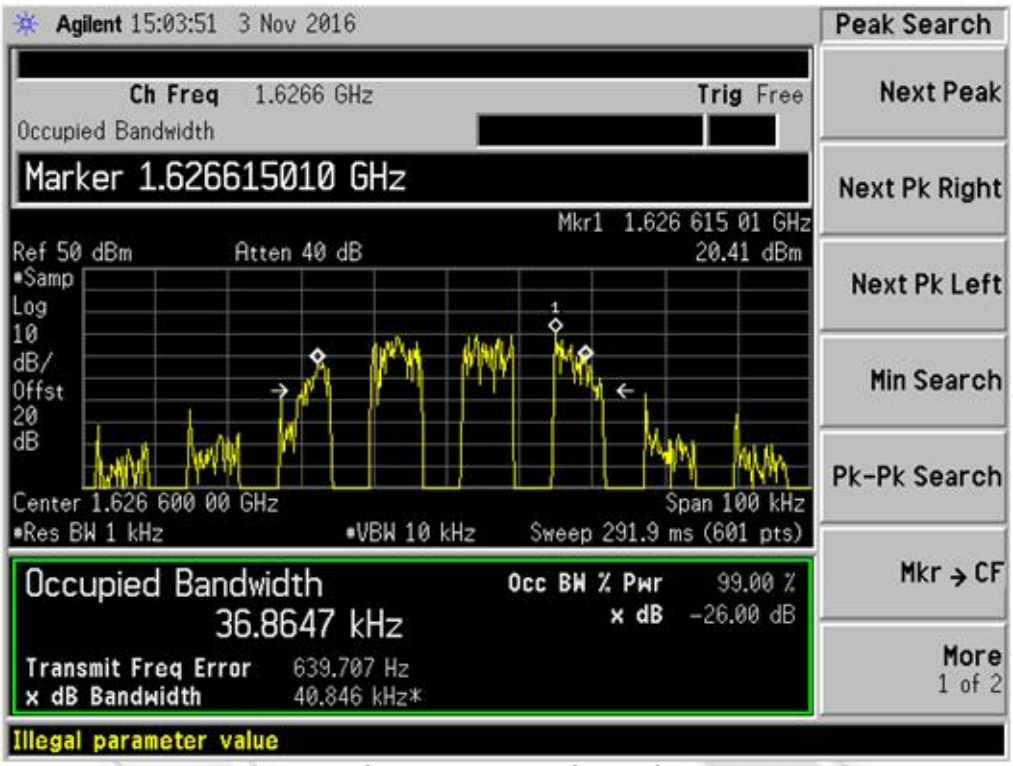
Plot 83 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 3)

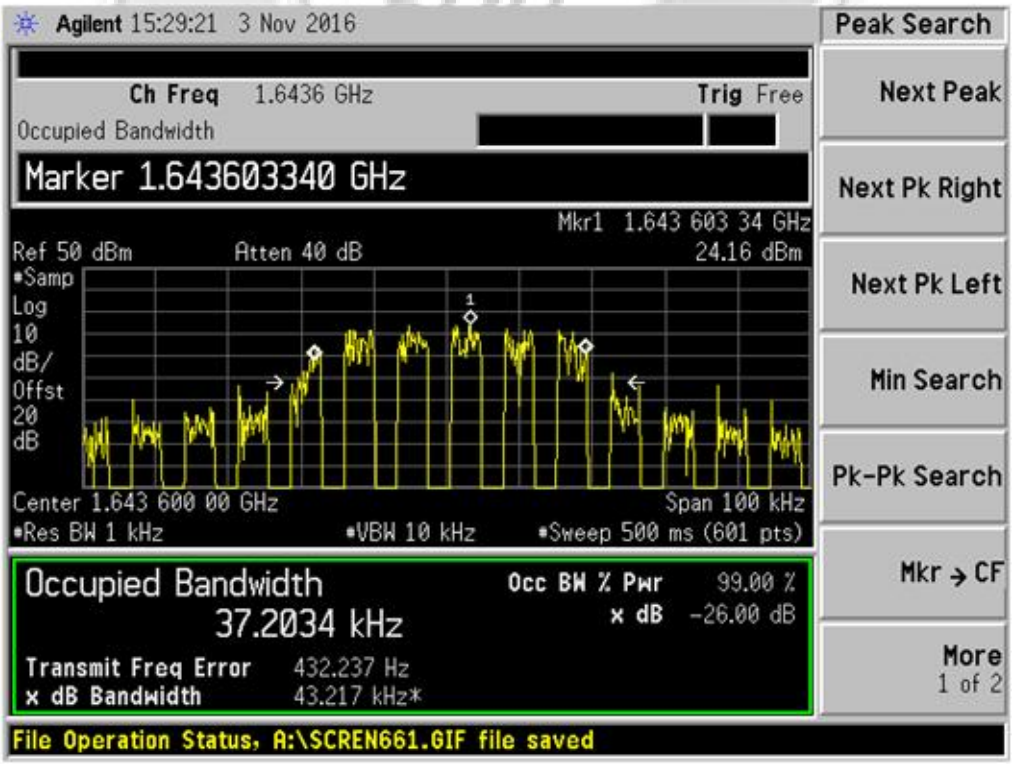


Plot 84 – Upper Channel

26dB Bandwidth Plots (Bearer Type : 4)

