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Report On

FCC Testing of the
Sharp CDMA SHT21 Dual-band CDMA (BC0, BC6) & Dual-band LTE
(B11, B18). Dual mode Media Tablet with Bluetooth, WLAN,
NFC(Type-A/ B) and GPS in accordance with FCC CFR 47 Part 15C
(WLAN and Bluetooth Low Energy)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00179

Document 75919259 Report 10 Issue 3

July 2013



Product Service

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COMMERCIAL-IN-CONFIDENCE

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Document 75919259 Report 10 Issue 3

July 2013

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DATED

18 July 2013

This report has been up-issued to Issue 3 to include Bluetooth Low Energy testing.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler

M Russell





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp CDMA SHT21 Dual-band CDMA (BC0, BC6) & Dual-band LTE (B11, B18). Dual mode
Media Tablet with Bluetooth, WLAN, NFC(Type-A/ B) and GPS
In accordance with FCC CFR 47 Part 15C (WLAN and Bluetooth Low Energy)



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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Sharp CDMA SHT21 Dual-band CDMA (BC0, BC6) & Dual-band LTE (B11, B18). Dual mode Media Tablet with Bluetooth, WLAN, NFC(Type-A/ B) and GPS to the requirements of FCC CFR 47 Part 15C.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Model Number(s)	CDMA SHT21
Serial Number(s)	IMEI 004401114403773 IMEI 004401114403849 IMEI 004401114403781 IMEI 004401114403831
Number of Samples Tested	4
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2011)
Incoming Release Date	Application Form 11 October 2012
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	9385 24 October 2012
Start of Test	17 October 2012
Finish of Test	14 July 2013
Name of Engineer(s)	G Lawler M Russell
Related Document(s)	ANSI C63.10: 2009



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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
802.11(b)				
2.1	15.207	AC Line Conducted Emissions	Pass	
2.2	15.247 (b)(3)	Maximum Peak Conducted Output Power	Pass	
2.3	15.247 (b)(4)	EIRP Peak Power	Pass	
2.4	15.247 (d)	Spurious and Band Edge Emissions	Pass	
2.5	15.247 (e)	Power Spectral Density	Pass	
2.6	15.247 (2)	6dB Bandwidth	Pass	
802.11(g)				
2.2	15.247 (b)(3)	Maximum Peak Conducted Output Power	Pass	
2.3	15.247 (b)(4)	EIRP Peak Power	Pass	
2.4	15.247 (d)	Spurious and Band Edge Emissions	Pass	
2.5	15.247 (e)	Power Spectral Density	Pass	
2.6	15.247 (2)	6dB Bandwidth	Pass	
802.11(n)				
2.2	15.247 (b)(3)	Maximum Peak Conducted Output Power	Pass	
2.3	15.247 (b)(4)	EIRP Peak Power	Pass	
2.4	15.247 (d)	Spurious and Band Edge Emissions	Pass	
2.5	15.247 (e)	Power Spectral Density	Pass	
2.6	15.247 (2)	6dB Bandwidth	Pass	



Product Service

Section	Spec Clause	Test Description	Result	Comments/Base Standard
Bluetooth Low Energy				
2.1	15.247 (b)(3)	Maximum Peak Conducted Output Power	Pass	
2.2	15.247 (b)(4)	EIRP Peak Power	Pass	
2.3	15.247 (d)	Spurious and Band Edge Emissions	Pass	
2.4	15.247 (e)	Power Spectral Density	Pass	
2.5	15.247 (2)	6dB Bandwidth	Pass	



Product Service

1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	CDMA SHT21
Part Number	
FCC ID (if applicable)	APYHRO00179
Industry Canada ID (if applicable)	
Technical Description (Please provide a brief description of the intended use of the equipment)	Dual-Band CDMA(800MHz_BC0, 1900MHz_BC6) and Dual-band LTE(1.5GHz_B11, 800MHz_B18) Dual Mode Cellular Phone with Bluetooth, W-LAN, NFC and GPS receiver enabled.

EXTREME TEMPERATURE RANGE over which the equipment is to be type tested
<input type="checkbox"/> -20°C to +55°C <input checked="" type="checkbox"/> Other (2) <input type="checkbox"/> Not applicable (no extreme temperature testing required)
Extreme temperature range for the host(s): -10C to +55C

- (2) The equipment shall be tested over the following temperature ranges :
- a) 0°C to +35°C for equipment for indoor use only, or intended for used in areas where the temperature is controlled within this range.
 - b) Over the extremes of the temperature range(s) of the declared host equipment(s) in case of plug-in radio devices.

TYPE OF ANTENNA	
<input checked="" type="checkbox"/> Integral	
Temporary RF connector provided:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Antenna connector	
<input type="checkbox"/> Number of antenna assembly(ies) submitted	
Gain of the antenna intended for normal use:	
2 dBi for assembly identified as Bluetooth	
2 dBi for assembly identified as WLAN	
dBi for assembly identified as	
dBi for assembly identified as	
dBi for assembly identified as	

TRANSMITTER TECHNICAL CHARACTERISTICS		
TRANSMITTER OPERATING FREQUENCY RANGE(S)		
	FCC and/or Industry Canada	EU
Bluetooth	2402 to 2480 MHz	2402 to 2480 MHz



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WLAN	2412 to 2462 MHz	2412 to 2472 MHz
FCC and/or Industry Canada (only)		
Highest Internally Generated Frequency 1512.0 MHz		



SPREAD SPECTRUM PARAMETERS			
<input checked="" type="checkbox"/> Bluetooth			
FHSS:	Channel <input checked="" type="checkbox"/> 79 Other	EDR	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Medium Access Protocol (Customer Declaration)			
"We have implemented Bluetooth protocol which satisfies the medium access protocol requirement of EN 300 328".			
<input checked="" type="checkbox"/> WLAN			
IEEE 802.11(b) – DSSS <input checked="" type="checkbox"/>			
IEEE 802.11(g) – OFDM <input checked="" type="checkbox"/>			
IEEE 802.11(n) – OFDM <input checked="" type="checkbox"/>			
Supported Spatial Streams		2.4 GHz	5GHz
Transmitter (Tx)		Yes	Yes
Receiver (Rx)		Yes	Yes
GI (Guard Interval)	<input checked="" type="checkbox"/> 800 ns	<input type="checkbox"/> 400 ns	
Band Width	<input checked="" type="checkbox"/> 20 MHz	<input checked="" type="checkbox"/> 40 MHz	
<input type="checkbox"/> Other Technology			
Direct Sequence	<input type="checkbox"/>	Frequency Hopping	<input type="checkbox"/>
		Combined	<input type="checkbox"/>
		Other	
DSSS	Chip Sequence Length	bit	
	Spectrum Width	MHz	
FHSS	Total Number of Hops		
	Dwell Time	ms	
	Bandwidth Per Hop	MHz	
	Maximum Separation of Hops	MHz for ETSI EN 300 328	
Other			
Medium Access Protocol (Customer Declaration)			
"We have implemented IEEE 802.11 (b/g/n) protocol which satisfies the medium access protocol requirement of EN 300 328".			



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- Continuously variable
dB per step
- Stepped



Product Service

TRANSMITTER POWER SOURCE (3)			
<input checked="" type="checkbox"/> Common power source for transmitter and receiver			
<input type="checkbox"/> AC mains			
AC supply frequency	(Hz)	VAC	Max Current
Single phase		<input type="checkbox"/> Three phase	
And / Or			
<input type="checkbox"/> External DC supply			
Nominal voltage		Max Current	
Extreme upper voltage		Extreme lower voltage	
Battery			
<input type="checkbox"/> Nickel Cadmium			
<input type="checkbox"/> Lead acid (Vehicle regulated)			
<input type="checkbox"/> Alkaline			
<input checked="" type="checkbox"/> Lithium			
<input type="checkbox"/> Other Details :			
4.0 Volts nominal.			
End point voltage as quoted by equipment manufacturer		3.7	V

(3) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF	
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.	
<input checked="" type="checkbox"/> Applies	3.4 V cut-off voltage
<input type="checkbox"/> Does not apply	



Product Service

RECEIVER POWER SOURCE (4)				
<input type="checkbox"/> AC mains		State voltage		
AC supply frequency	(Hz)	VAC	Max Current	Hz
<input type="checkbox"/> Single phase		<input type="checkbox"/> Three phase		
And / Or				
<input type="checkbox"/> External DC supply				
Nominal voltage		Max Current		A
Extreme upper voltage		Extreme lower voltage		
Battery				
<input type="checkbox"/> Nickel Cadmium				
<input type="checkbox"/> Lead acid (Vehicle regulated)				
<input type="checkbox"/> Alkaline				
<input type="checkbox"/> Lithium				
<input type="checkbox"/> Other Details :				
	Volts nominal.			
End point voltage as quoted by equipment manufacturer				V

(4) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF	
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.	
<input type="checkbox"/> Applies	V cut-off voltage
<input type="checkbox"/> Does not apply	

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature: Name: Mototsugu Moroi
 Position held: Manager Date: 11th October, 2012



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp CDMA SHT21 Dual-band CDMA (BC0, BC6) & Dual-band LTE (B11, B18). Dual mode Media Tablet with Bluetooth, WLAN, NFC(Type-A/ B) and GPS. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 4.0 V DC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard or test plan were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.



Product Service

SECTION 2

TEST DETAILS

FCC Testing of the
Sharp CDMA SHT21 Dual-band CDMA (BC0, BC6) & Dual-band LTE (B11, B18). Dual mode
Media Tablet with Bluetooth, WLAN, NFC(Type-A/ B) and GPS
In accordance with FCC CFR 47 Part 15C (WLAN and Bluetooth Low Energy)



2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.207

2.1.2 Equipment Under Test and Modification State

CDMA SHT21 S/N: IMEI 004401114403849 - Modification State 0

2.1.3 Date of Test

31 October 2012

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The EUT is set up on a test table 800mm above a horizontal ground plane. A vertical ground plane is also required and is placed 400mm from the EUT. Where a EUT is floor standing it will be stood on but insulated from the ground plane by up to 12mm.

The EUT is powered through a Line Impedance Stabilisation Network (LISN) which is bonded to the ground plane. The EUT is located so that the distance between the EUT and the LISN is no less than 800mm. Where possible the cable between the mains input of the EUT and the LISN is 1m. Where this is not possible the cable is non inductively bundled with the bundle not exceeding 400mm in length.

A preliminary profile of the Conducted Emissions is obtained over the frequency range 150kHz to 30MHz. Any points of interest are noted for formal measurements.

During formal measurements, the measuring receiver is tuned to the emission of interest where Quasi – Peak and Average measurements are performed in a 9kHz Video and Resolution Bandwidth.

2.1.6 Environmental Conditions

Ambient Temperature	21.5°C
Relative Humidity	36.0%

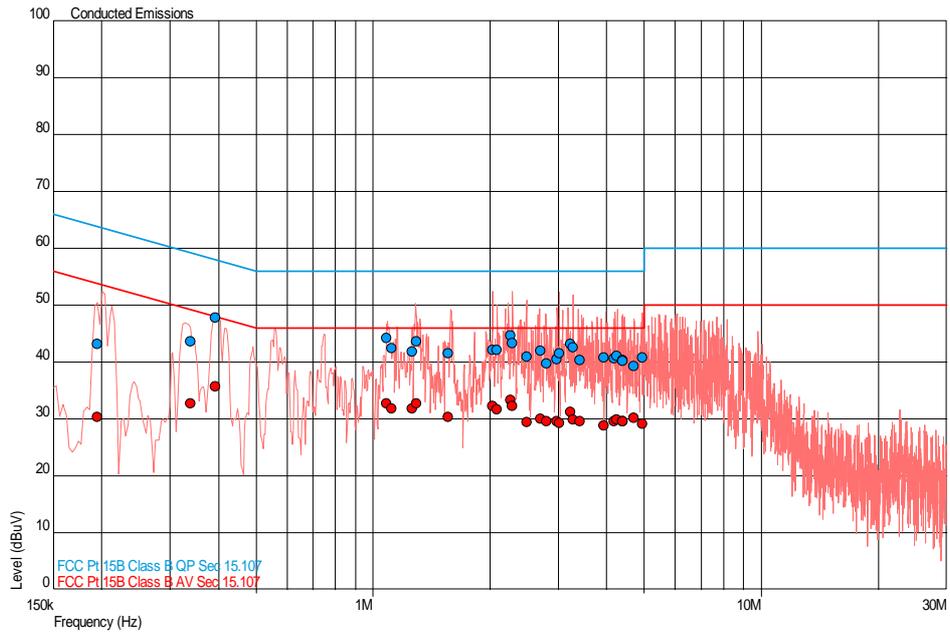


Product Service

2.1.7 Test Results

802.11(b)

Live Line

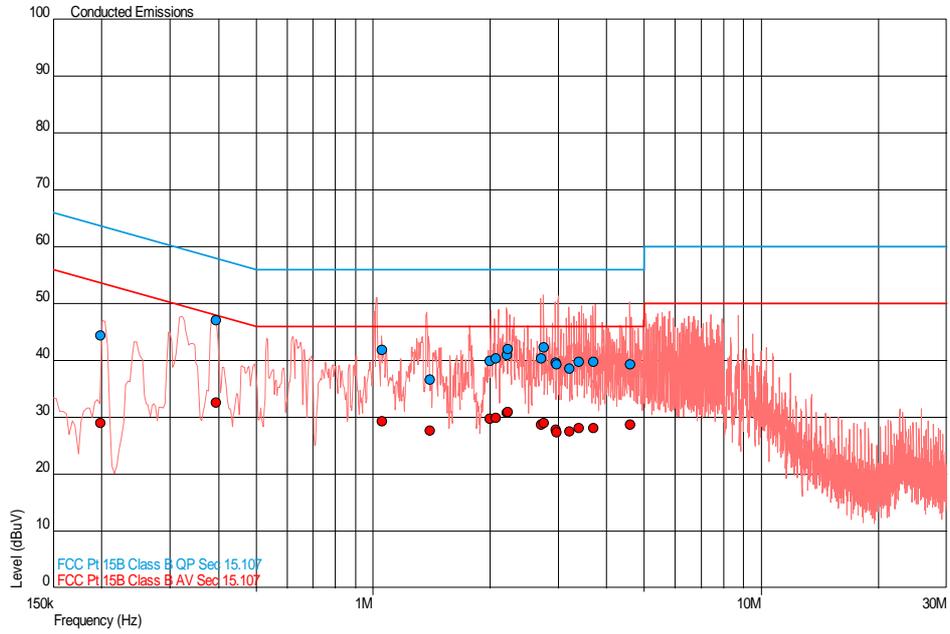




Frequency (MHz)	QP Level (dB μ V)	QP Limit (dB μ V)	QP Margin (dB μ V)	AV Level (dB μ V)	AV Limit (dB μ V)	AV Margin (dB μ V)
0.194	43.2	63.8	-20.7	30.4	53.8	-23.5
0.338	43.6	59.2	-15.6	32.7	49.2	-16.5
0.391	47.9	58.0	-10.1	35.8	48.0	-12.2
1.083	44.2	56.0	-11.8	32.8	46.0	-13.2
1.115	42.5	56.0	-13.5	31.9	46.0	-14.1
1.261	41.8	56.0	-14.2	31.9	46.0	-14.1
1.292	43.7	56.0	-12.3	32.8	46.0	-13.2
1.563	41.6	56.0	-14.4	30.4	46.0	-15.6
2.033	42.2	56.0	-13.8	32.4	46.0	-13.6
2.085	42.2	56.0	-13.8	31.7	46.0	-14.3
2.255	44.7	56.0	-11.3	33.4	46.0	-12.6
2.288	43.4	56.0	-12.6	32.4	46.0	-13.6
2.485	41.0	56.0	-15.0	29.4	46.0	-16.6
2.703	42.0	56.0	-14.0	30.1	46.0	-15.9
2.797	39.8	56.0	-16.2	29.6	46.0	-16.4
2.976	40.5	56.0	-15.5	29.6	46.0	-16.4
3.023	41.6	56.0	-14.4	29.4	46.0	-16.6
3.226	43.3	56.0	-12.7	31.2	46.0	-14.8
3.271	42.6	56.0	-13.4	30.0	46.0	-16.0
3.408	40.4	56.0	-15.6	29.6	46.0	-16.4
3.934	40.8	56.0	-15.2	28.9	46.0	-17.1
4.181	40.7	56.0	-15.3	29.6	46.0	-16.4
4.234	41.2	56.0	-14.8	29.9	46.0	-16.1
4.385	40.3	56.0	-15.7	29.7	46.0	-16.3
4.388	40.4	56.0	-15.6	29.6	46.0	-16.4
4.704	39.4	56.0	-16.6	30.2	46.0	-15.8
4.940	40.8	56.0	-15.2	29.2	46.0	-16.8



Neutral Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.199	44.4	63.6	-19.3	29.0	53.6	-24.7
0.395	47.1	58.0	-10.8	32.6	48.0	-15.3
1.056	41.9	56.0	-14.1	29.3	46.0	-16.7
1.401	36.6	56.0	-19.4	27.7	46.0	-18.3
1.997	39.9	56.0	-16.1	29.7	46.0	-16.3
2.079	40.4	56.0	-15.6	29.9	46.0	-16.1
2.217	41.0	56.0	-15.0	30.9	46.0	-15.1
2.231	42.1	56.0	-13.9	31.0	46.0	-15.0
2.716	40.3	56.0	-15.7	28.8	46.0	-17.2
2.753	42.4	56.0	-13.6	29.1	46.0	-16.9
2.960	39.6	56.0	-16.4	27.8	46.0	-18.2
2.970	39.3	56.0	-16.7	27.3	46.0	-18.7
3.213	38.6	56.0	-17.4	27.5	46.0	-18.5
3.401	39.7	56.0	-16.3	28.1	46.0	-17.9
3.692	39.8	56.0	-16.2	28.2	46.0	-17.8
4.602	39.3	56.0	-16.7	28.8	46.0	-17.2



2.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(3)

2.2.2 Equipment Under Test and Modification State

CDMA SHT21 S/N: IMEI 004401114403849 - Modification State 0

CDMA SHT21 S/N: IMEI 004401114403781 - Modification State 0

2.2.3 Date of Test

21 November 2012 and 10 July 2013

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The EUT was transmitted at maximum power via a cable to the Peak Power Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a reference level offset was entered to account for the measurement path loss. The measurement bandwidth was set according to the signal being measured and the peak and average levels were recorded.

2.2.6 Environmental Conditions

Ambient Temperature 21.8 - 23.7°C

Relative Humidity 39.6 - 54.4%



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2.2.7 Test Results

802.11(b)

4.0 V DC Supply

Modulation Data Rate (Mbps)	Maximum Peak Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
1	14.84	14.97	14.08	30.48	31.41	25.59
2	14.89	15.09	14.97	30.83	32.28	31.41
5.5	14.87	15.03	15.01	30.69	31.84	31.70
11	15.09	15.22	14.29	32.28	33.27	26.85

Modulation Data Rate (Mbps)	Maximum Average Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
1	11.25	10.83	10.63	13.34	12.11	11.56
2	11.29	11.42	10.90	13.46	13.87	12.30
5.5	10.89	10.79	10.81	12.27	11.99	12.05
11	11.34	11.14	10.66	13.61	13.00	11.64

Limit Clause

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.