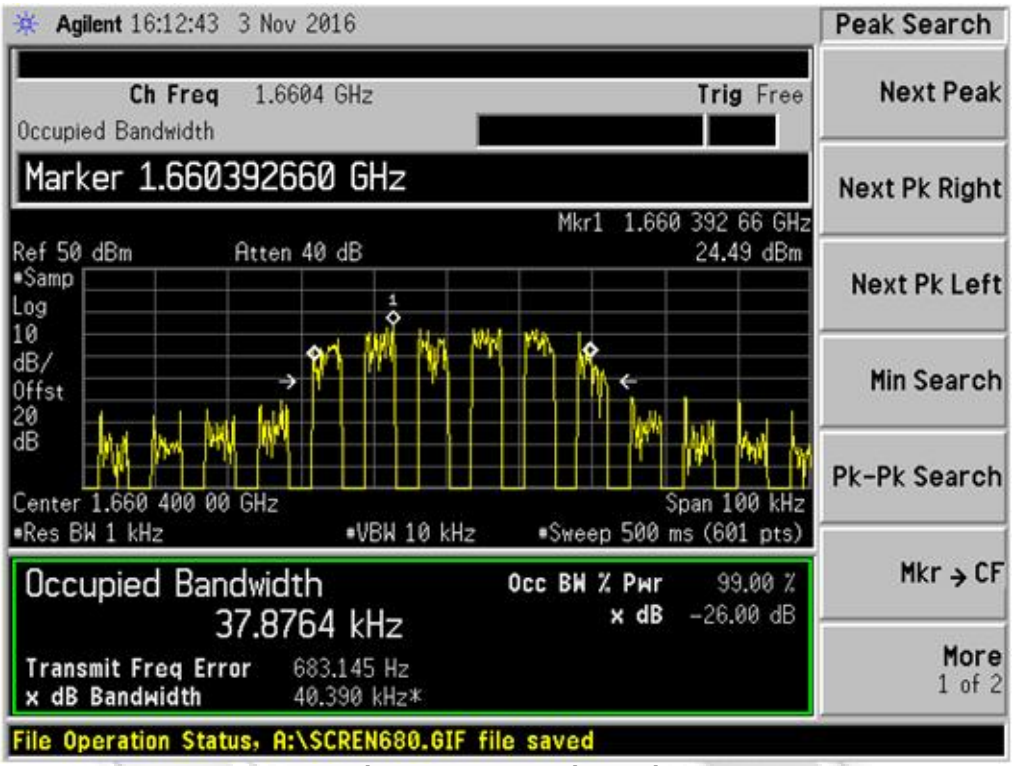


Plot 85 – Lower Channel



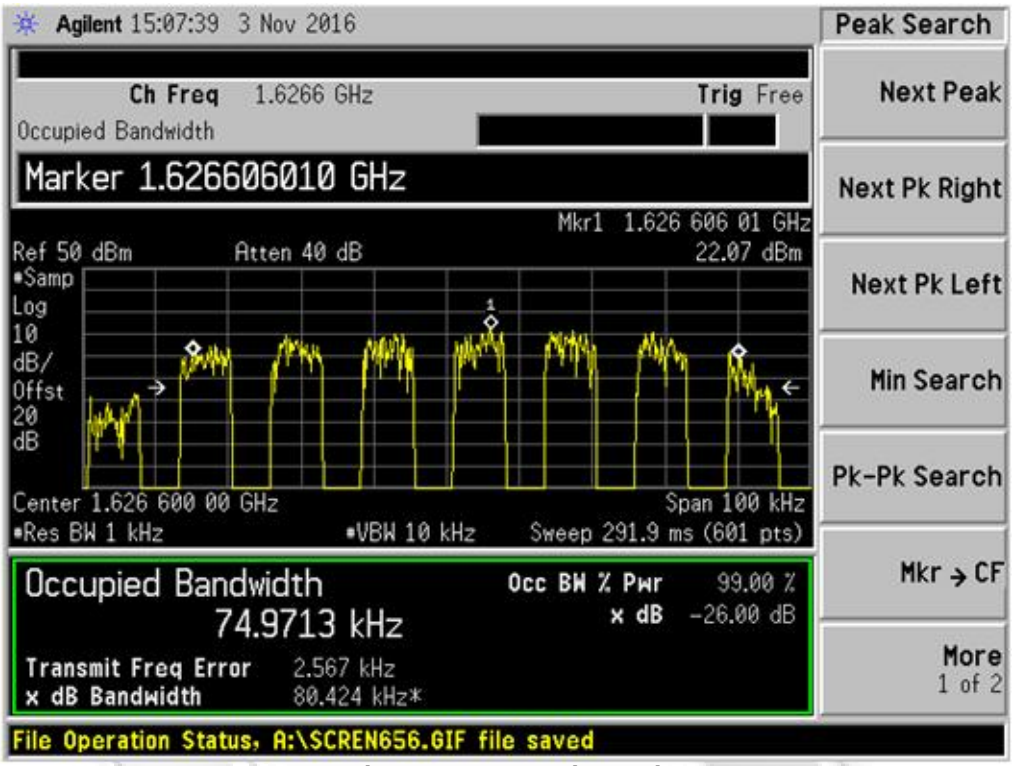
Plot 86 – Middle Channel

26dB Bandwidth Plots (Bearer Type : 4)

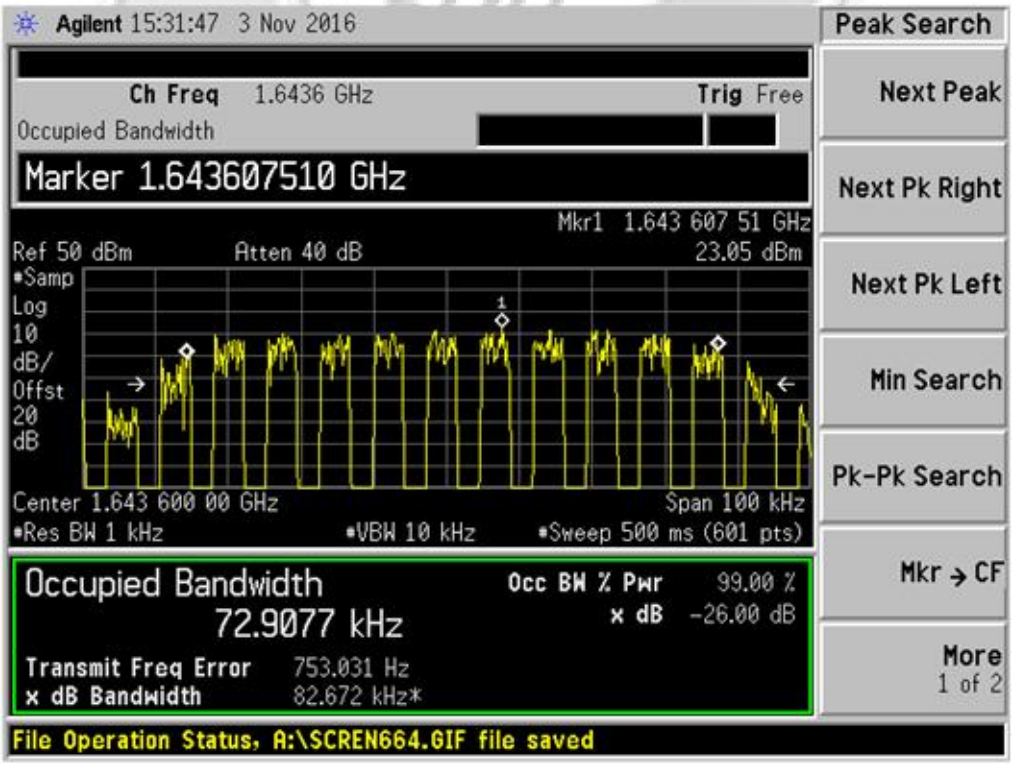


Plot 87 – Upper Channel

26dB Bandwidth Plots (Bearer Type : 5)

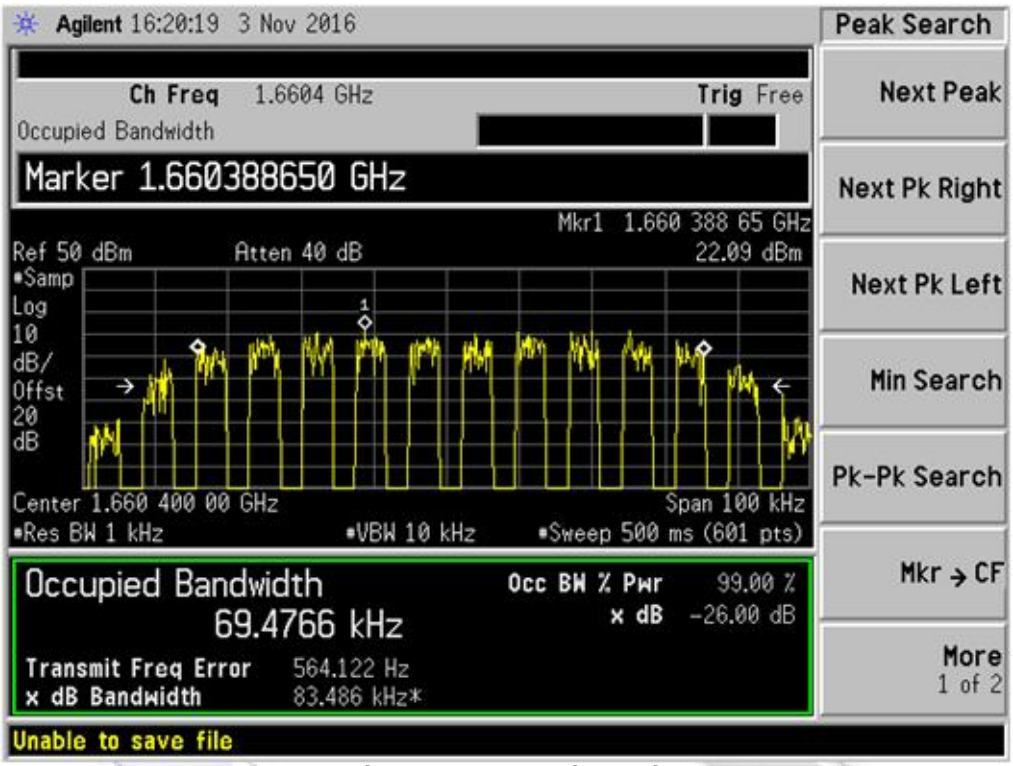


Plot 88 – Lower Channel



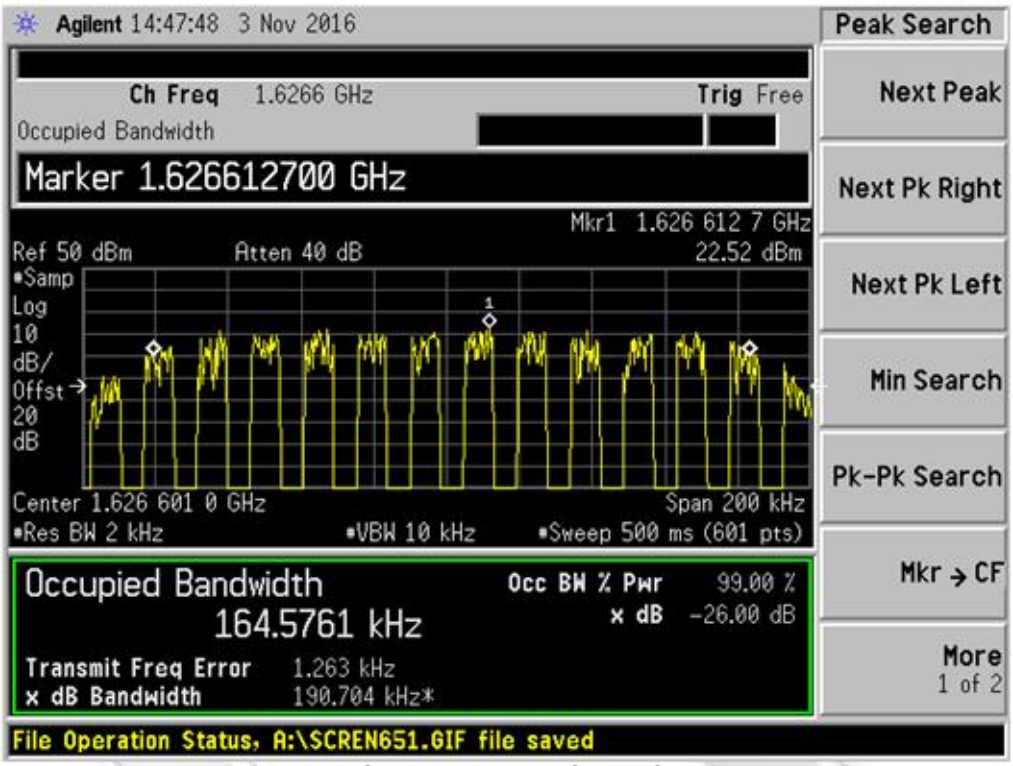
Plot 89 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 5)

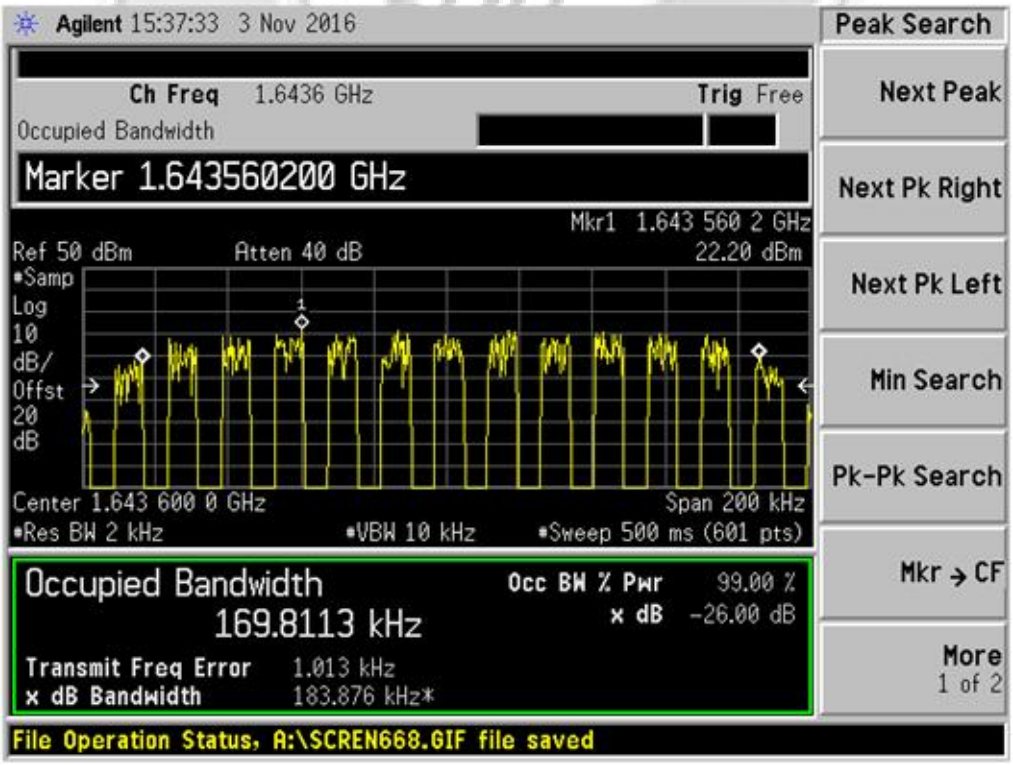


Plot 90 – Upper Channel

26dB Bandwidth Plots (Bearer Type: 6)