Product Service

802.11(g)

4.0 V DC Supply

Modulation Data Rate (Mbps)	Maximum Peak Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
6	19.59	20.62	19.93	90.99	115.35	98.40
9	19.78	20.71	20.25	95.06	117.76	105.93
12	19.83	21.01	20.22	96.16	126.18	105.20
18	20.12	21.04	20.68	102.80	127.06	116.95
24	20.07	20.93	20.27	101.62	123.88	106.41
36	20.48	21.03	19.99	111.69	126.77	99.77
48	19.47	21.08	20.77	88.51	128.23	119.40
54	20.17	20.88	20.48	103.99	122.46	111.69

Modulation Data Rate (Mbps)	Maximum Average Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
6	8.71	9.22	8.61	7.43	8.36	7.26
9	9.26	9.29	9.10	8.43	8.49	8.13
12	8.69	9.39	9.18	7.40	8.69	8.28
18	9.36	9.38	9.16	8.63	8.67	8.24
24	8.57	8.65	8.82	7.19	7.33	7.62
36	9.24	9.19	8.74	8.39	8.30	7.48
48	8.55	9.18	8.95	7.16	8.28	7.85
54	8.46	9.16	8.70	7.01	8.24	7.41

Limit Clause

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.



802.11(n)

4.0 V DC Supply

Modulation Data Rate (Mbps)	Maximum Peak Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
6.5	19.73	20.89	20.34	93.97	122.74	108.14
13	20.38	21.08	21.49	109.14	128.23	140.93
19.5	20.31	21.04	20.16	107.40	127.06	103.75
26	19.88	20.90	20.51	97.27	123.03	112.46
39	20.27	21.00	20.60	106.41	125.89	114.82
52	19.98	20.24	20.43	99.54	105.68	110.41
58.5	19.76	20.97	20.93	94.62	125.03	123.88
65	19.85	21.06	20.27	96.61	127.64	106.41

Modulation Data Rate (Mbps)	Maximum Average Conducted Output Power					
	dBm			mW		
	2412 MHz	2437 MHz	2462 MHz	2412 MHz	2437 MHz	2462 MHz
6.5	8.71	9.42	9.27	7.43	8.75	8.45
13	9.39	9.42	8.75	8.69	8.75	7.50
19.5	9.46	9.50	8.95	8.83	8.91	7.85
26	8.75	8.71	9.26	7.50	7.43	8.43
39	9.23	9.28	9.07	8.38	8.47	8.07
52	8.53	8.59	9.04	7.13	7.23	8.02
58.5	8.52	9.18	8.98	7.11	8.28	7.91
65	8.54	9.25	8.69	7.14	8.41	7.40

Limit Clause

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.



Product Service

Bluetooth Low Energy

4.0 V DC Supply

Packet Type	Maximum Peak Conducted Output Power					
	dBm			mW		
	2402 MHz	2441 MHz	2480 MHz	2402 MHz	2441 MHz	2480 MHz
37 oct/prbs9	-1.77	-3.07	-3.96	0.666	0.493	0.402

Limit Clause

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.



Product Service

2.3 EIRP PEAK POWER

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(4)

2.3.2 Equipment Under Test and Modification State

CDMA SHT21 S/N: IMEI 004401114403849 - Modification State 0

CDMA SHT21 S/N: IMEI 004401114403831 - Modification State 0

2.3.3 Date of Test

28 October 2012 and 13 July 2013

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

The EUT was transmitted at maximum power via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a resolution bandwidth and video bandwidth of 1 MHz were used to perform the measurement. The level on the spectrum analyser was maximised by rotating the EUT 360° and a height search of the measuring antenna. A substitution was then performed using a substitution antenna and signal generator.

This level was maximised by adjusting the height of the measuring antenna once more. The level from the signal generator was then adjusted to achieve the same raw result as with the EUT. This level was then corrected to account for cable loss and antenna factor. If applicable, a peak power analyser was also used to obtain a correction factor for wideband signals such as WLAN.

A calculation was then performed to obtain the final figure.

2.3.6 Environmental Conditions

Ambient Temperature	18.9 - 21.2°C
Relative Humidity	40.0 - 58.0%



Product Service

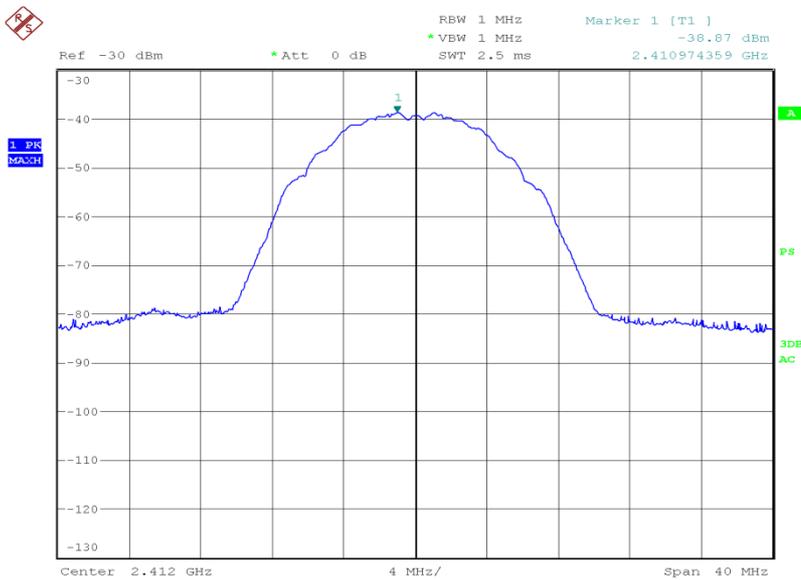
2.3.7 Test Results

802.11(b)

4.0 V DC Supply

2412 MHz

EIRP (dBm)	EIRP (mW)
11.50	14.126



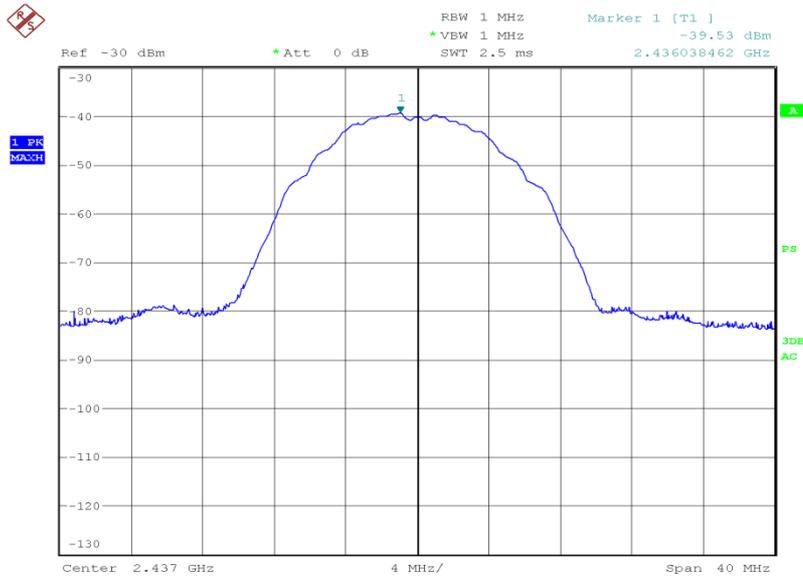
Date: 28.OCT.2012 11:59:12



Product Service

2437 MHz

EIRP (dBm)	EIRP (mW)
9.92	9.817



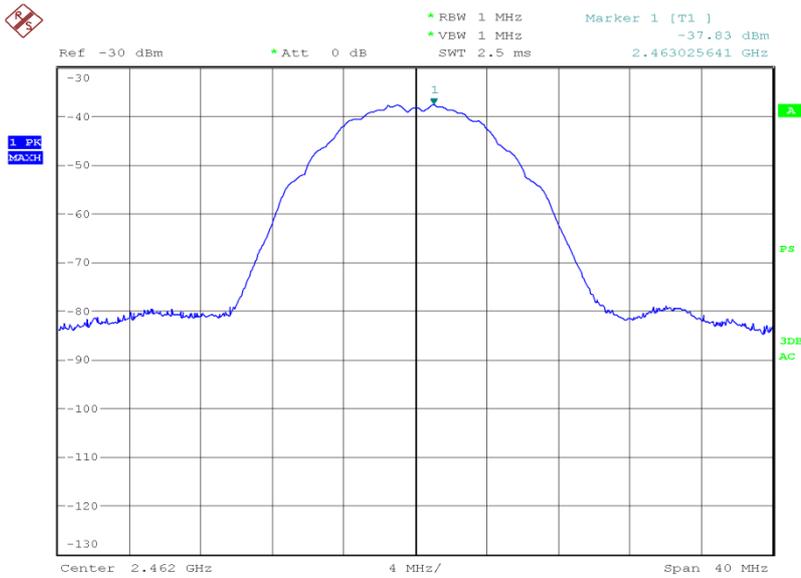
Date: 28.OCT.2012 12:01:23



Product Service

2462 MHz

EIRP (dBm)	EIRP (mW)
11.25	13.335



Date: 28.OCT.2012 08:10:09

Limit

EIRP (dBm)	EIRP (mW)
36.0	4000



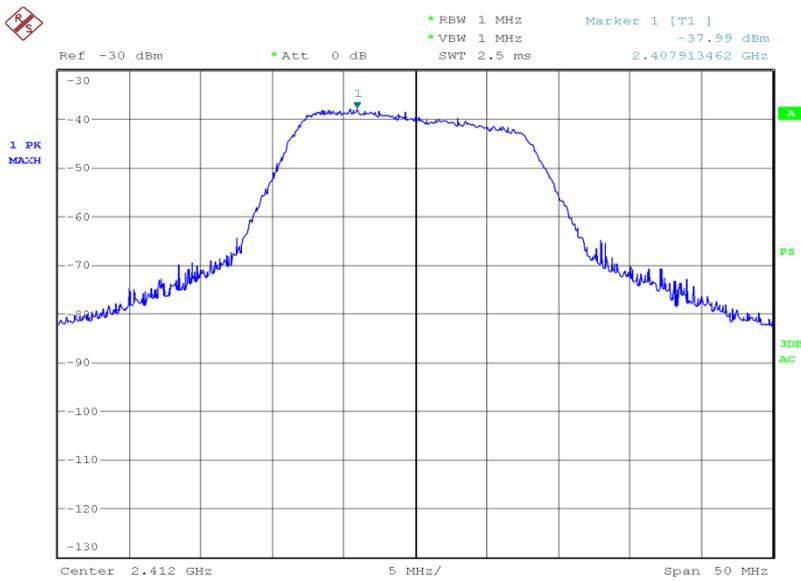
Product Service

802.11(g)

4.0 V DC Supply

2412 MHz

EIRP (dBm)	EIRP (mW)
13.07	20.277



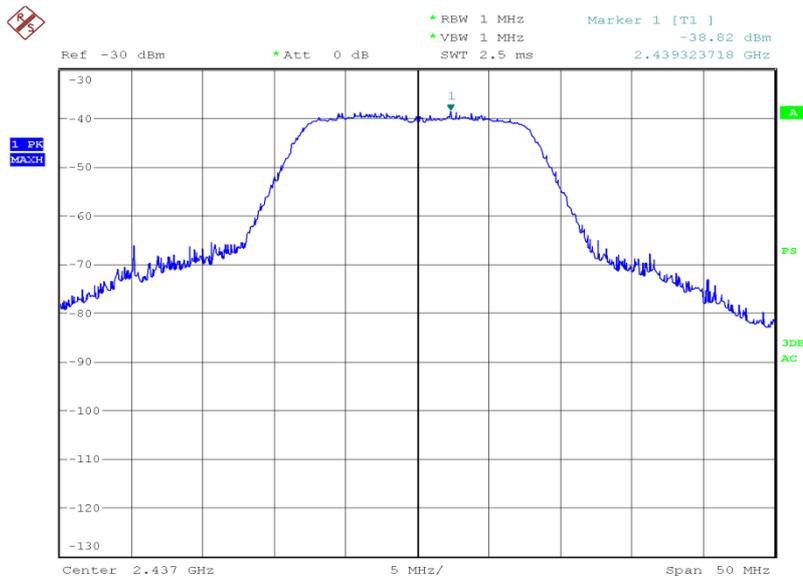
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Product Service

2437 MHz

EIRP (dBm)	EIRP (mW)
11.27	13.397



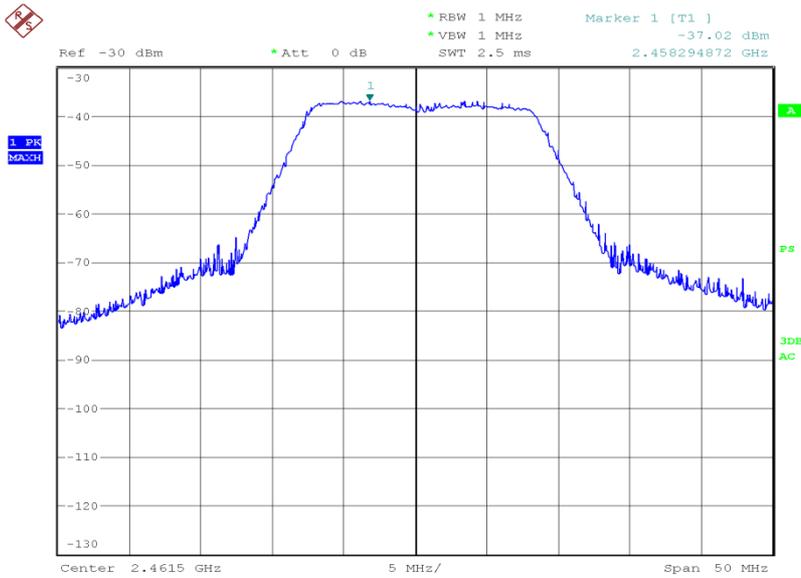
Date: 28.OCT.2012 08:59:25



Product Service

2462 MHz

EIRP (dBm)	EIRP (mW)
11.33	13.583



Date: 28.OCT.2012 09:28:30

Limit

EIRP (dBm)	EIRP (mW)
36.0	4000



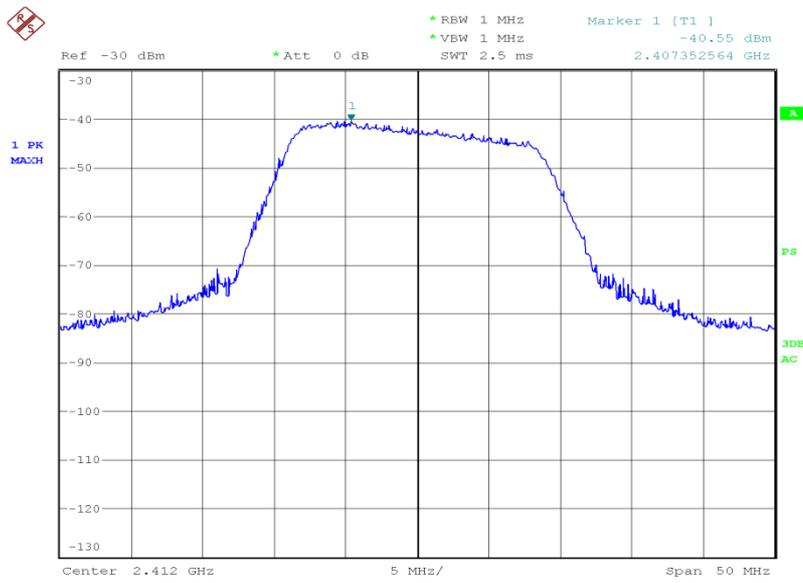
Product Service

802.11(n)