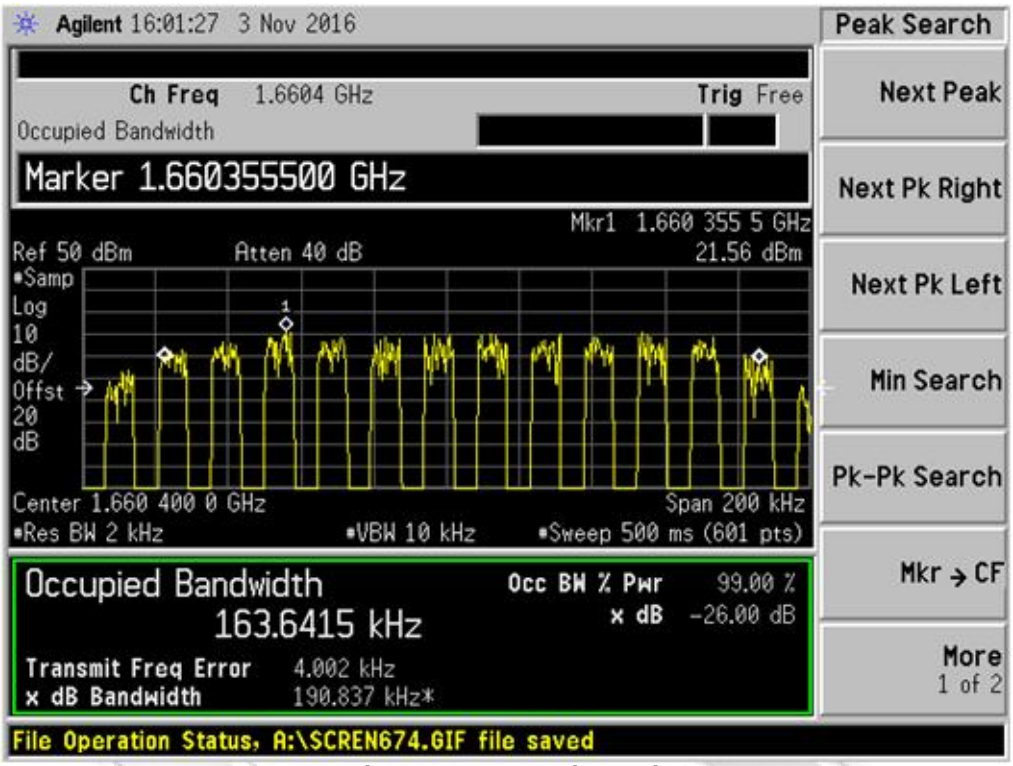


Plot 91 – Lower Channel



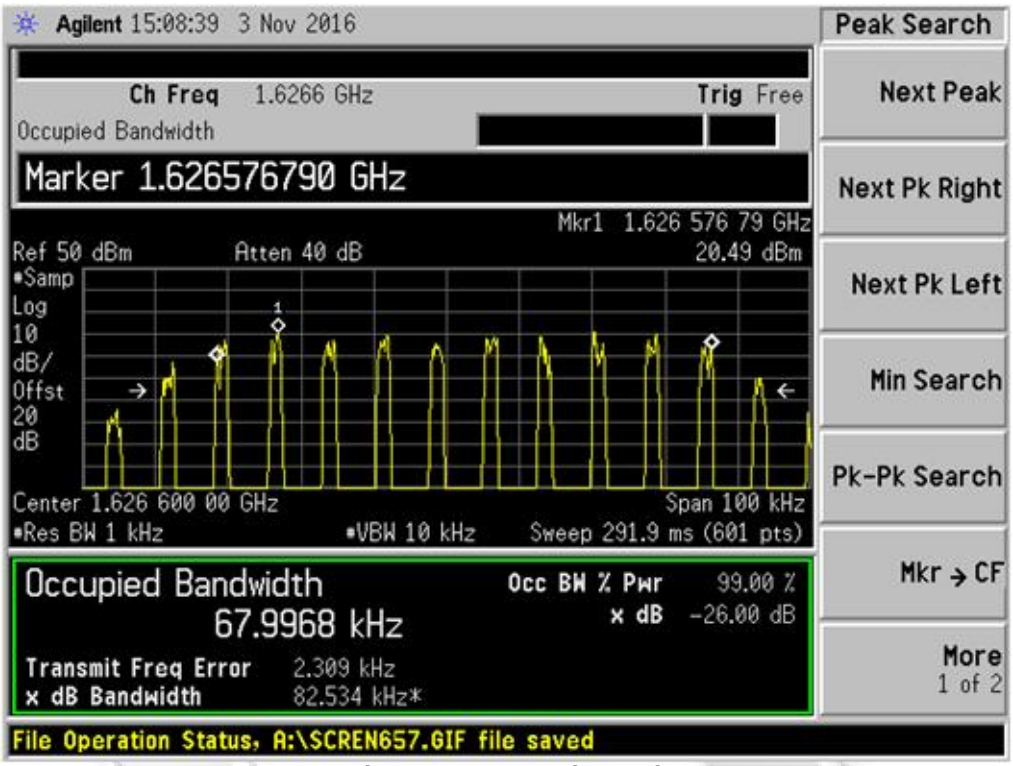
Plot 92 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 6)

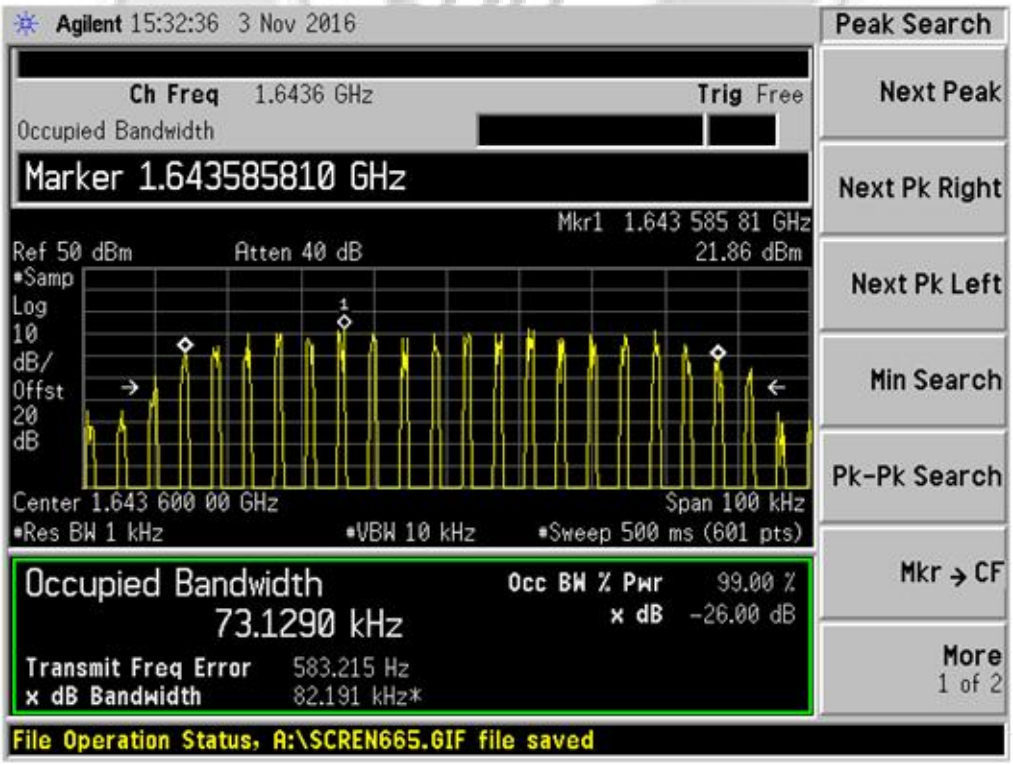


Plot 93 – Upper Channel

26dB Bandwidth Plots (Bearer Type: 7)