4.0 V DC Supply

2412 MHz

EIRP (dBm)	EIRP (mW)
11.57	14.354

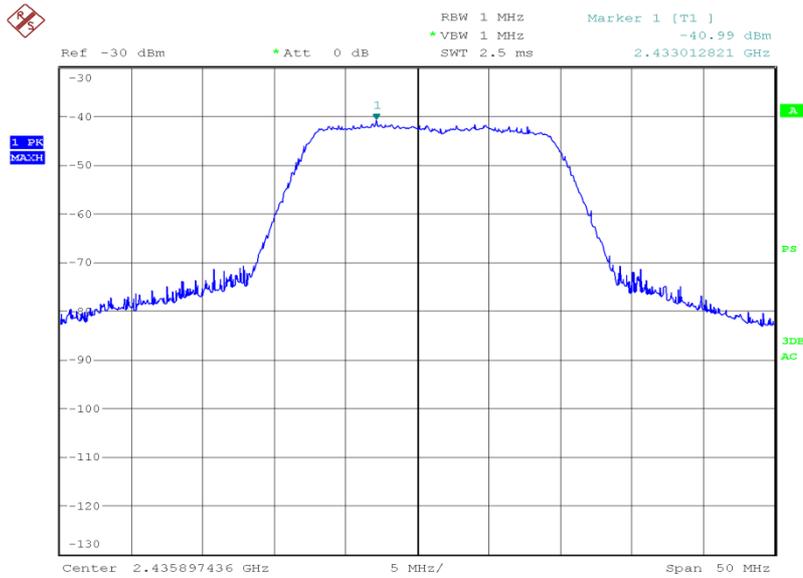


Date: 28.OCT.2012 10:18:09



2437 MHz

EIRP (dBm)	EIRP (mW)
10.28	10.666



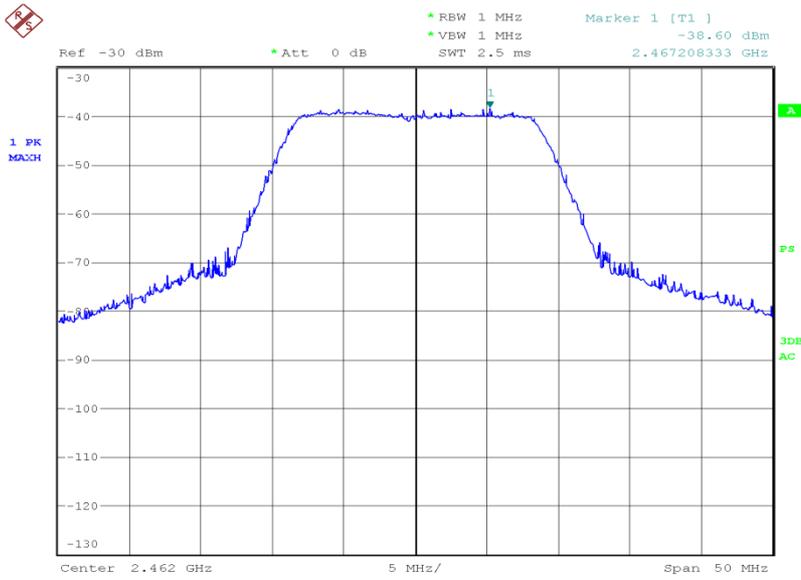
Date: 28.OCT.2012 10:35:57



Product Service

2462 MHz

EIRP (dBm)	EIRP (mW)
10.77	11.940



Date: 28.OCT.2012 11:19:25

Limit

EIRP (dBm)	EIRP (mW)
3630	4000

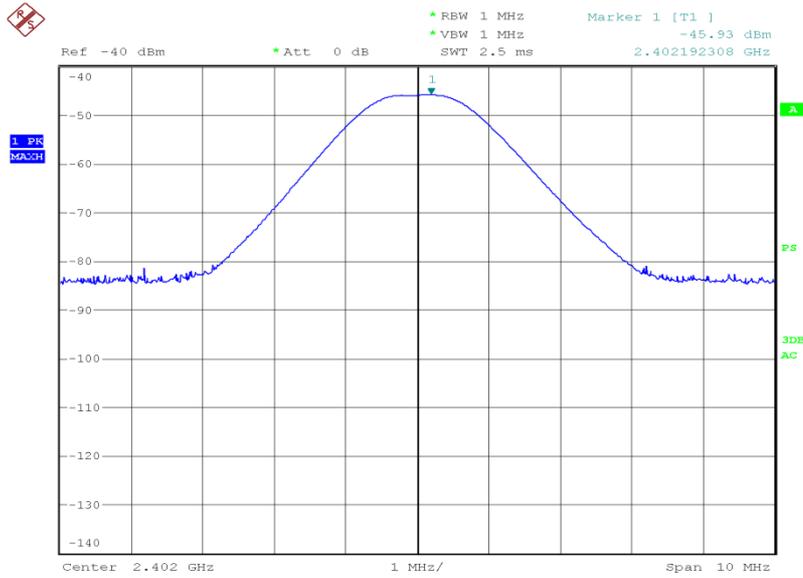


Product Service

Bluetooth Low Energy

2402 MHz

EIRP (dBm)	EIRP (mW)
-4.61	0.346



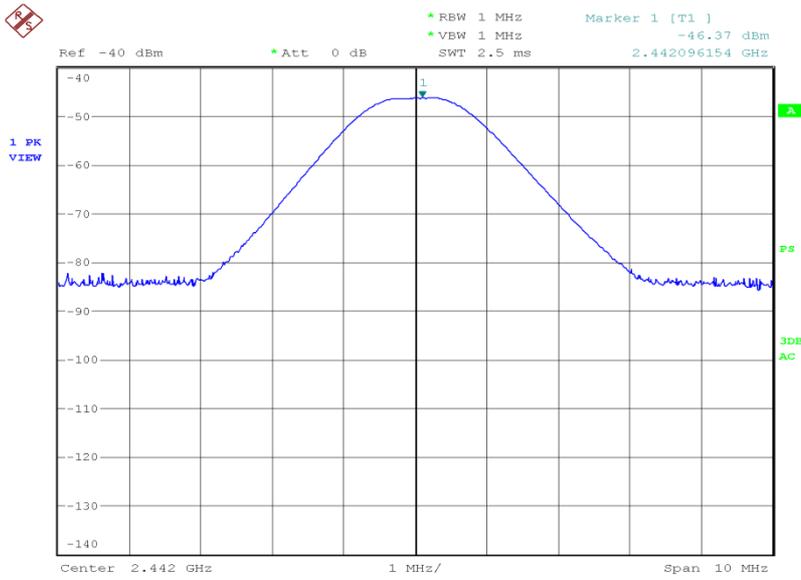
Date: 13.JUL.2013 10:36:51



Product Service

2441 MHz

EIRP (dBm)	EIRP (mW)
-5.33	0.293



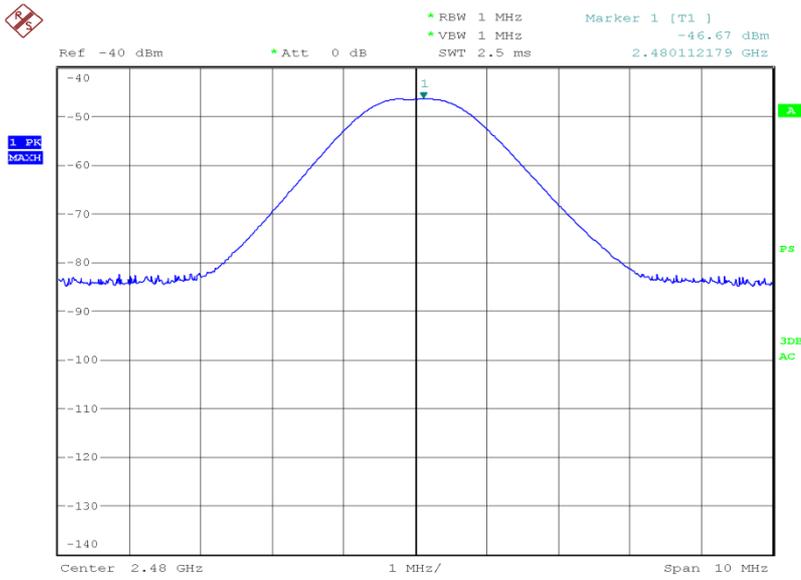
Date: 13.JUL.2013 11:02:51



Product Service

2480 MHz

EIRP (dBm)	EIRP (mW)
-4.83	0.329



Date: 13.JUL.2013 11:16:42

Limit

EIRP (dBm)	EIRP (mW)
36.0	4000



2.4 SPURIOUS AND BAND EDGE EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (d)

2.4.2 Equipment Under Test and Modification State

CDMA SHT21 S/N: IMEI 004401114403849 - Modification State 0

CDMA SHT21 S/N: IMEI 004401114403831 - Modification State 0

2.4.3 Date of Test

28 October 2012, 29 October 2012, 31 October 2012, 10 July 2013 and 14 July 2013

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

For conducted emissions, the EUT was set to operate at maximum power on the worst case data rate. The test was performed on the bottom, middle and top channels. The test was performed from 9 kHz to 25 GHz. Firstly, the power of each fundamental frequency was measured in 100 kHz bandwidth and this was used to show a -20 dBc limit line on the trace. The measurement path loss in each relevant frequency band was measured and entered as a reference level offset.

For radiated emissions, the test method described above was also used. However, the measurement was performed from 30 MHz to 25 GHz and the path loss is incorporated as a transducer factor and entered into the spectrum analyser.

The band edge measurements were performed in accordance with ANSI C63.10, Clause 6.9.3. The results were analysed to ensure compliance with restricted bands. The EUT was set to the lowest and highest operating frequencies.

2.4.6 Environmental Conditions

Ambient Temperature	19.6 - 23.9°C
Relative Humidity	37.6 - 58.0%



Product Service

2.4.7 Test Results

802.11(b)

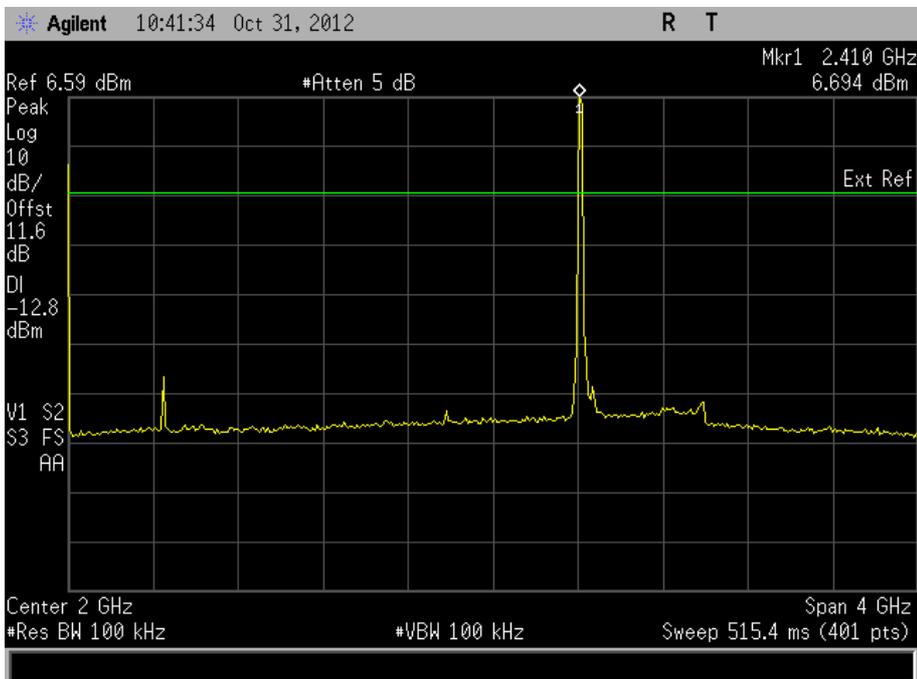
4.0 V DC Supply

Spurious Conducted Emissions

1 Mbps

2412 MHz

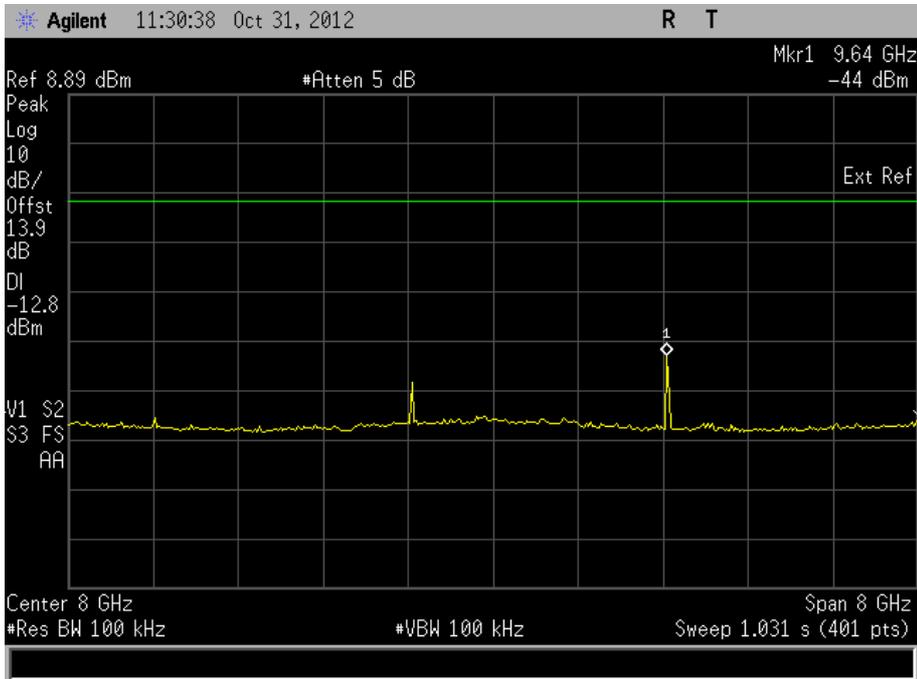
9 kHz to 4 GHz



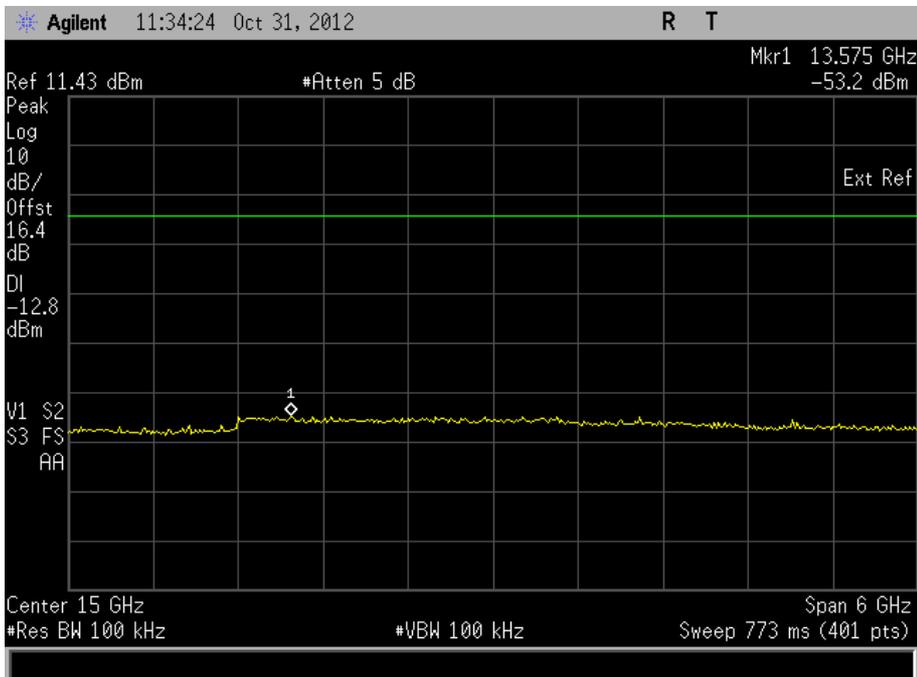


Product Service

4 GHz to 12 GHz



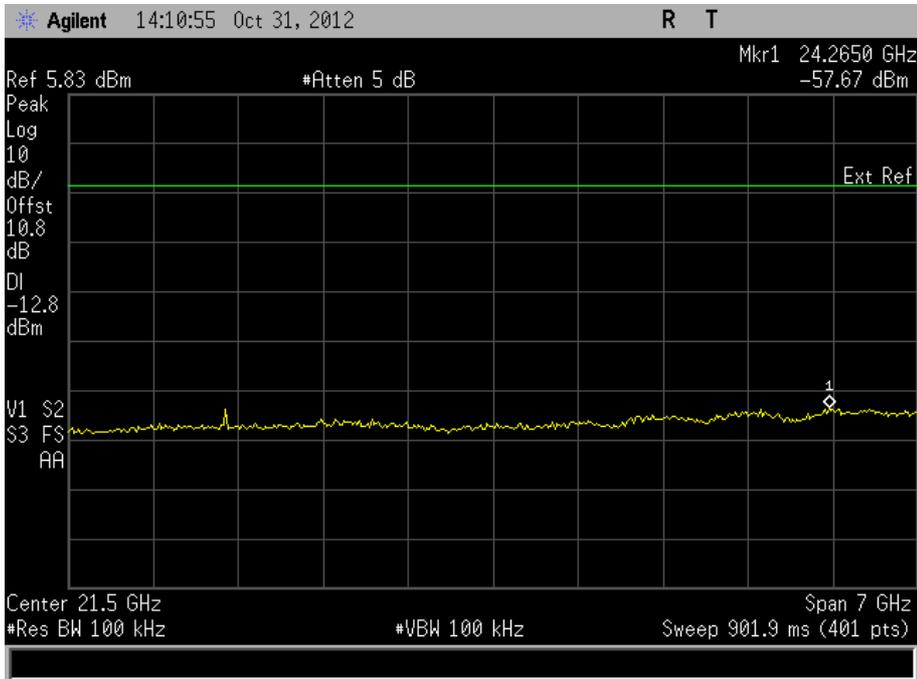
12 GHz to 18 GHz





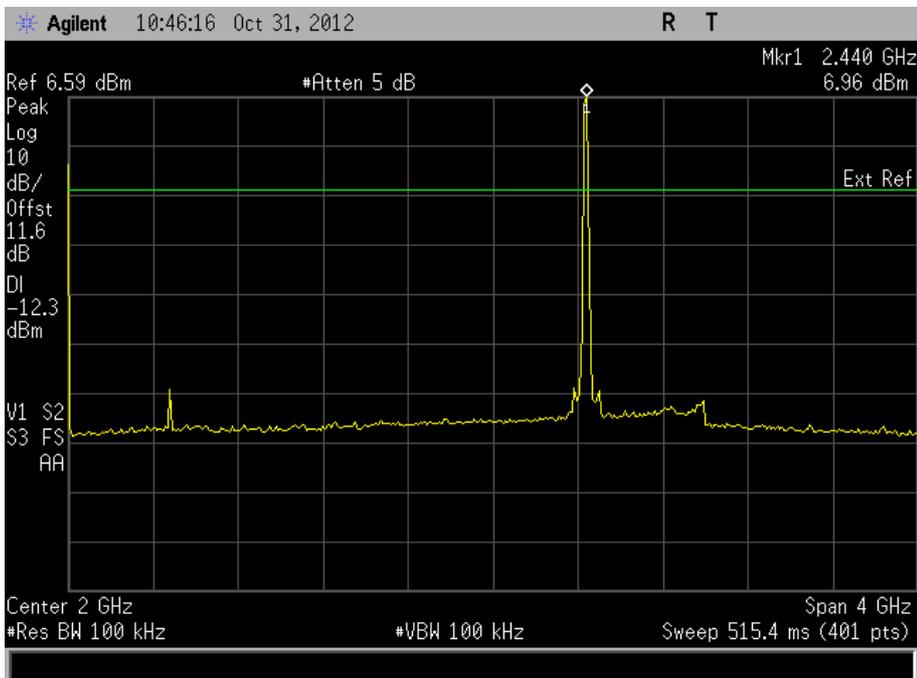
Product Service

18 GHz to 25 GHz



2437 MHz

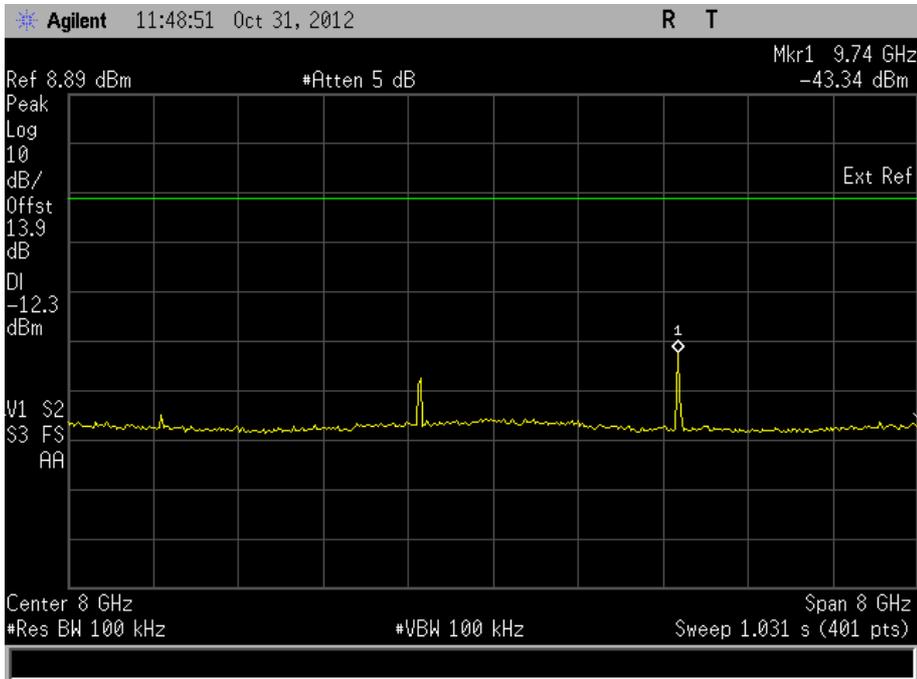
9 kHz to 4 GHz



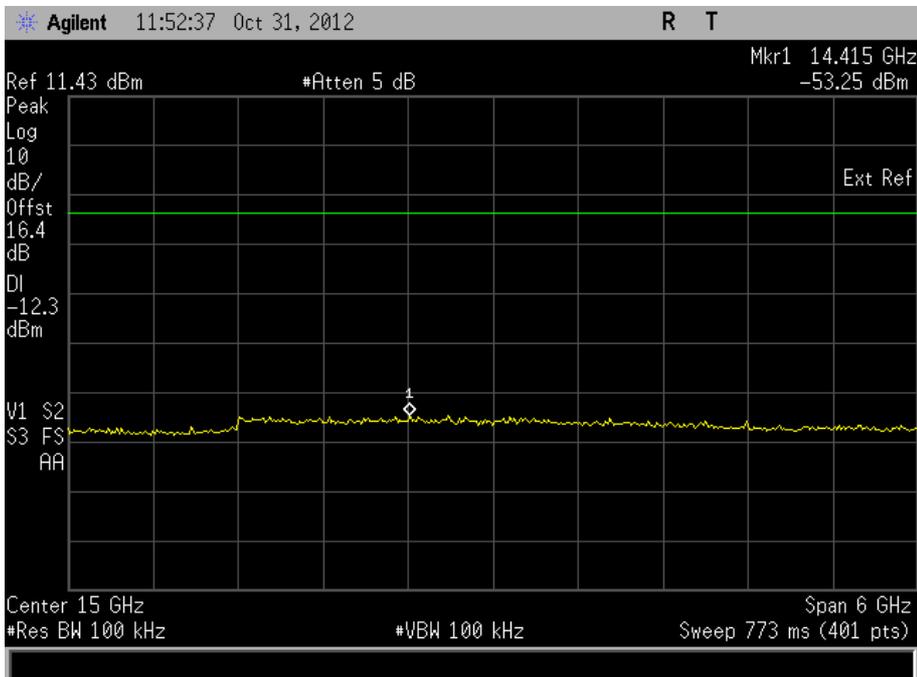


Product Service

4 GHz to 12 GHz



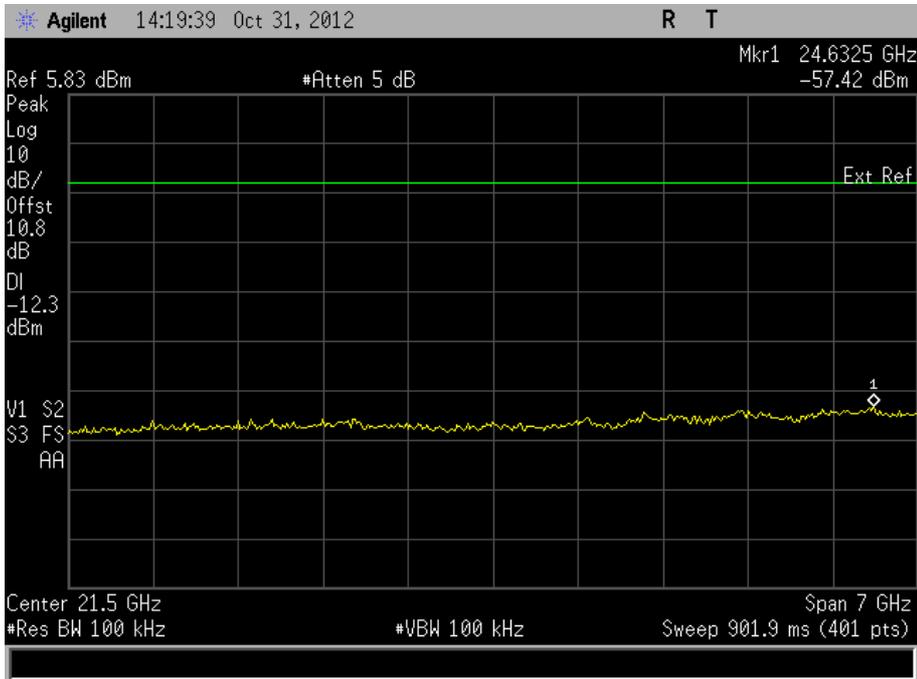
12 GHz to 18 GHz





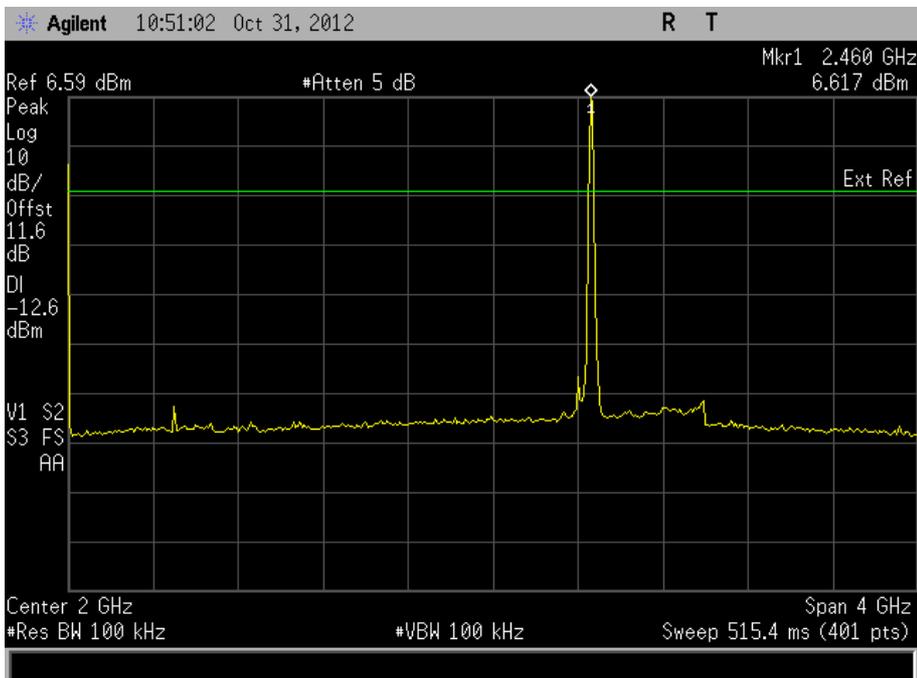
Product Service

18 GHz to 25 GHz



2462 MHz

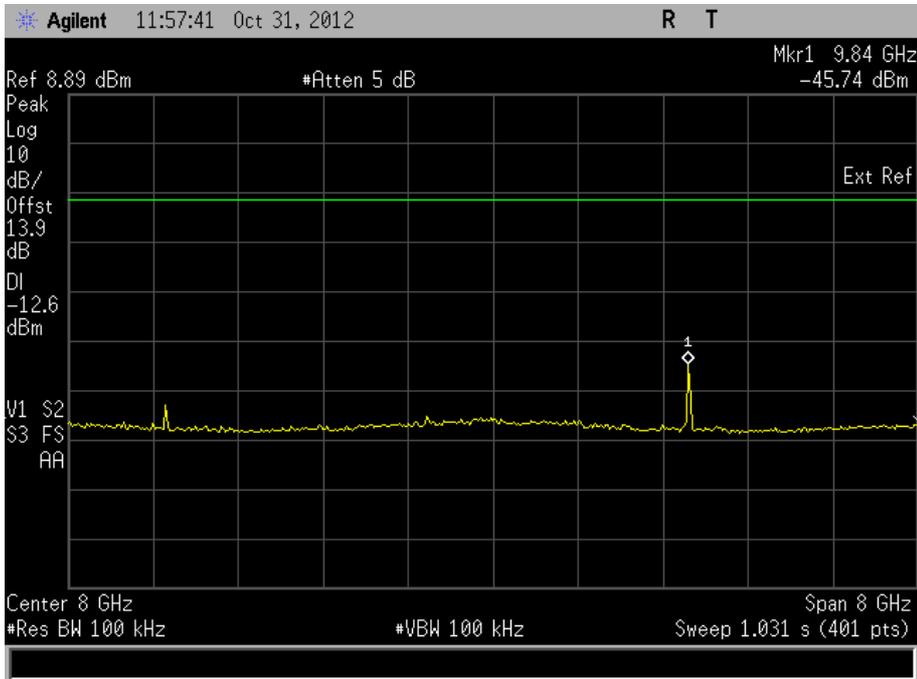
9 kHz to 4 GHz



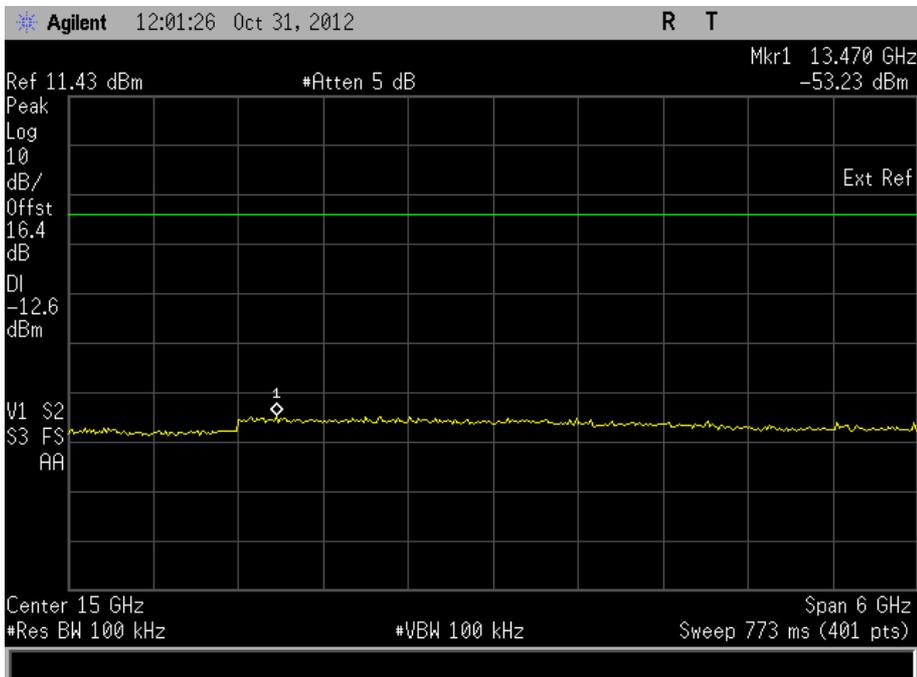


Product Service

4 GHz to 12 GHz



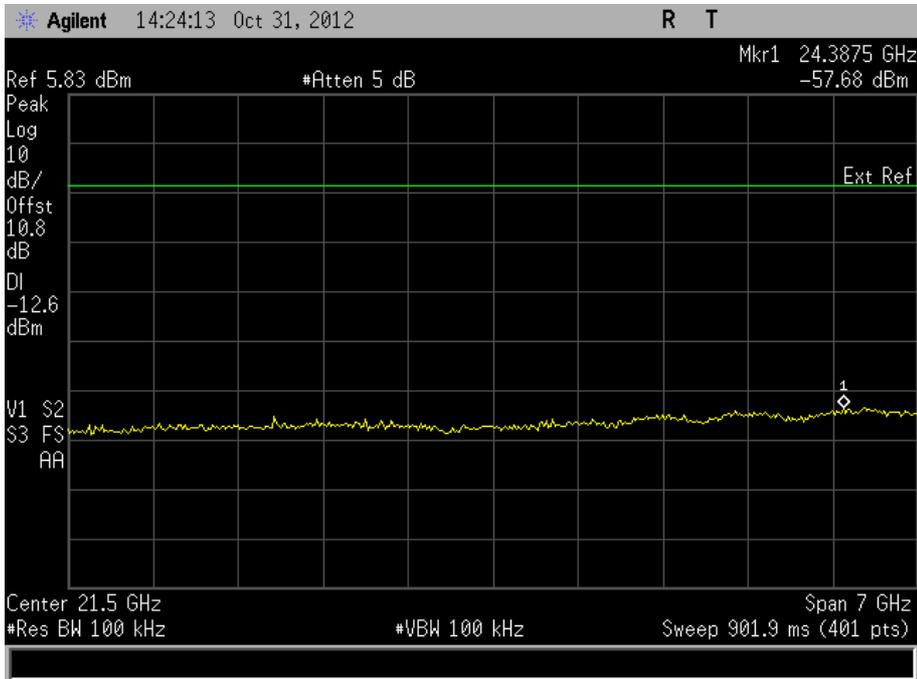
12 GHz to 18 GHz





Product Service

18 GHz to 25 GHz



Limit Clause

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

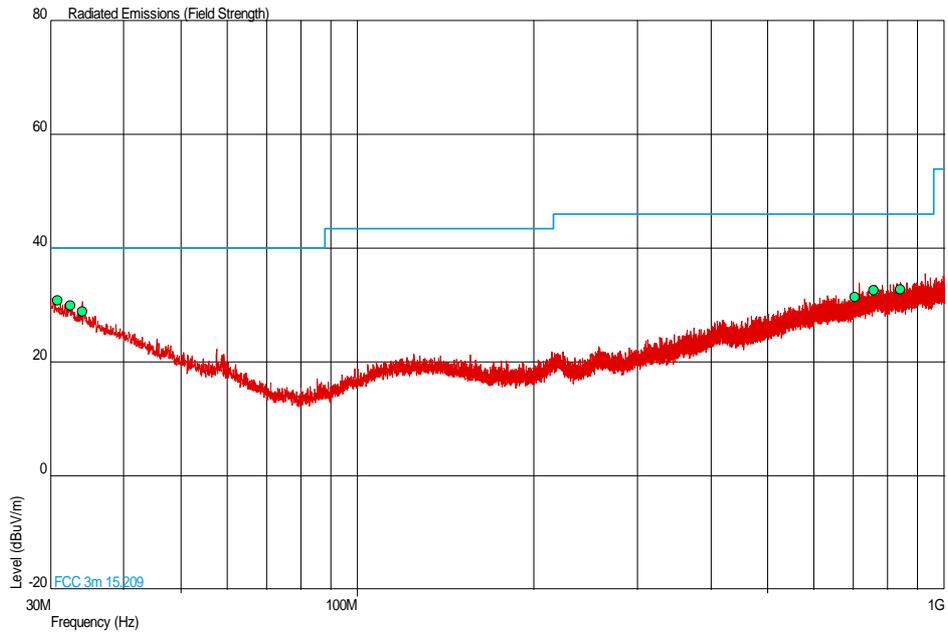
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Spurious Radiated Emissions

2412 MHz

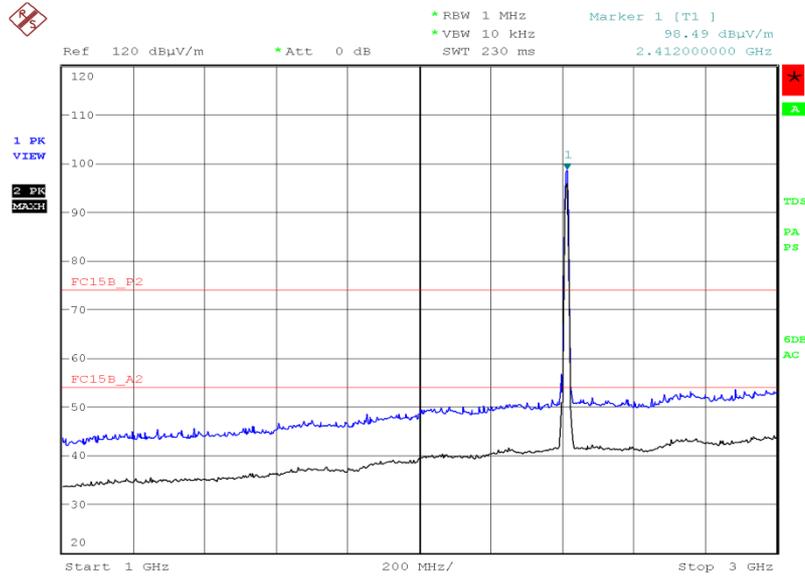
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
30.825	30.8	34.7	40.0	100	-9.2	65.3	0	1.00	Vertical
32.474	29.9	31.3	40.0	100	-10.1	68.7	0	1.00	Vertical
33.977	28.9	27.9	40.0	100	-11.1	72.1	0	1.00	Vertical
705.023	31.5	37.6	46.0	200	-14.5	162.4	180	1.00	Vertical
758.761	32.6	42.7	46.0	200	-13.4	157.3	0	1.00	Horizontal
841.114	32.8	43.7	46.0	200	-13.2	156.3	180	1.00	Vertical

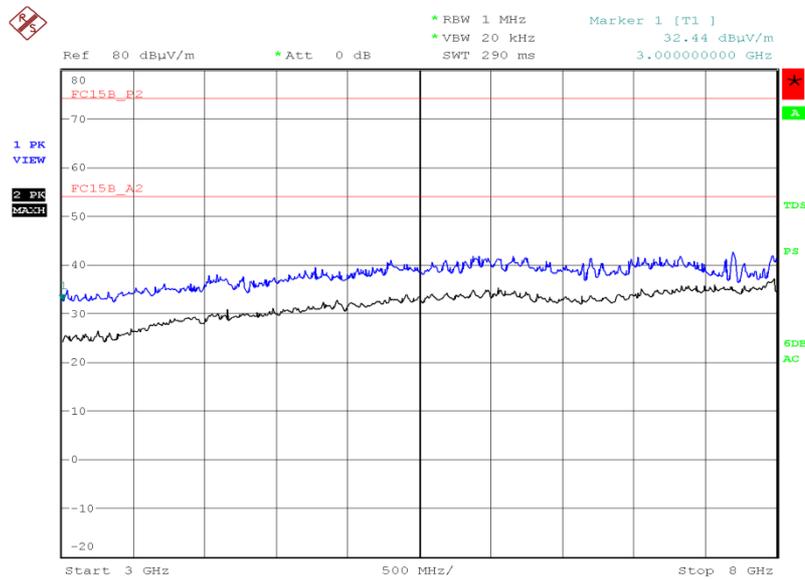


1 GHz to 3 GHz



Date: 28.OCT.2012 07:32:17

3 GHz to 8 GHz

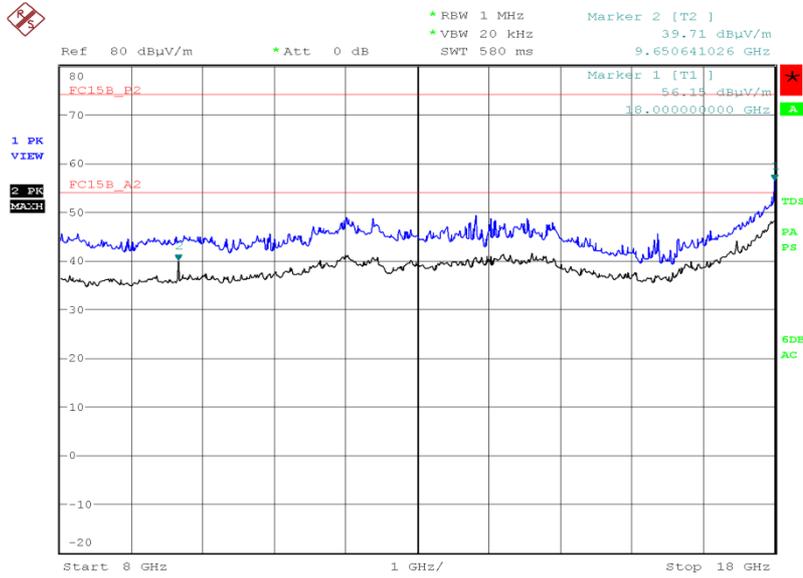


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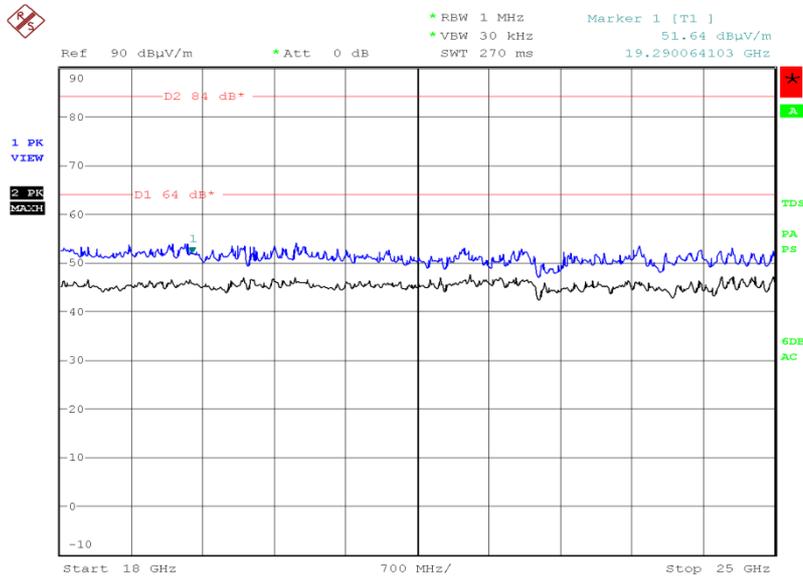
Product Service