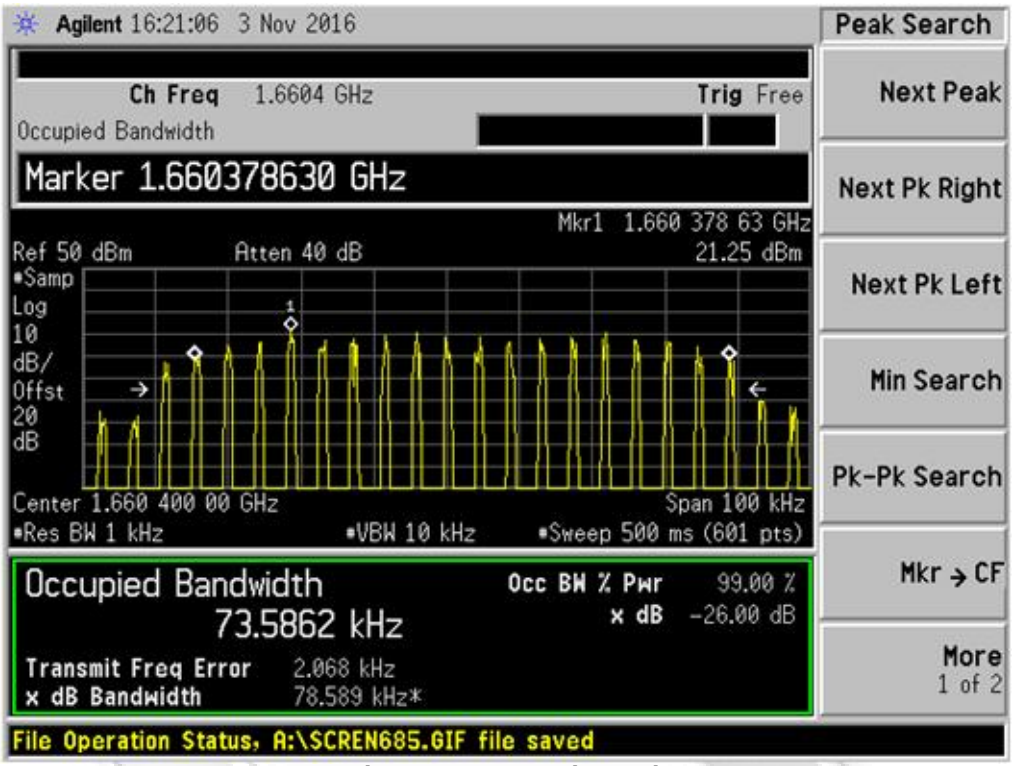


Plot 94 – Lower Channel



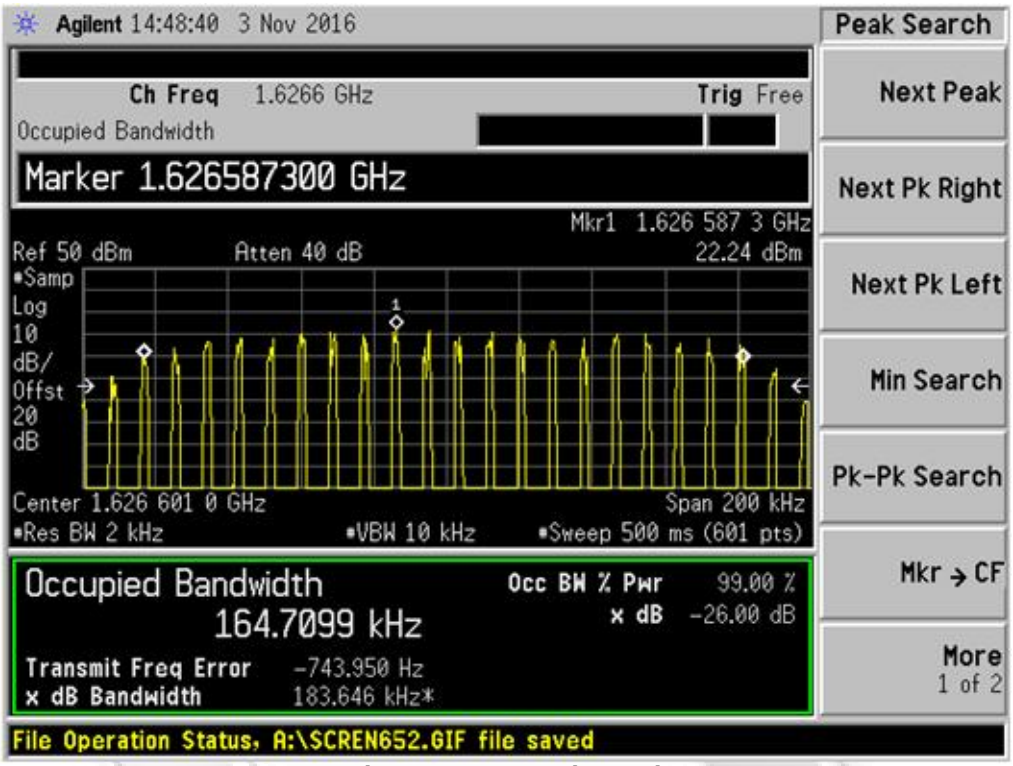
Plot 95 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 7)

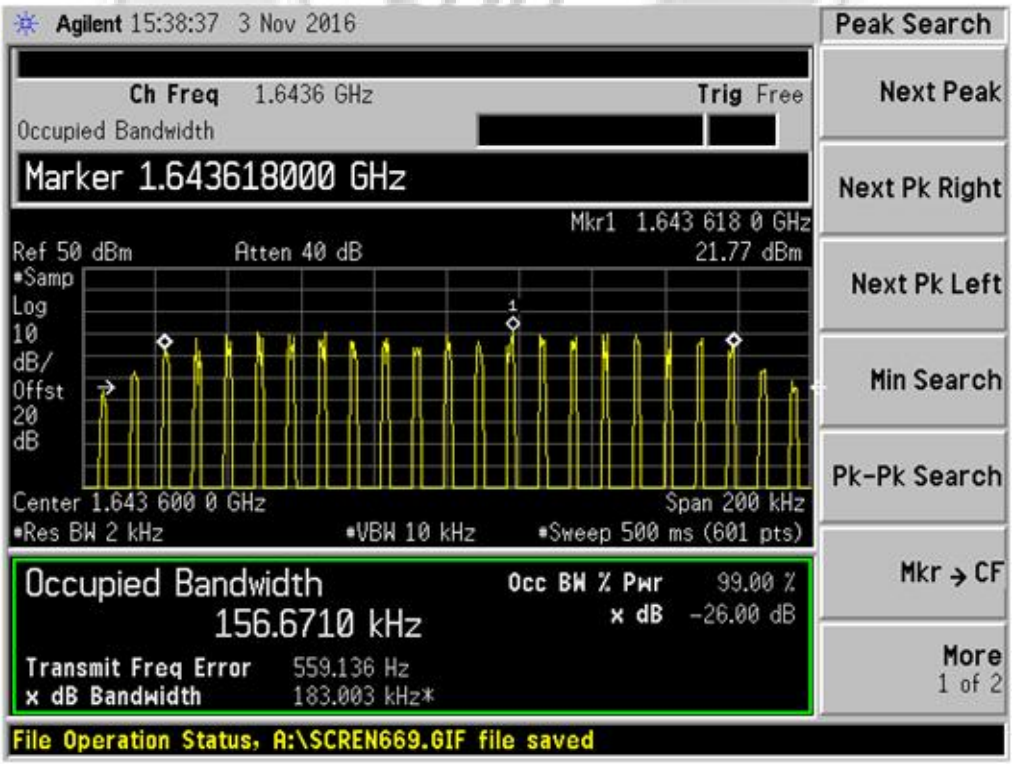


Plot 96 – Upper Channel

26dB Bandwidth Plots (Bearer Type : 8)

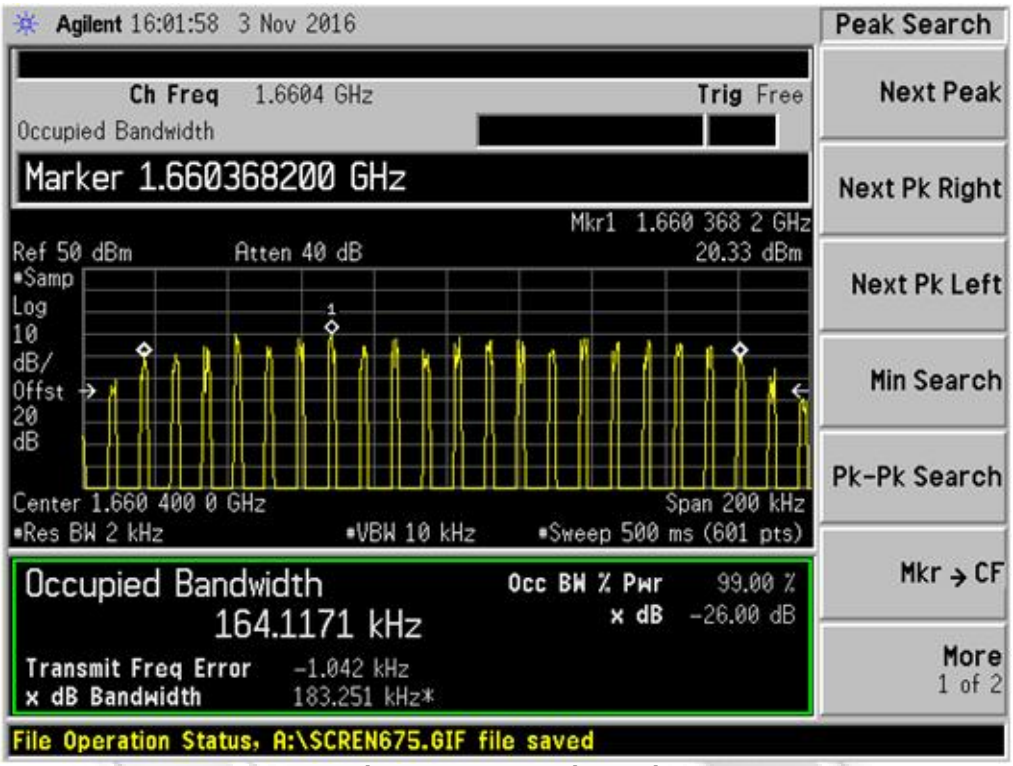


Plot 97 – Lower Channel



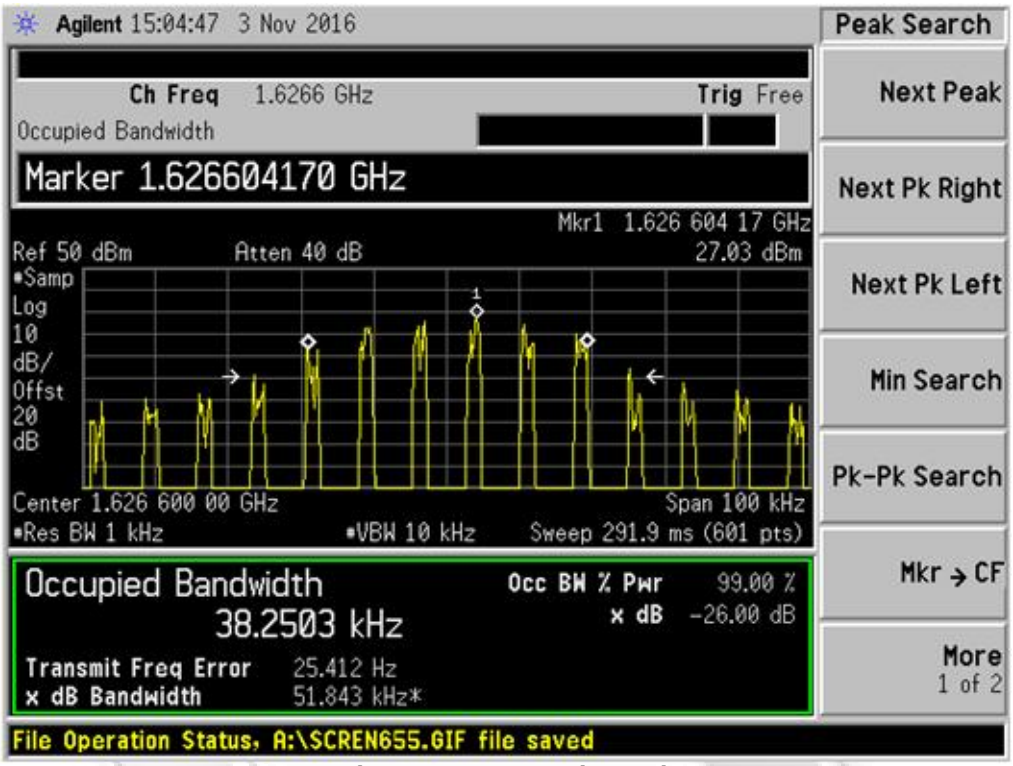
Plot 98 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 8)

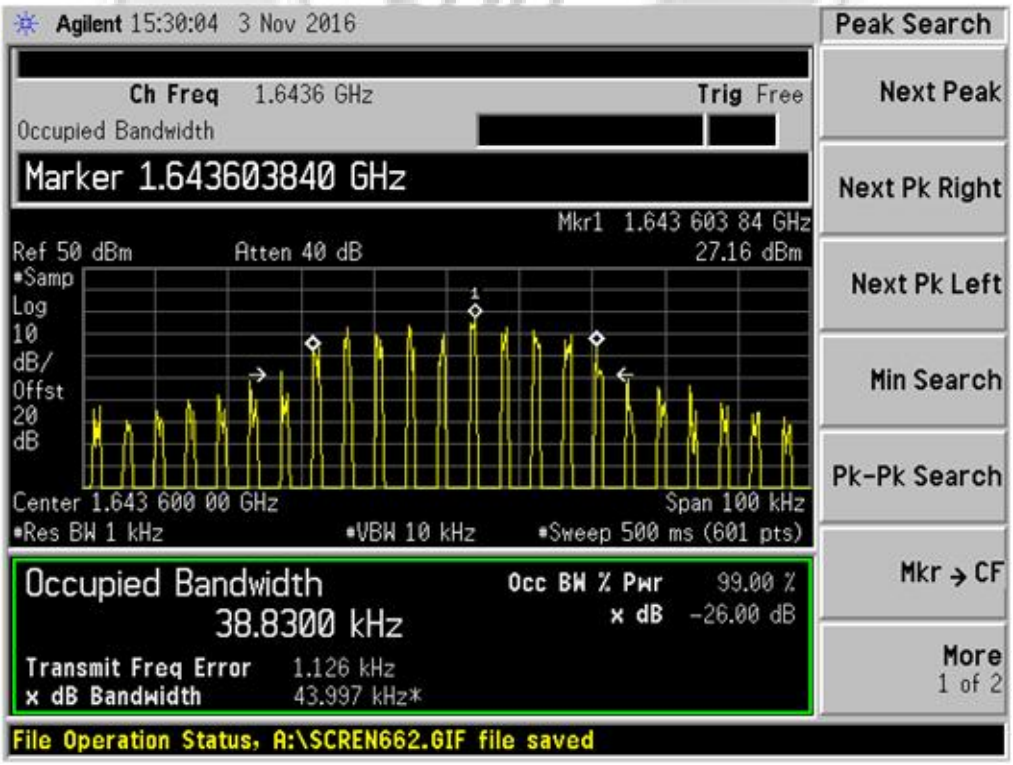


Plot 99 – Upper Channel

26dB Bandwidth Plots (Bearer Type: 9)