8 GHz to 18 GHz



Date: 28.OCT.2012 15:15:02

18 GHz to 25 GHz



Date: 29.OCT.2012 22:37:17

Limit

Peak (dBμV/m)	Average (dBμV/m)
74.0	54.0

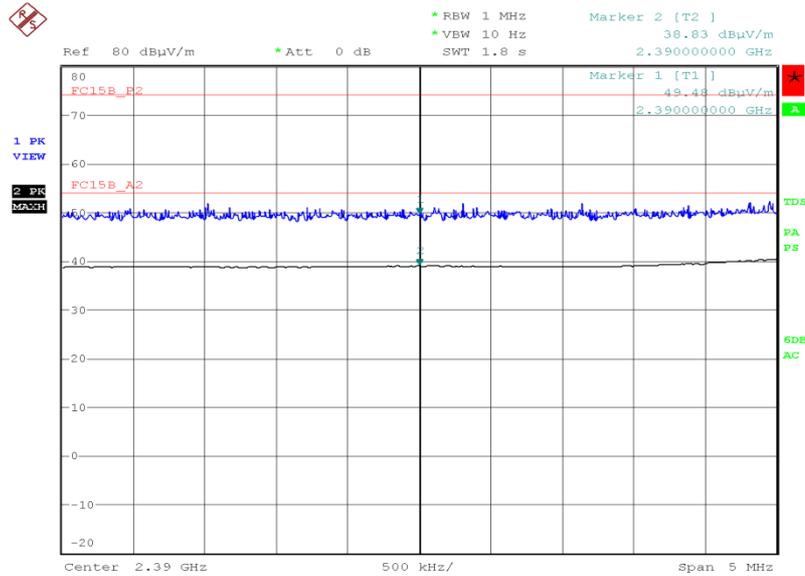


Product Service

Band Edge Emissions

2412 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Vertical	49.48	38.83

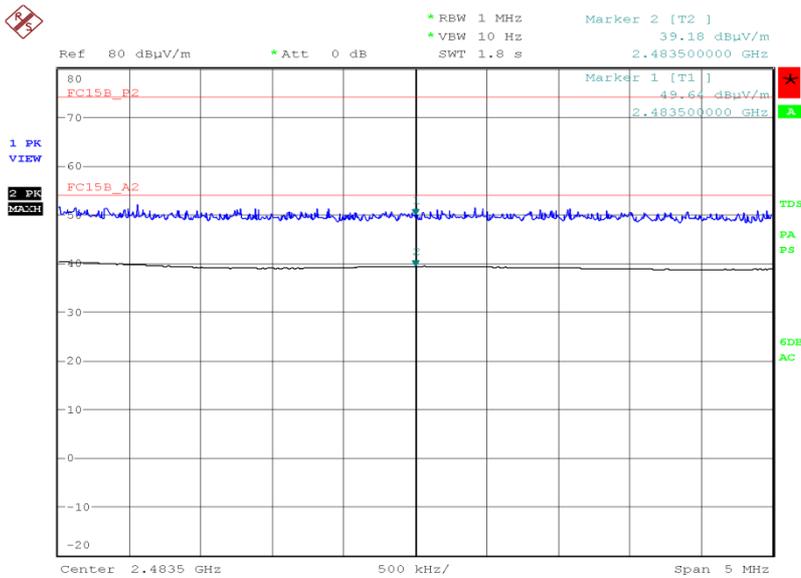


Date: 28.OCT.2012 07:27:50



2462 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Vertical	49.64	39.18



Date: 28.OCT.2012 08:08:11

Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

Conducted measurements have been performed on a different sample to the sample used for radiated measurements. The sample used for radiated measurements was reduced in output power to achieve compliance with the specification.

The sample used for conducted measurements was not reduced in output power but the test was not repeated because it was deemed as the worst case.



Product Service

802.11(g)