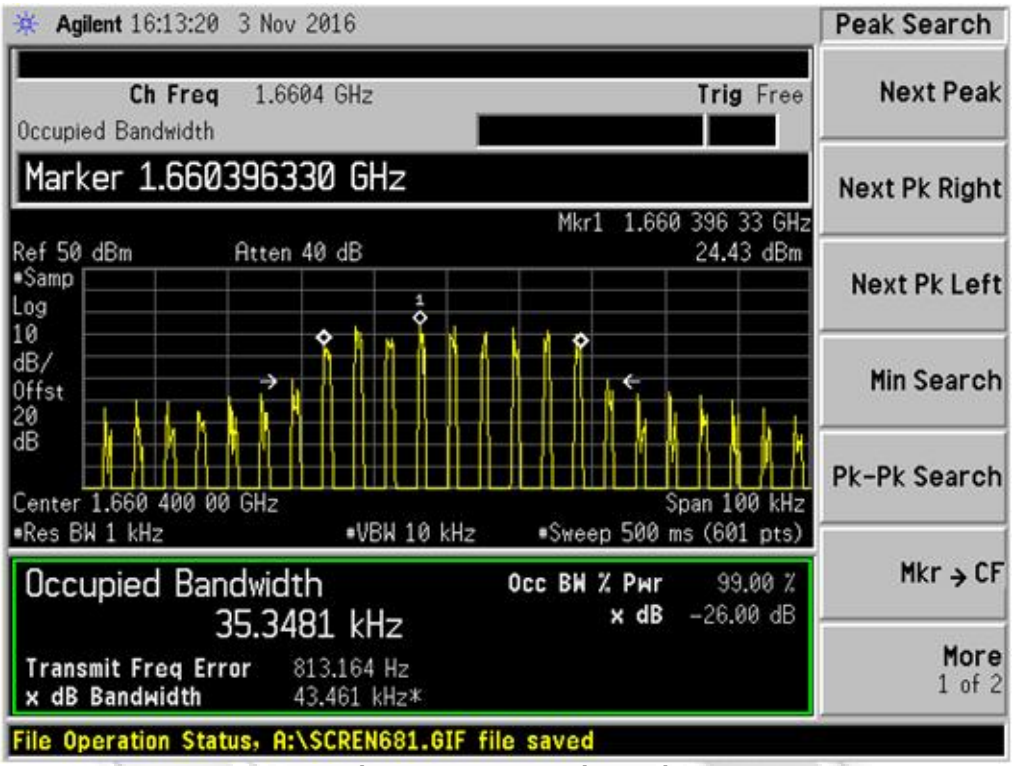


Plot 100 – Lower Channel



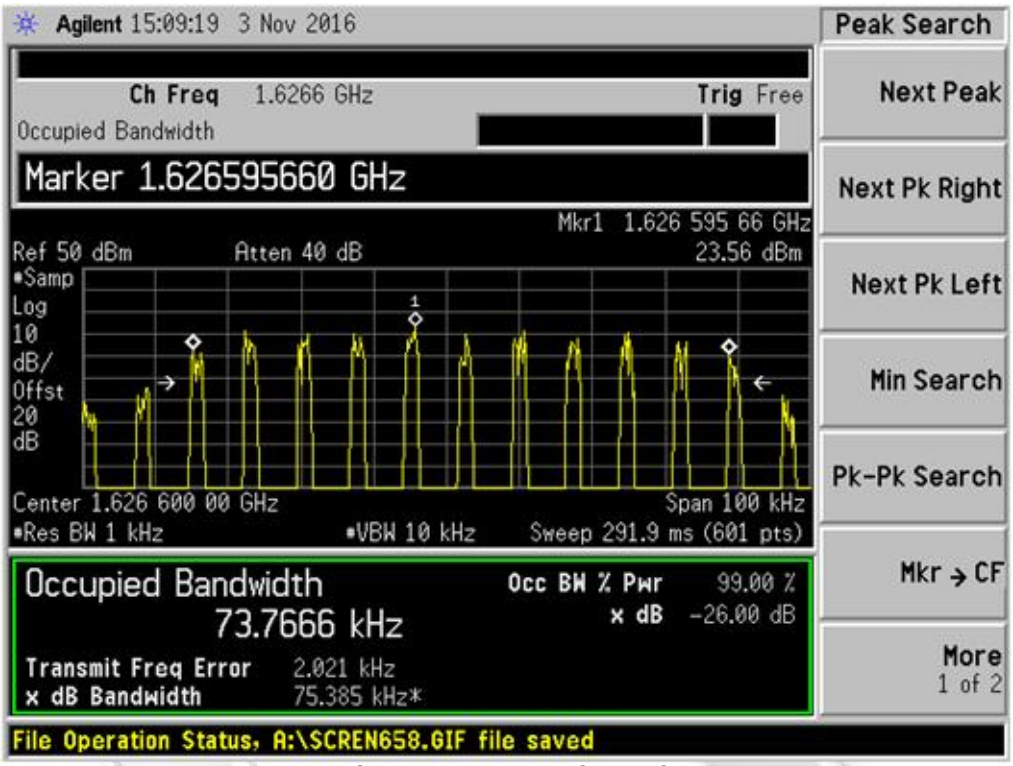
Plot 101 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 9)

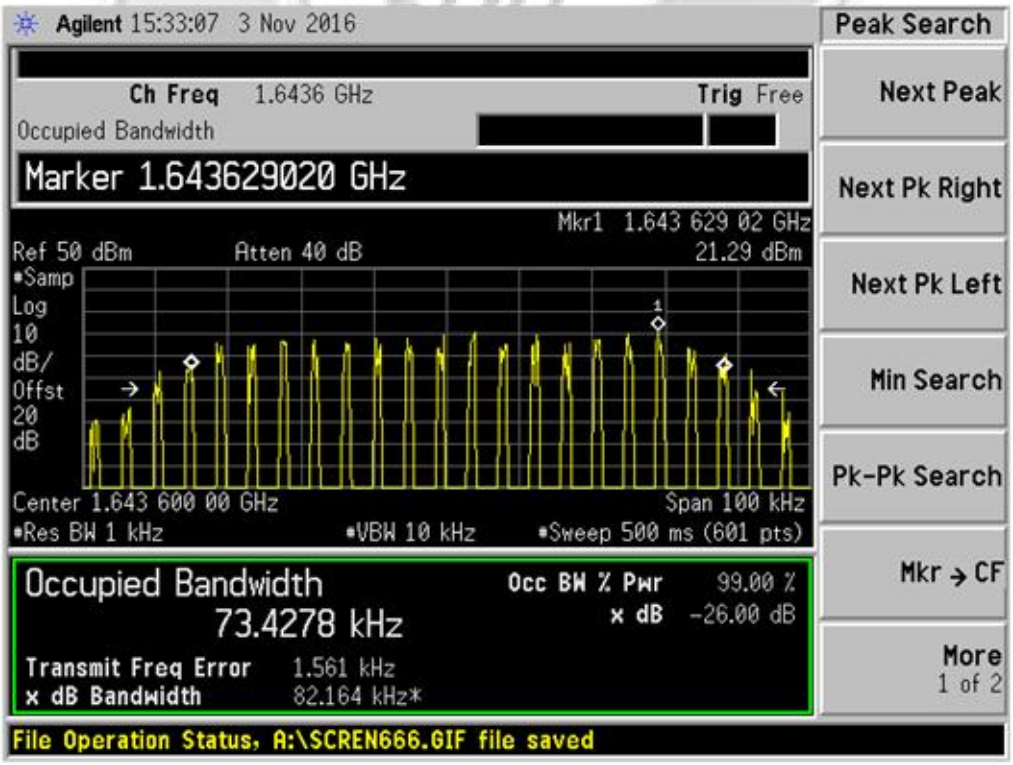


Plot 102 – Upper Channel

26dB Bandwidth Plots (Bearer Type: 10)

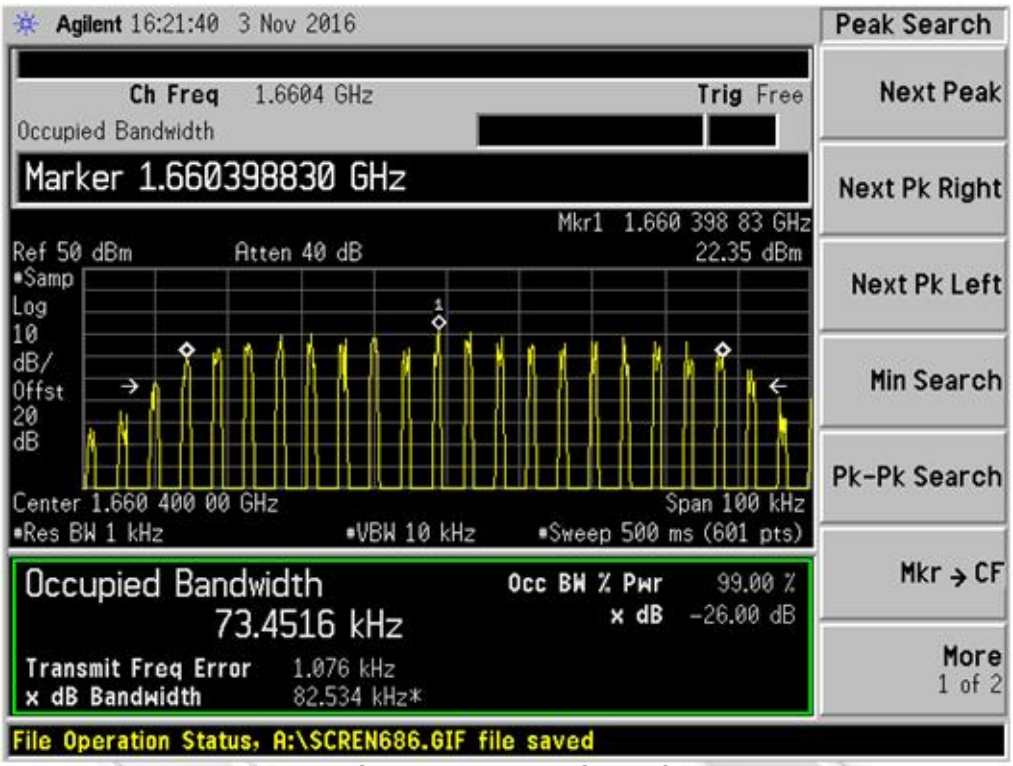


Plot 103 – Lower Channel



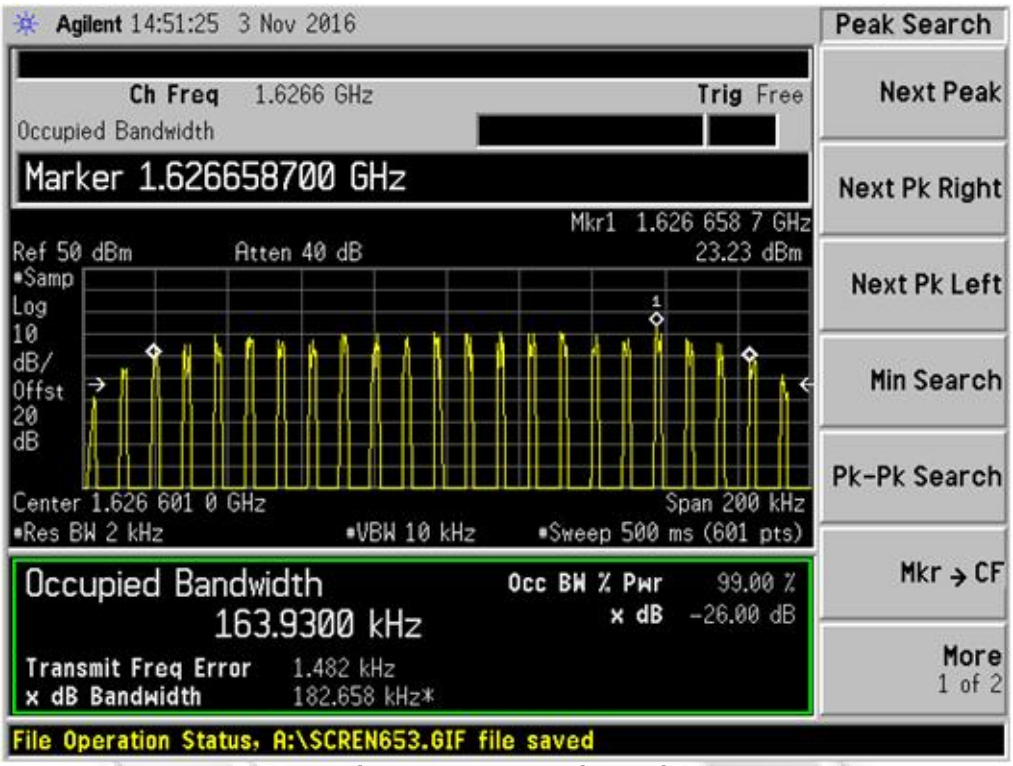
Plot 104 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 10)

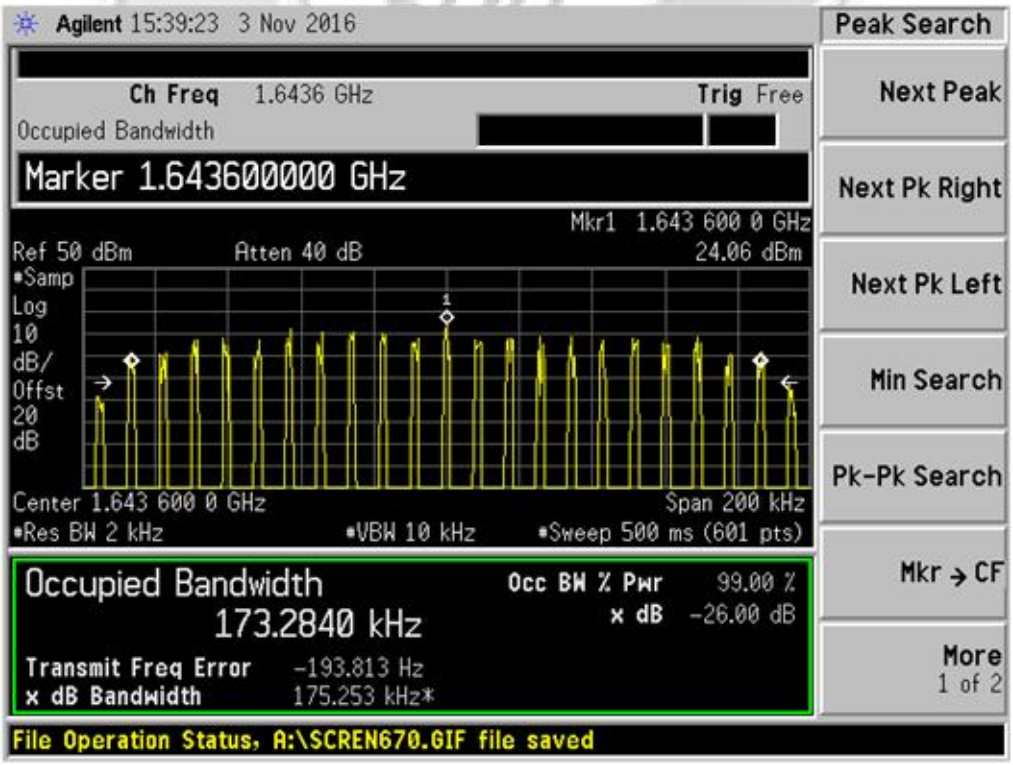


Plot 105 – Upper Channel

26dB Bandwidth Plots (Bearer Type: 11)

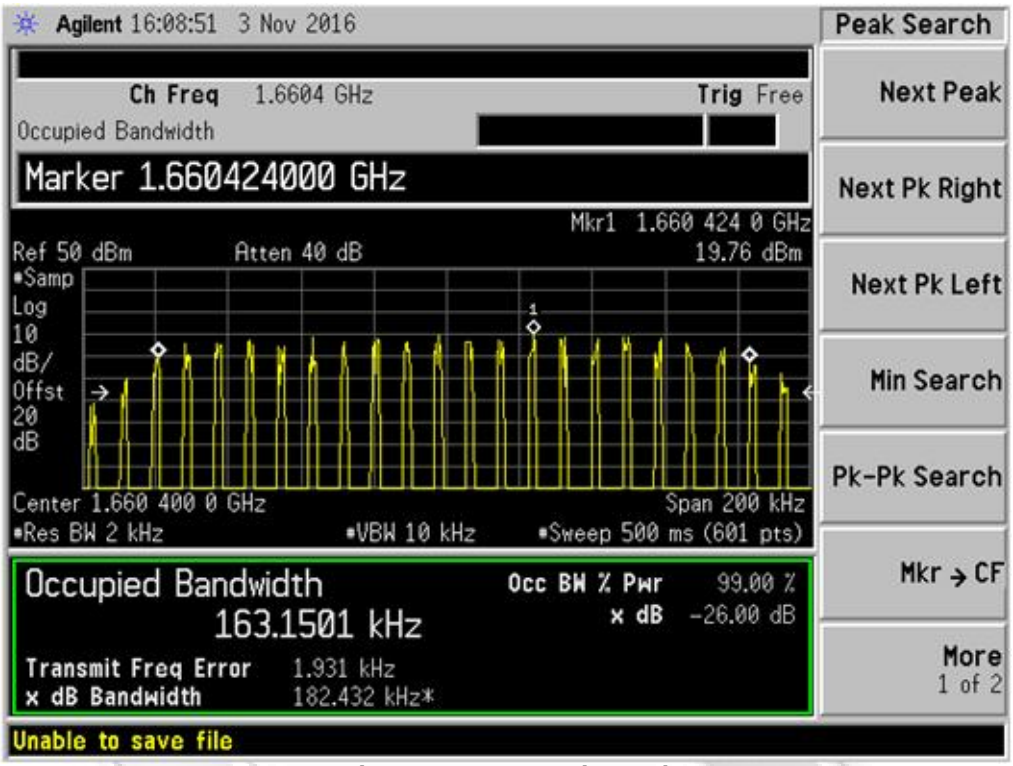


Plot 106 – Lower Channel



Plot 107 – Middle Channel

26dB Bandwidth Plots (Bearer Type: 11)



Plot 108 – Upper Channel