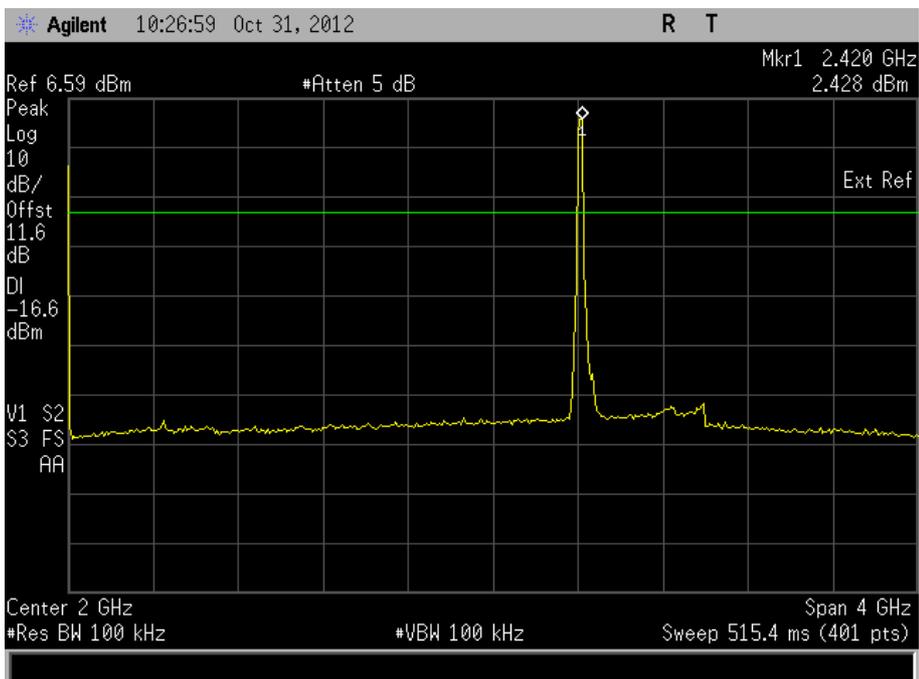
4.0 V DC Supply

Spurious Conducted Emissions

9 Mbps

2412 MHz

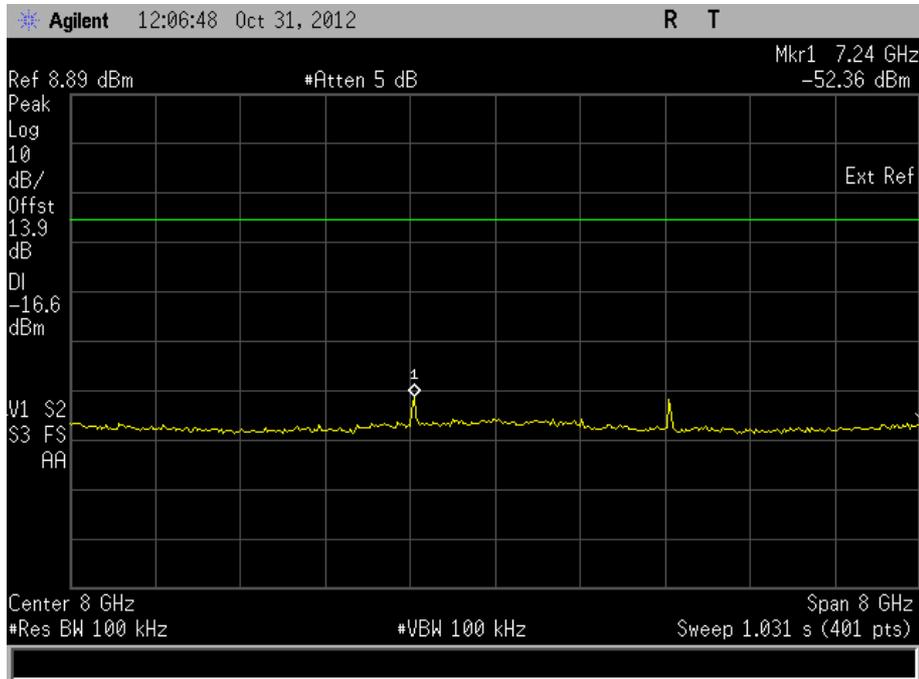
9 kHz to 4 GHz



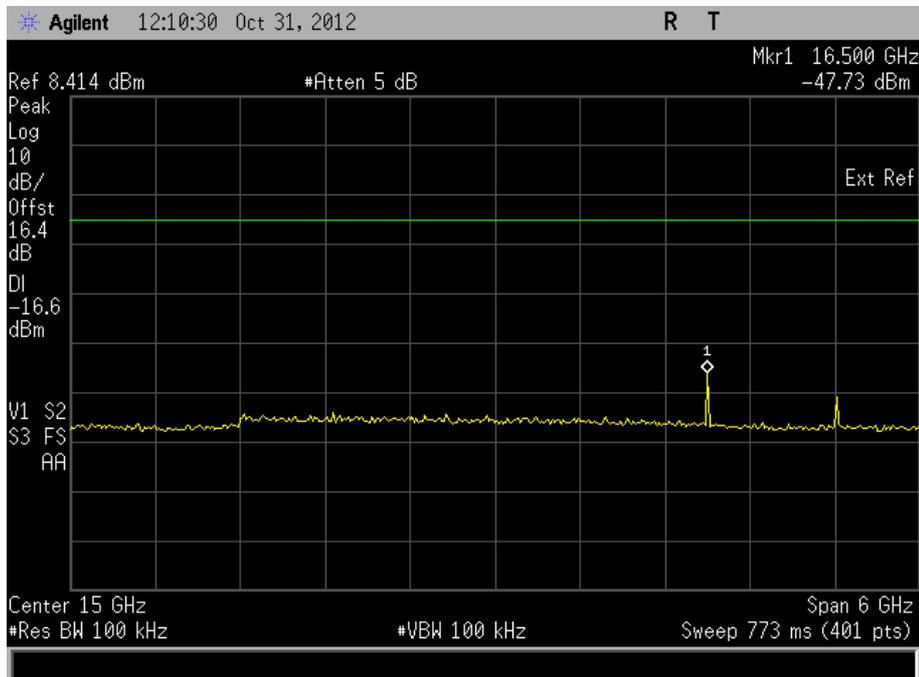


Product Service

4 GHz to 12 GHz



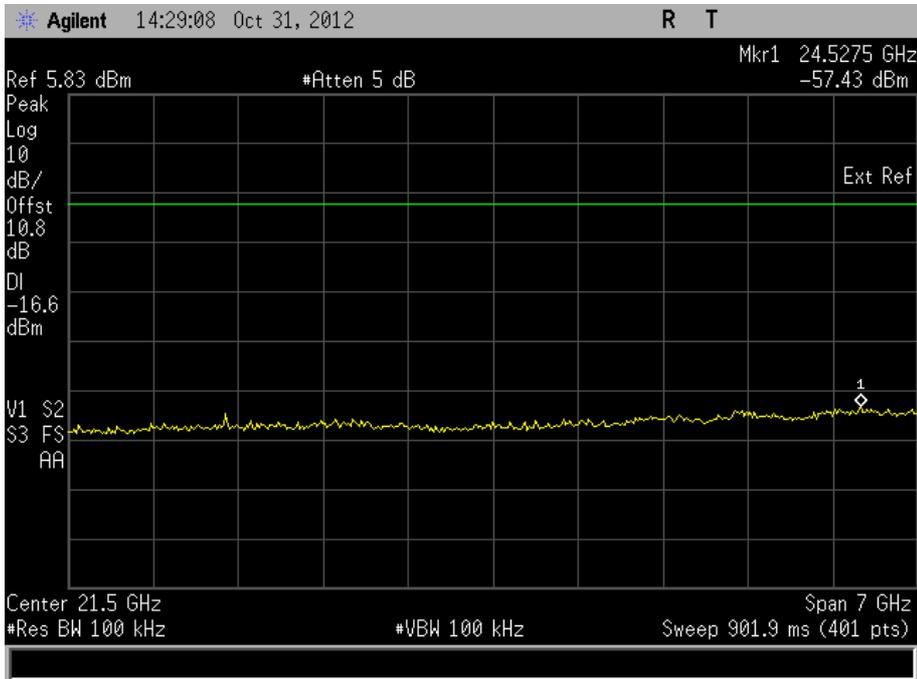
12 GHz to 18 GHz





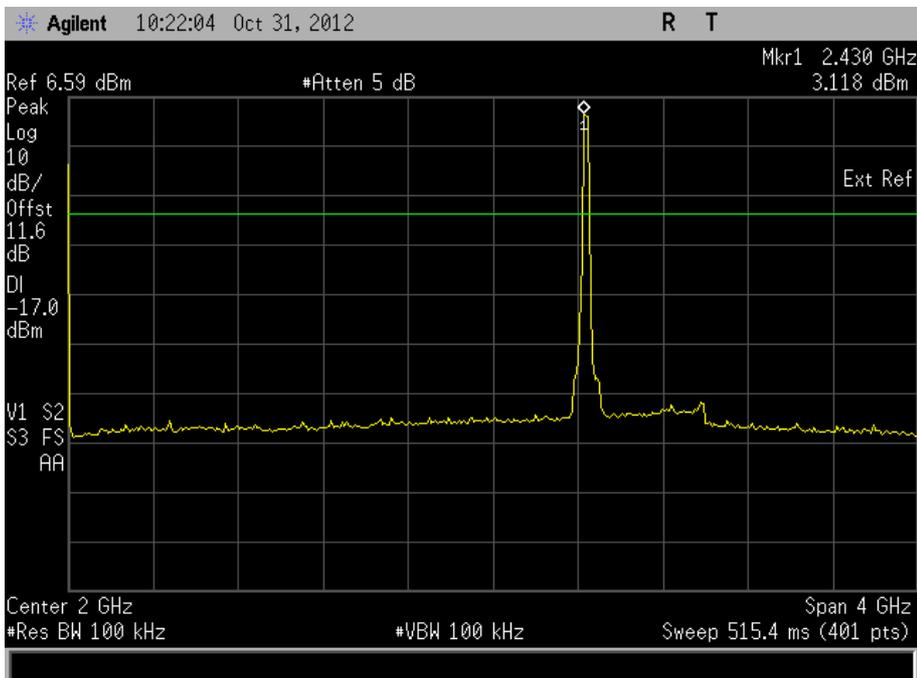
Product Service

18 GHz to 25 GHz



2437 MHz

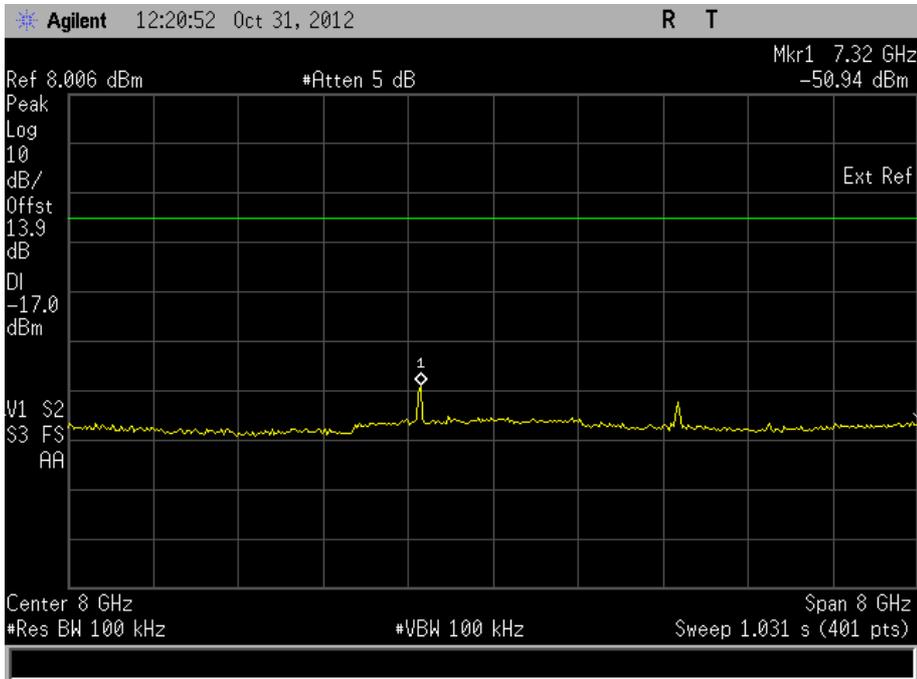
9 kHz to 4 GHz



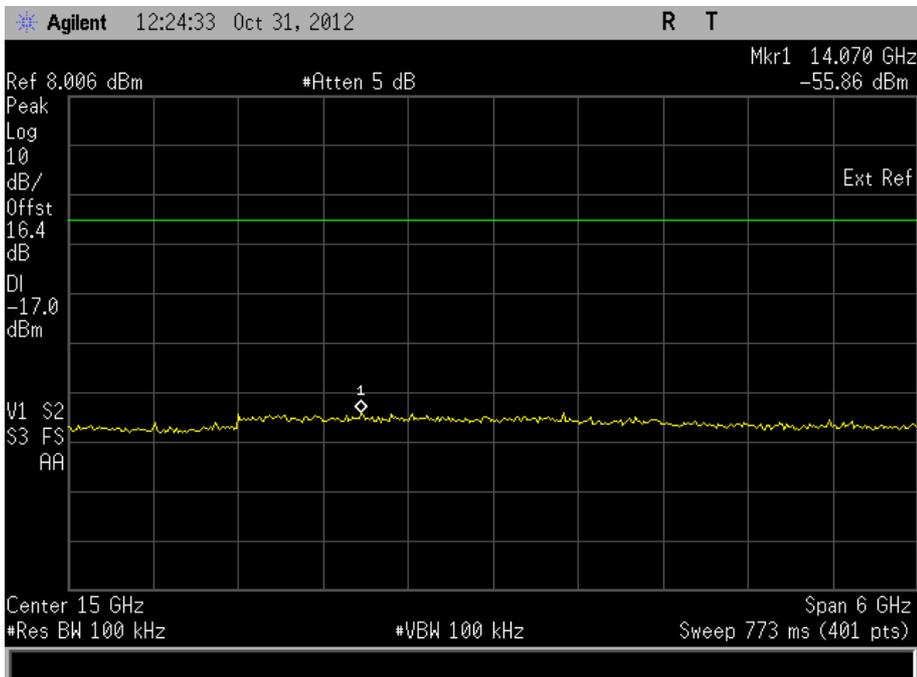


Product Service

4 GHz to 12 GHz



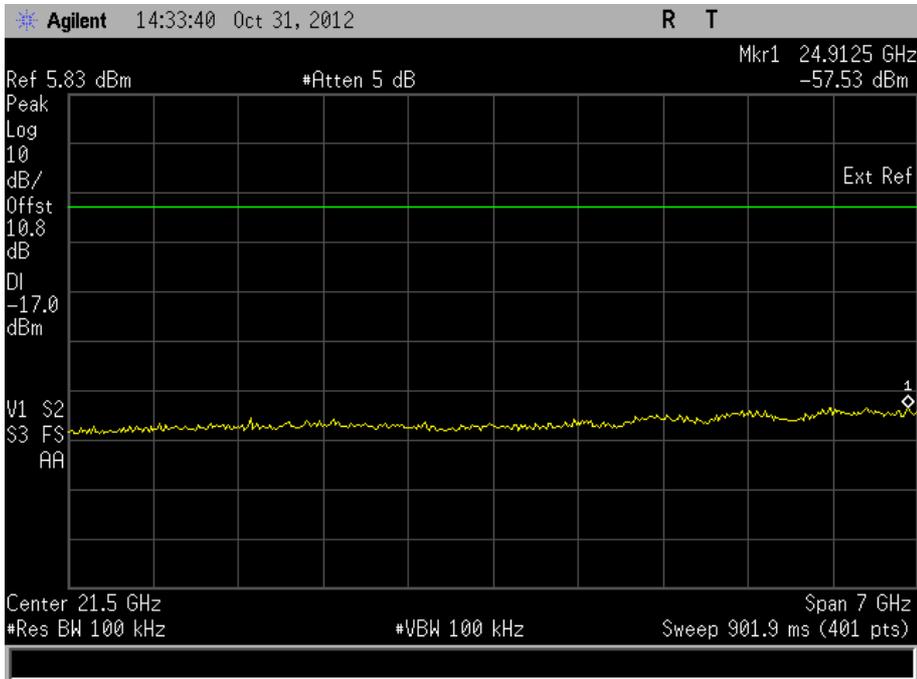
12 GHz to 18 GHz





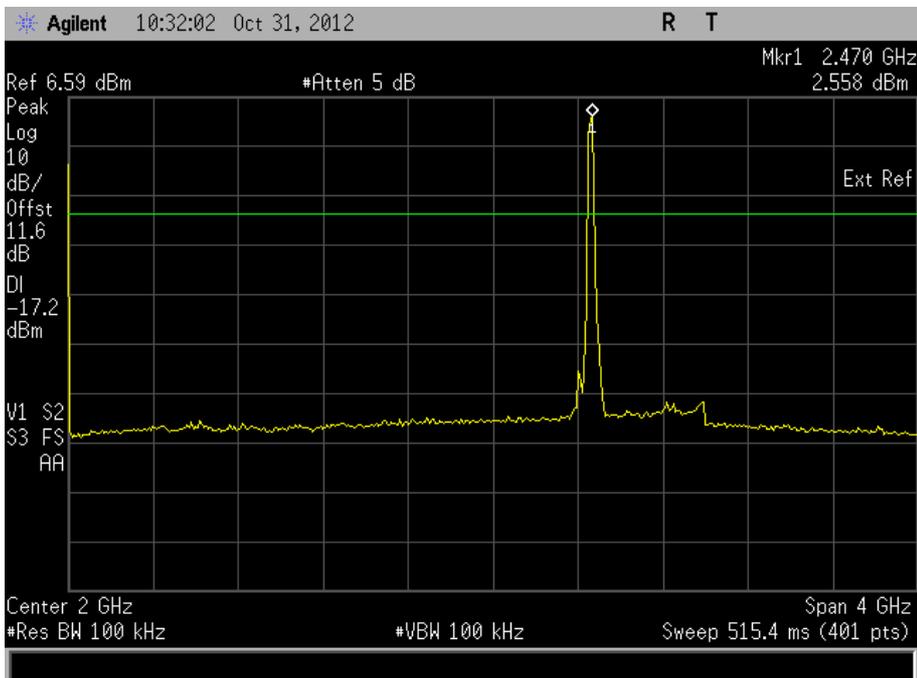
Product Service

18 GHz to 25 GHz



2462 MHz

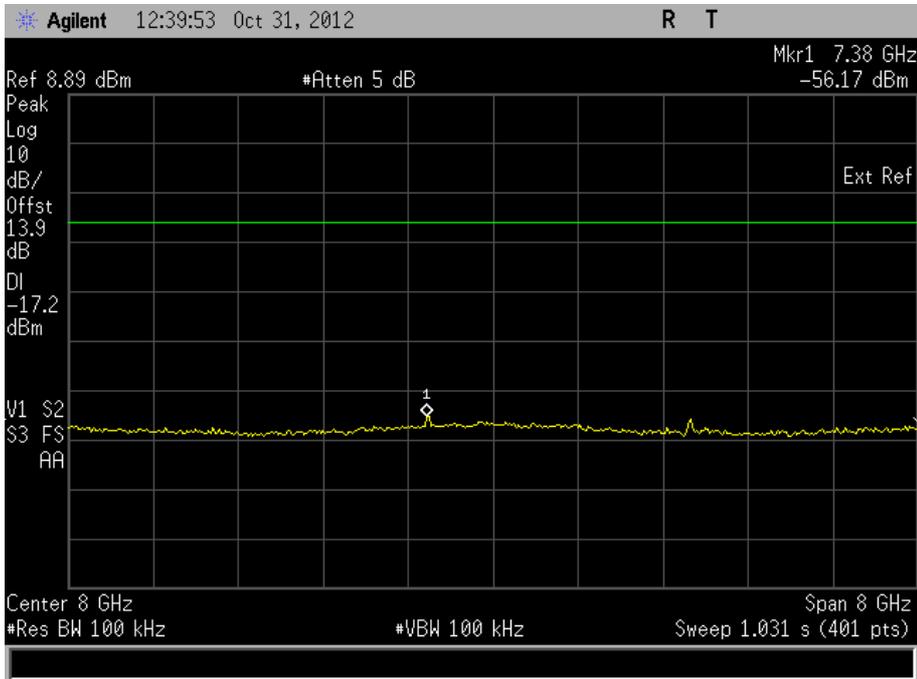
9 kHz to 4 GHz



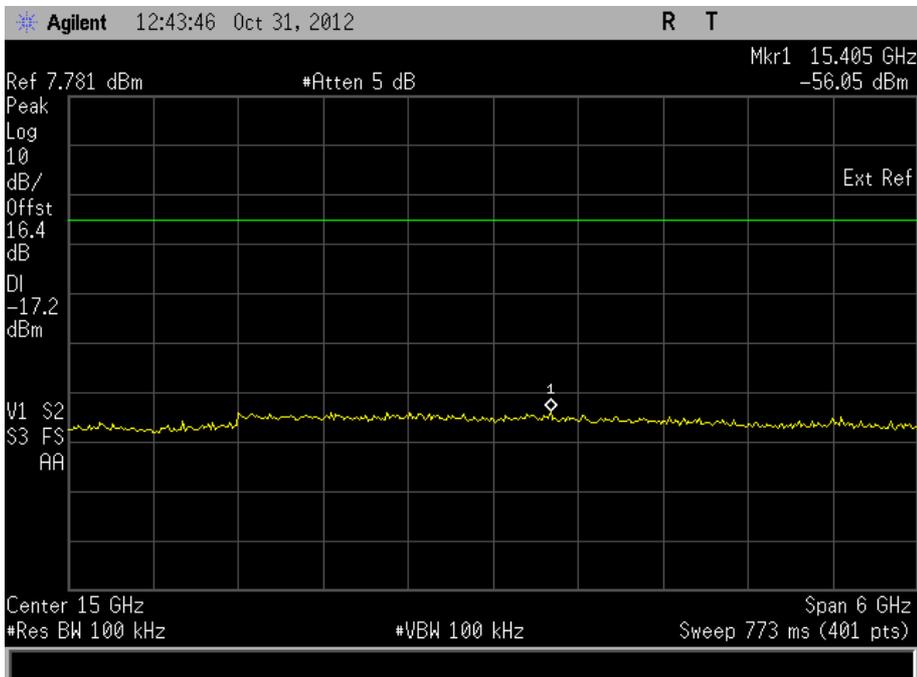


Product Service

4 GHz to 12 GHz



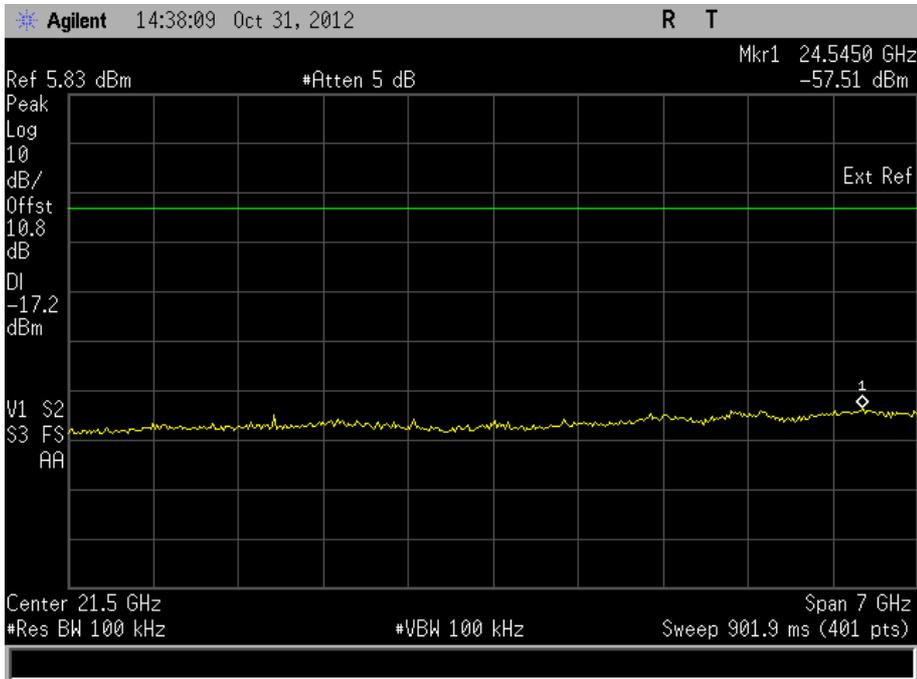
12 GHz to 18 GHz





Product Service

18 GHz to 25 GHz



Limit Clause

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

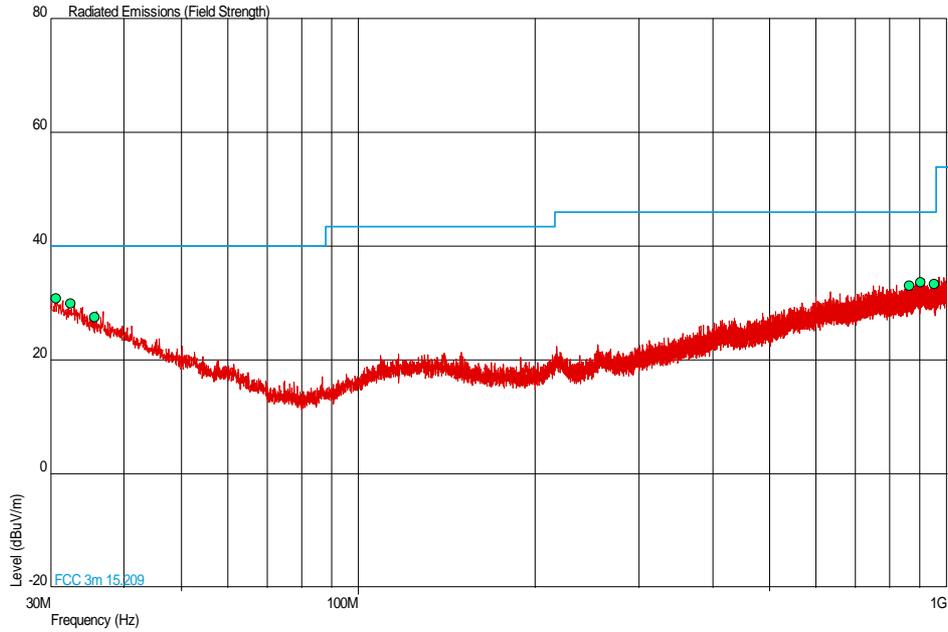
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Spurious Radiated Emissions

2412 MHz

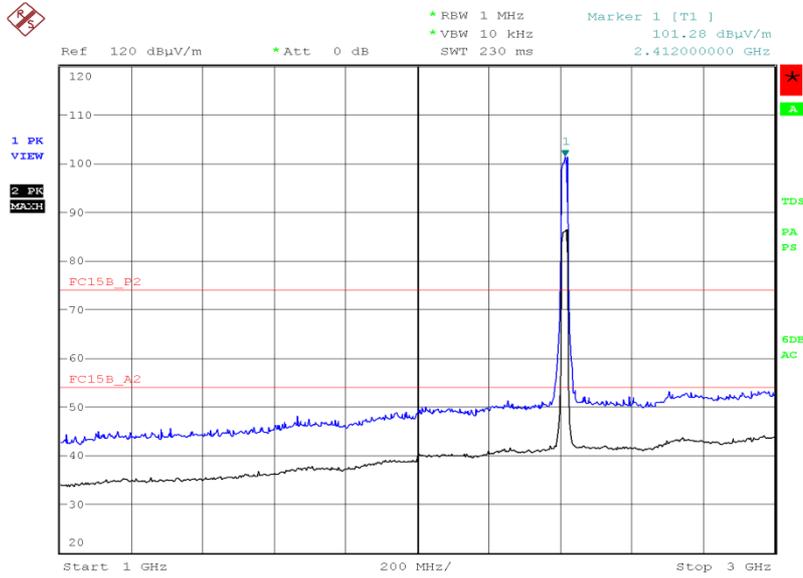
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
30.679	30.8	34.7	40.0	100	-9.2	65.3	0	1.00	Horizontal
32.474	29.9	31.3	40.0	100	-10.1	68.7	0	1.00	Vertical
35.723	27.5	23.7	40.0	100	-12.5	76.3	0	1.00	Vertical
865.122	33.1	45.2	46.0	200	-12.9	154.8	0	1.00	Vertical
903.194	33.7	48.4	46.0	200	-12.3	151.6	0	1.00	Vertical
951.888	33.4	46.8	46.0	200	-12.6	153.2	0	1.00	Horizontal

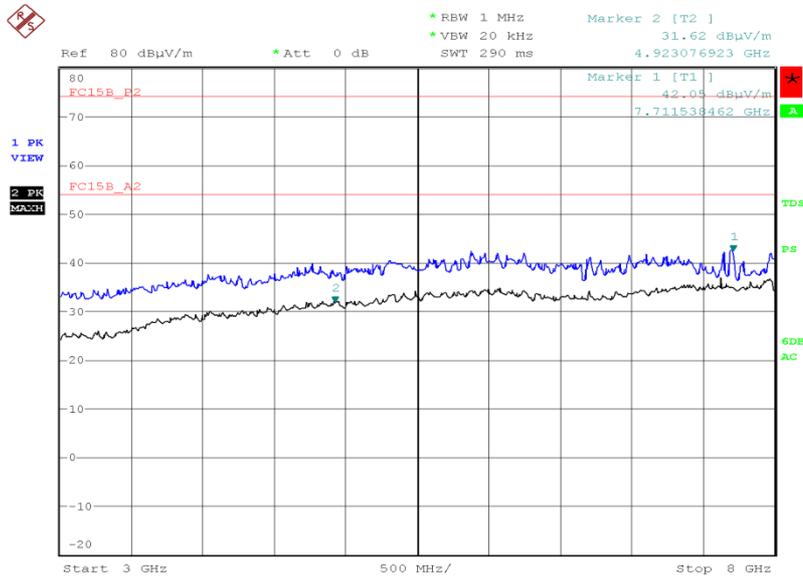


1 GHz to 3 GHz



Date: 28.OCT.2012 08:45:40

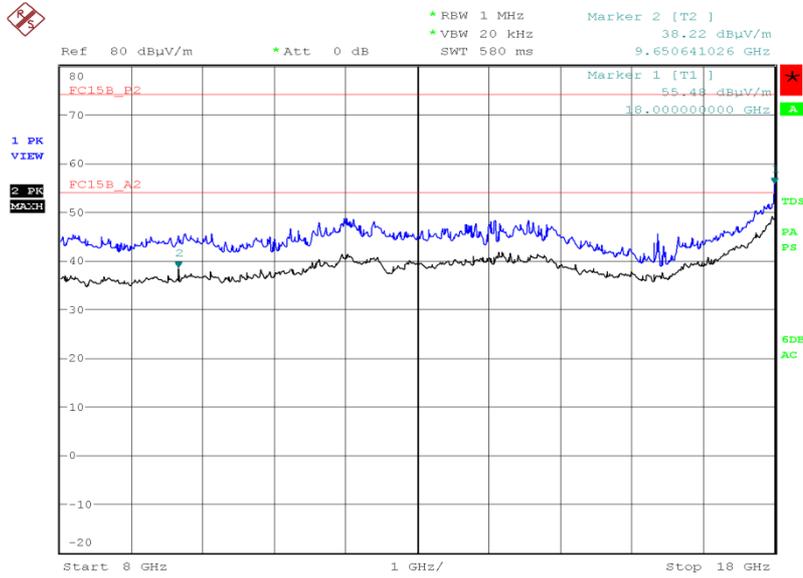
3 GHz to 8 GHz



Date: 28.OCT.2012 13:27:48

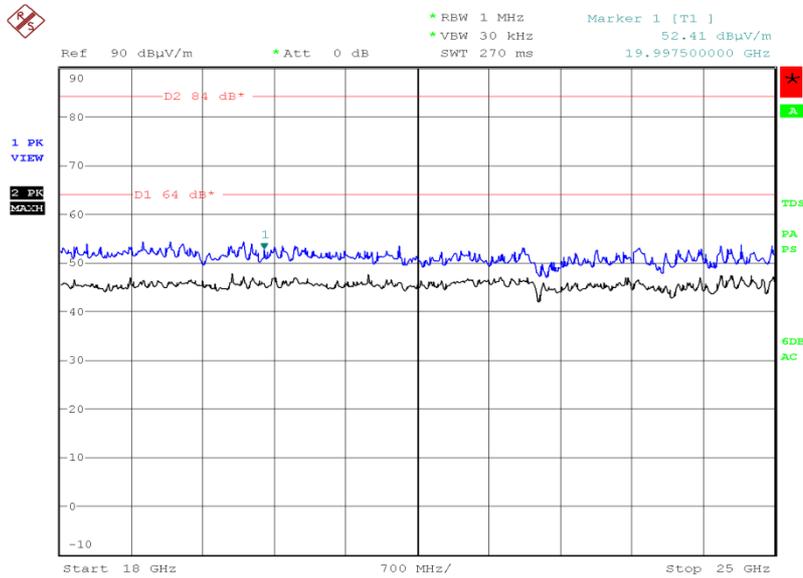


8GHz to 18 GHz



Date: 28.OCT.2012 14:45:13

18 GHz to 25 GHz



Date: 29.OCT.2012 22:10:17

Limit

Peak (dBμV/m)	Average (dBμV/m)
74.0	54.0

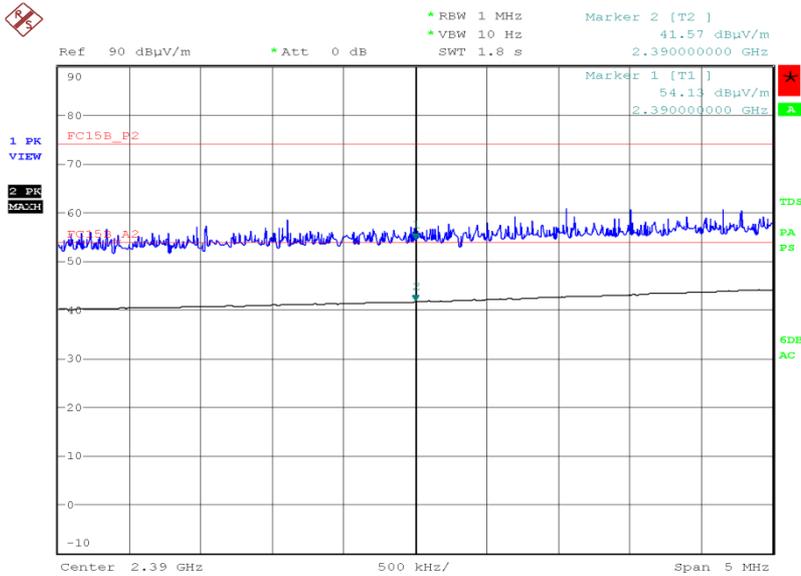


Product Service

Band Edge Emissions

2412 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Vertical	54.13	41.57

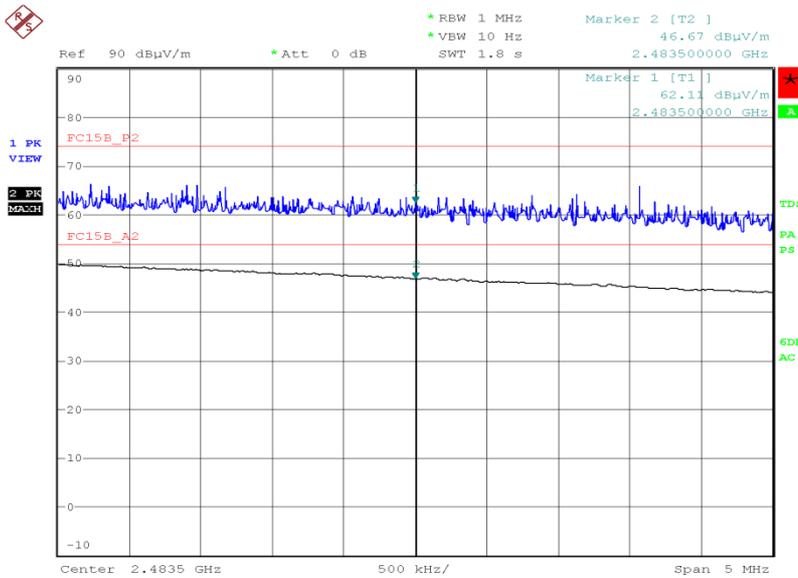


Date: 28.OCT.2012 08:36:26



2462 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	62.11	46.67



Date: 28.OCT.2012 09:33:20

Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

Conducted measurements have been performed on a different sample to the sample used for radiated measurements. The sample used for radiated measurements was reduced in output power to achieve compliance with the specification.

The sample used for conducted measurements was not reduced in output power but the test was not repeated because it was deemed as the worst case.



Product Service

802.11(n)

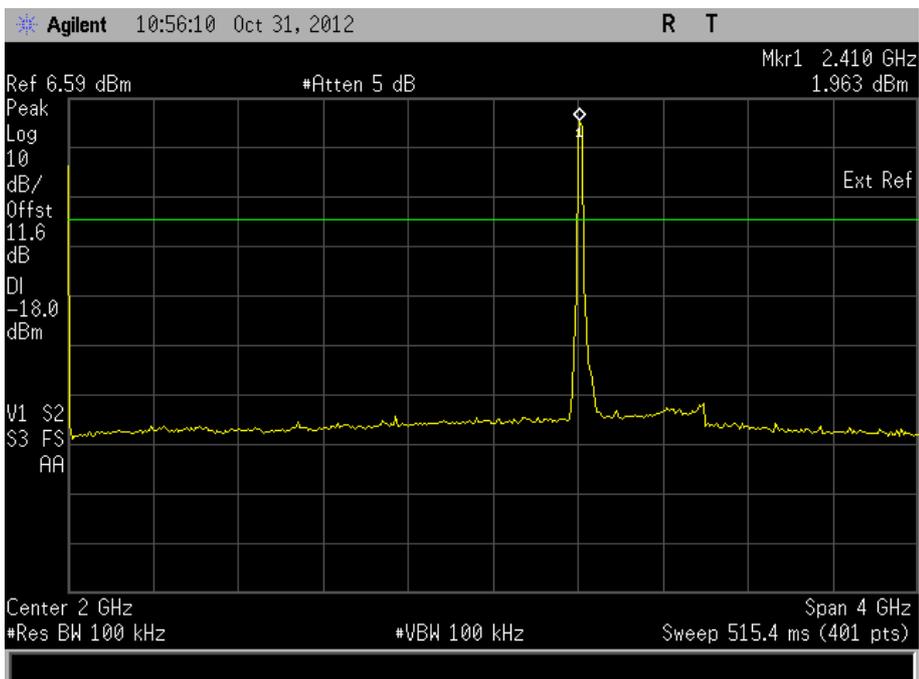
4.0 V DC Supply

Spurious Conducted Emissions

6.5 Mbps

2412 MHz

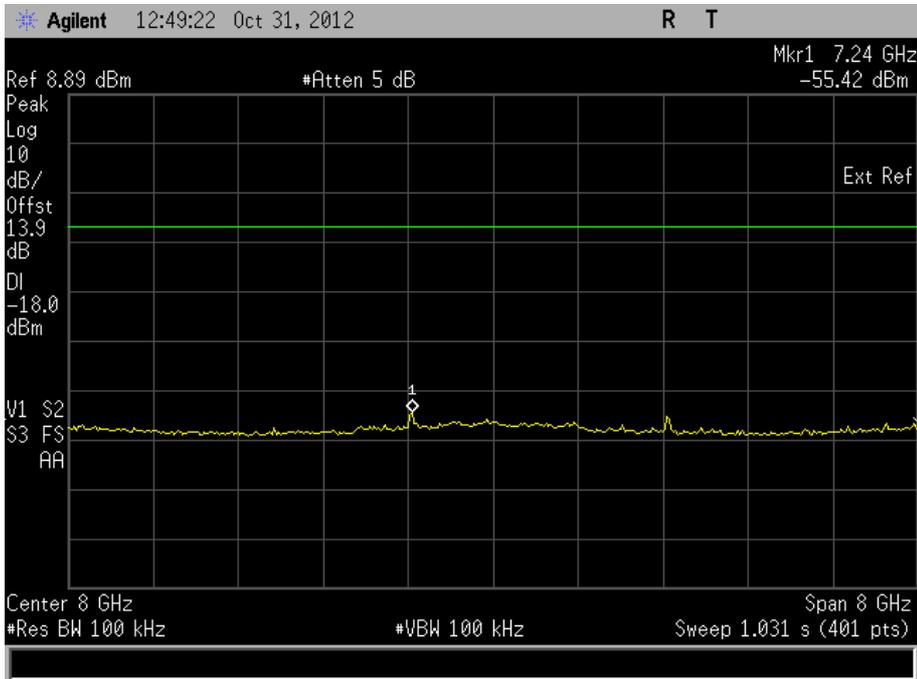
9 kHz to 4 GHz



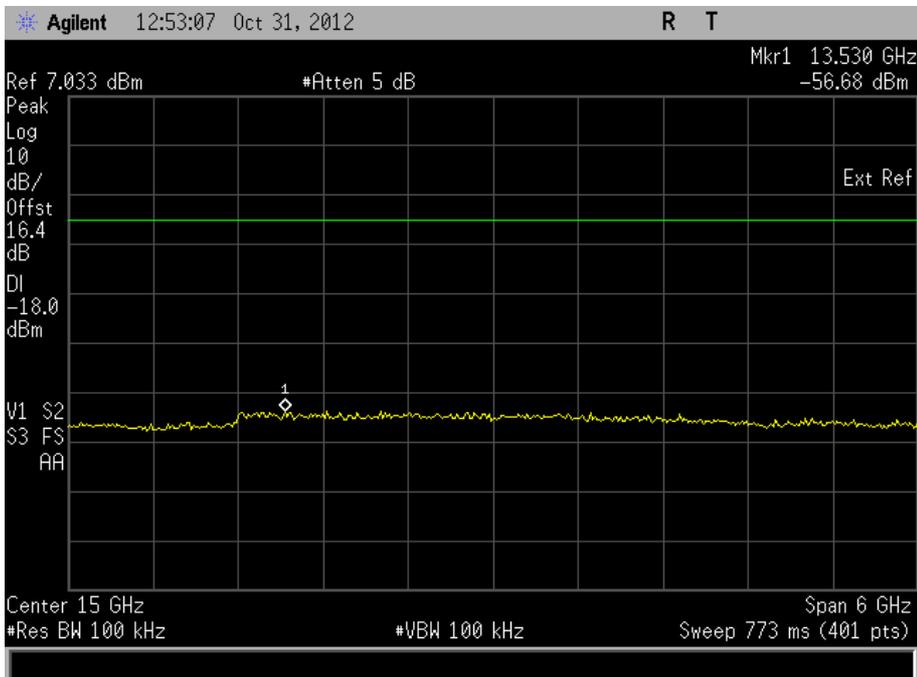


Product Service

4 GHz to 12 GHz



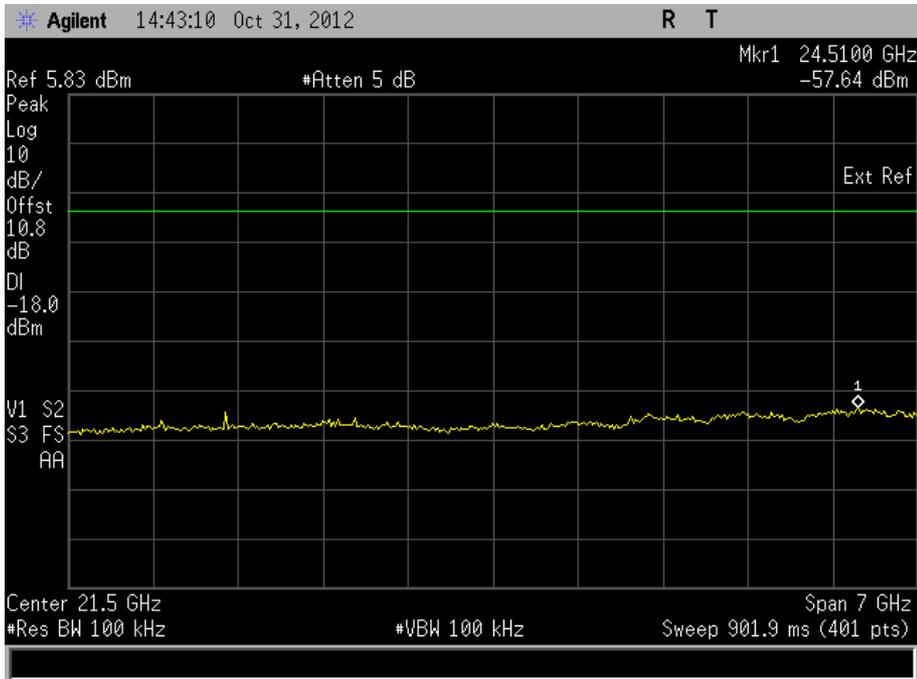
12 GHz to 18 GHz





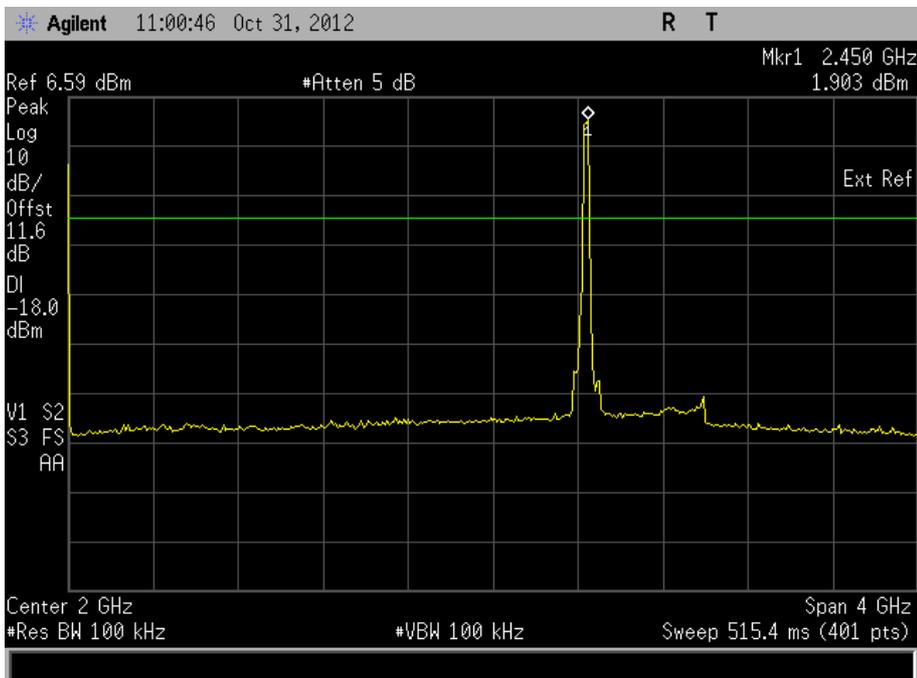
Product Service

18 GHz to 25 GHz



2437 MHz

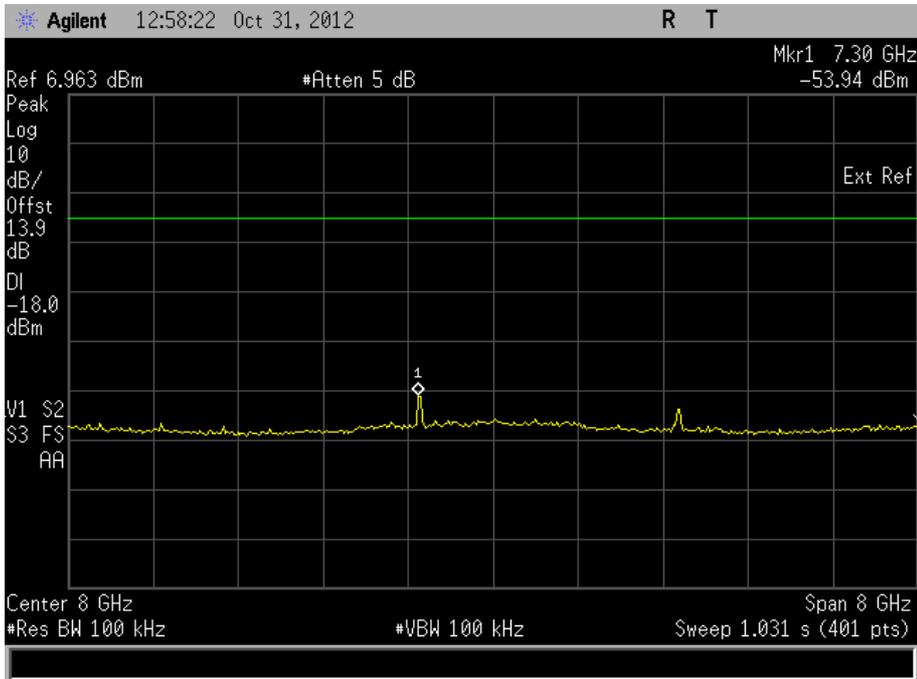
9 kHz to 4 GHz



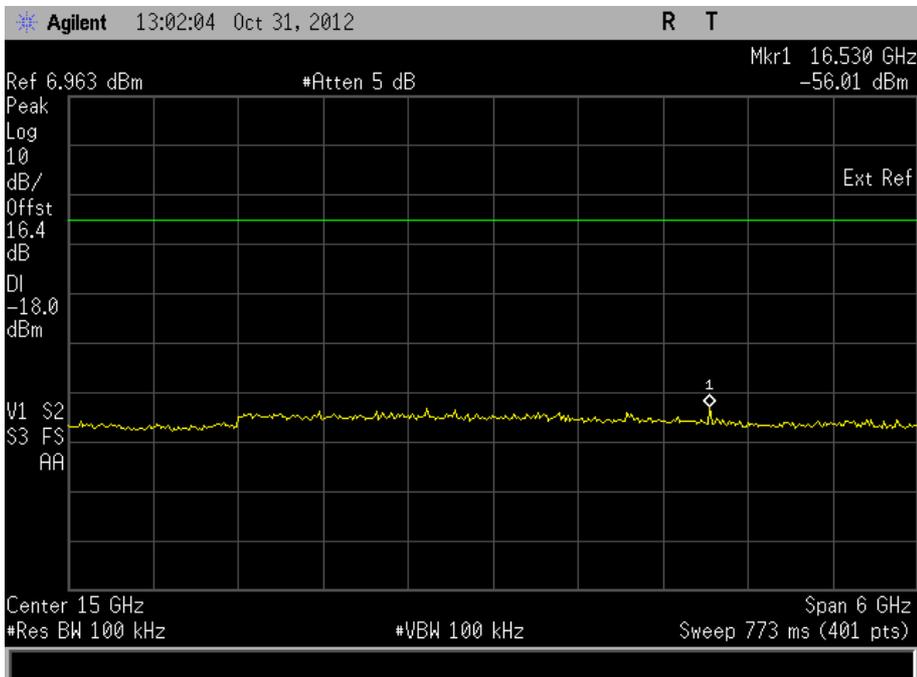


Product Service

4 GHz to 12 GHz



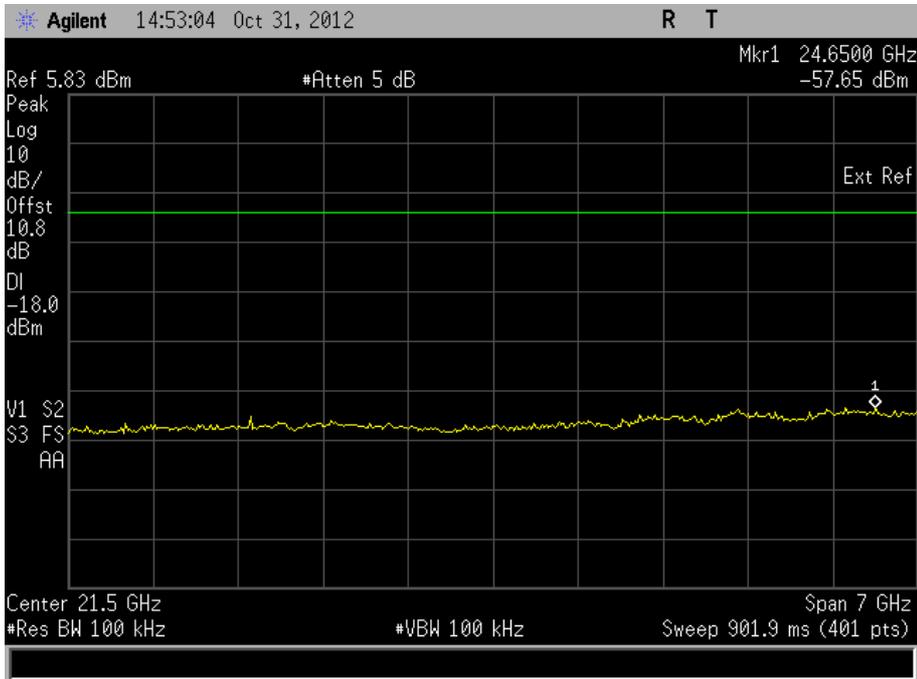
12 GHz to 18 GHz





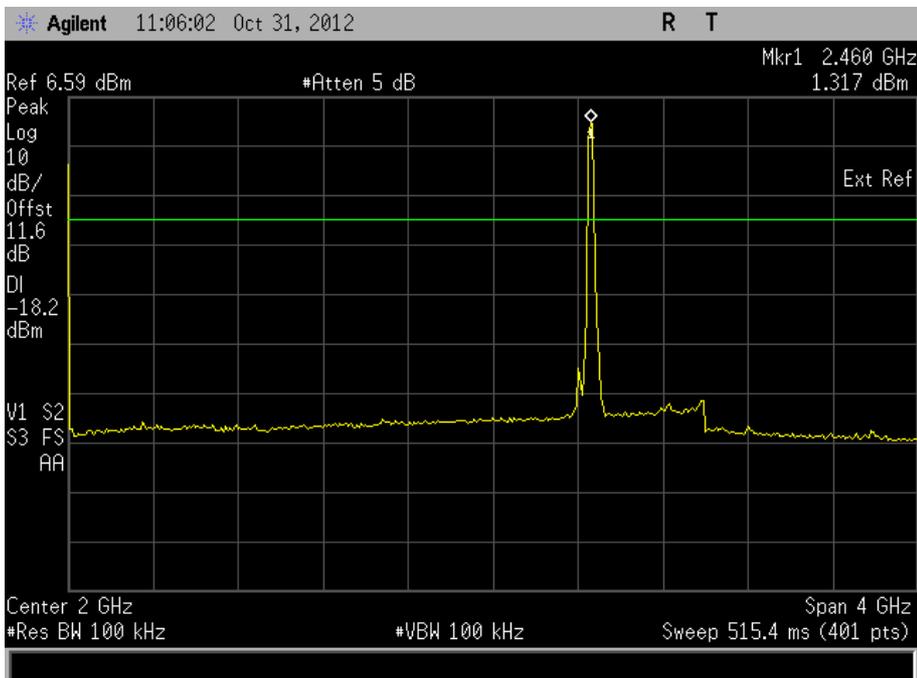
Product Service

18 GHz to 25 GHz



2462 MHz

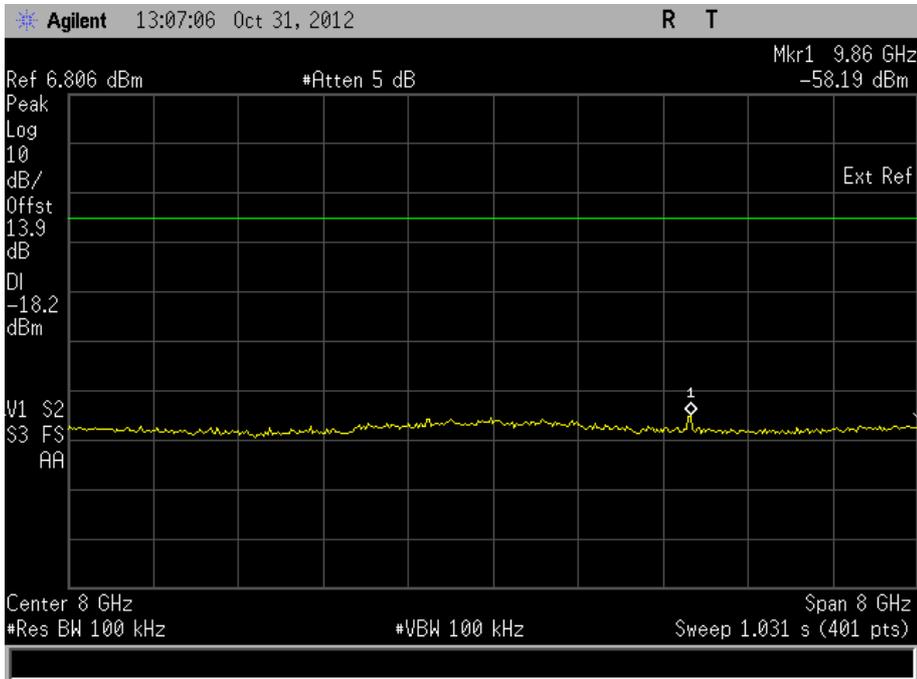
9 kHz to 4 GHz



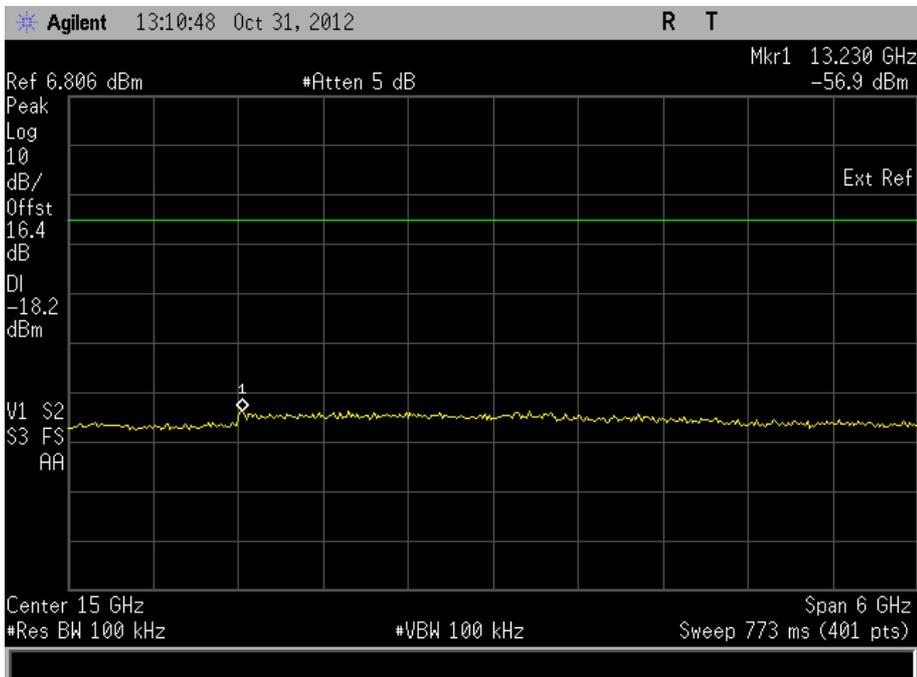


Product Service

4 GHz to 12 GHz



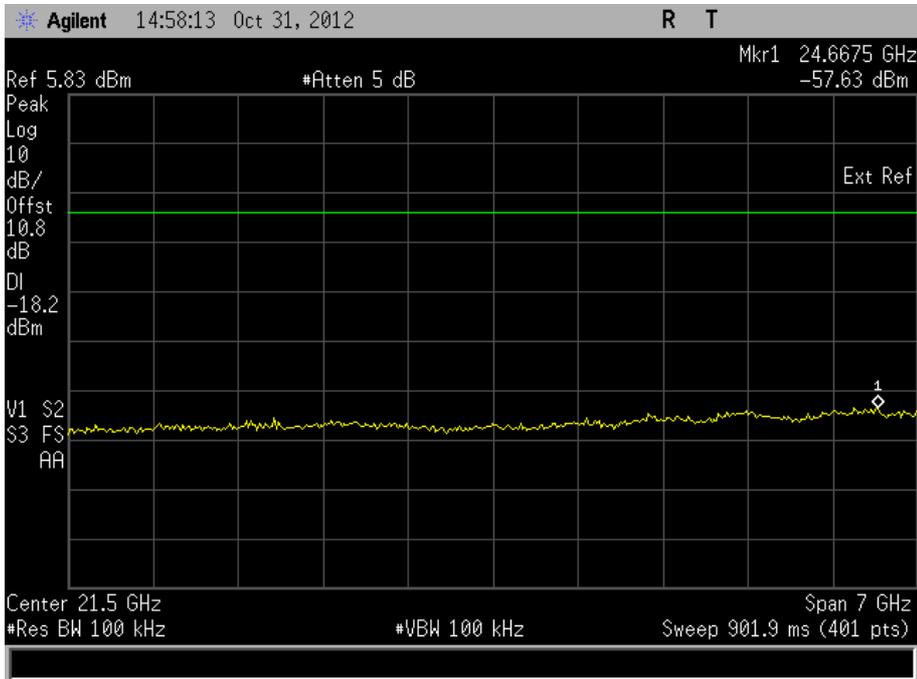
12 GHz to 18 GHz





Product Service

18 GHz to 25 GHz



Limit Clause

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

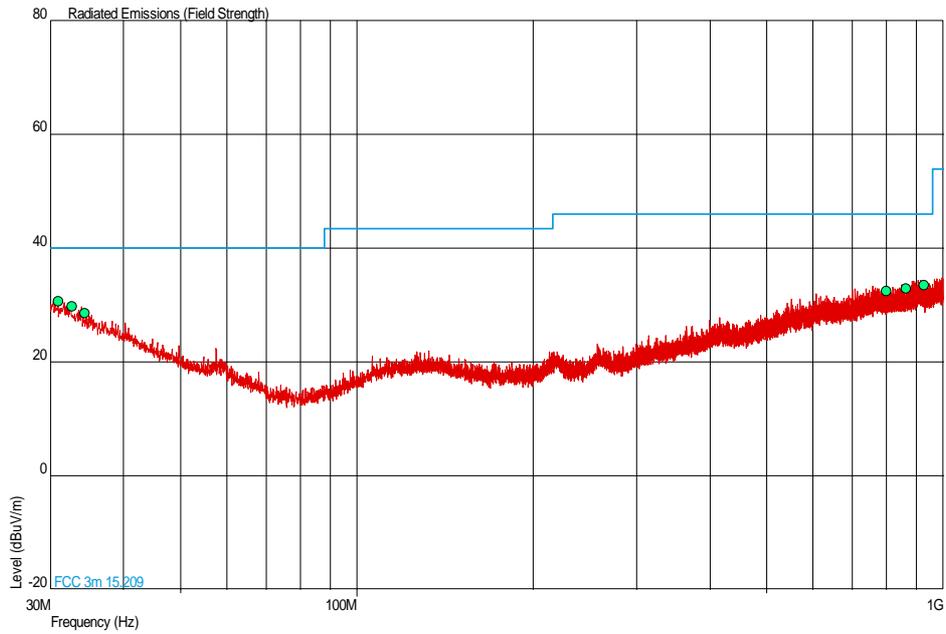
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Spurious Radiated Emissions

2412 MHz

30 MHz to 1 GHz

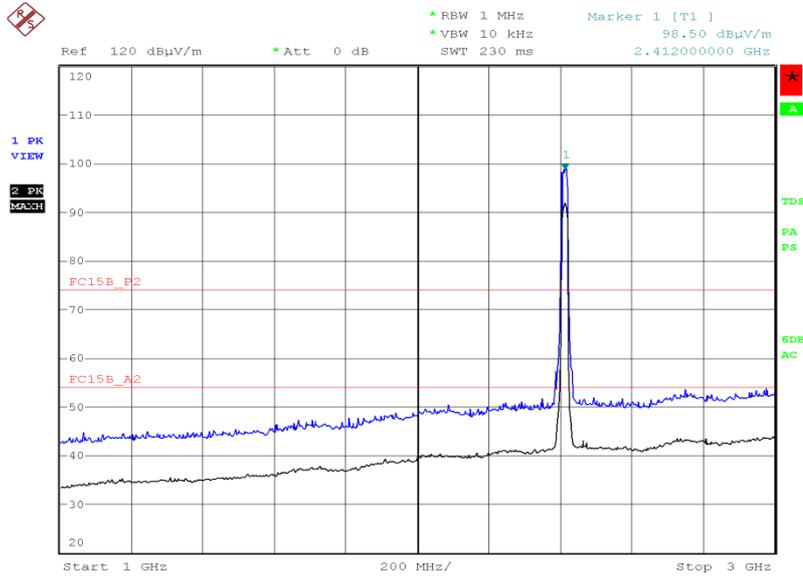


Frequency (MHz)	QP Level (dB μ V/m)	QP Level (μ V/m)	QP Limit (dB μ V/m)	QP Limit (μ V/m)	QP Margin (dB μ V/m)	QP Margin (μ V/m)	Angle (Deg)	Height (m)	Polarity
31.019	30.7	34.3	40.0	100	-9.3	65.7	180	1.00	Horizontal
32.668	29.7	30.5	40.0	100	-10.3	69.5	0	1.00	Vertical
34.317	28.5	26.6	40.0	100	-11.5	73.4	0	1.00	Vertical
800.083	32.4	41.7	46.0	200	-13.6	158.3	180	1.00	Horizontal
863.618	33.0	44.7	46.0	200	-13.0	155.3	180	1.00	Horizontal
926.474	33.5	47.3	46.0	200	-12.5	152.7	0	1.00	Horizontal



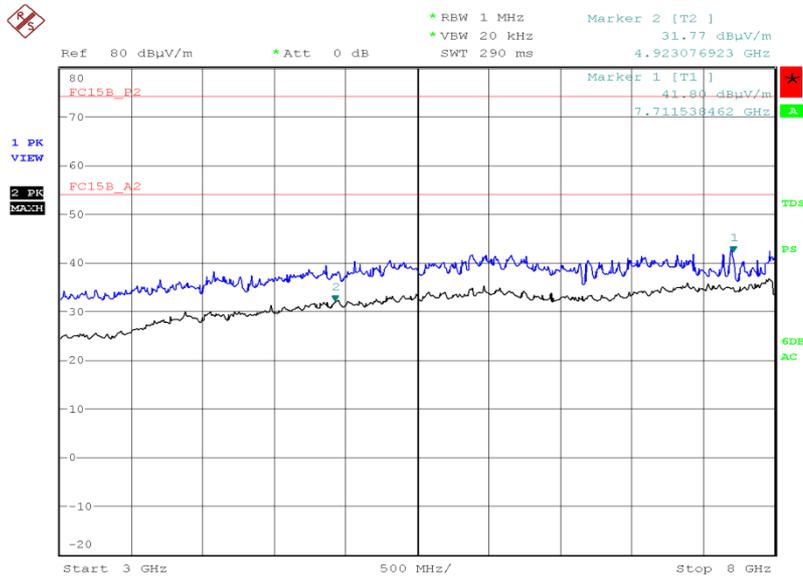
Product Service

1 GHz to 3 GHz



Date: 28.OCT.2012 11:39:49

3 GHz to 8 GHz

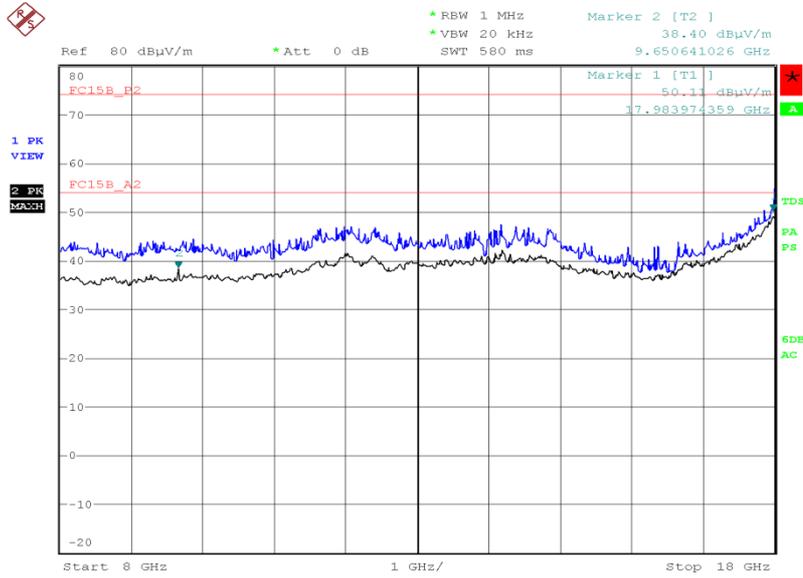


Date: 28.OCT.2012 13:59:04



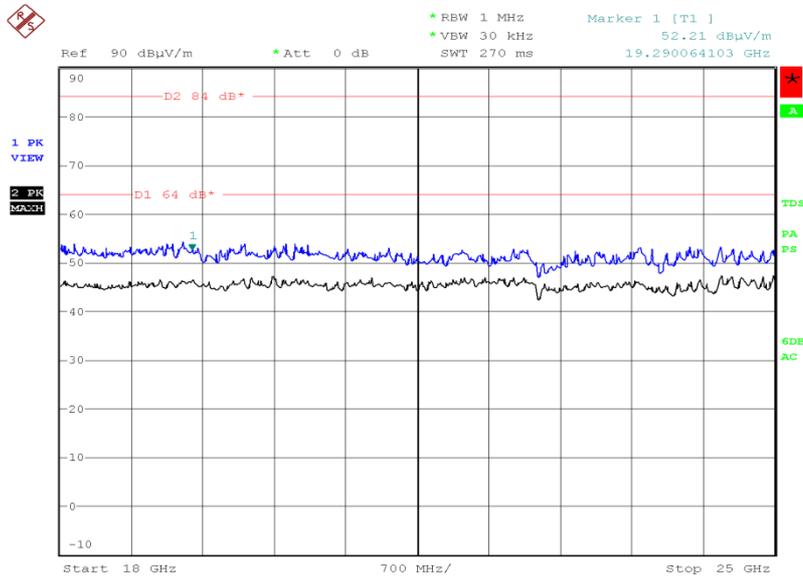
Product Service

8 GHz to 18 GHz



Date: 28.OCT.2012 14:39:23

18 GHz to 25 GHz



Date: 29.OCT.2012 22:23:39

Limit

Peak (dBμV/m)	Average (dBμV/m)
74.0	54.0

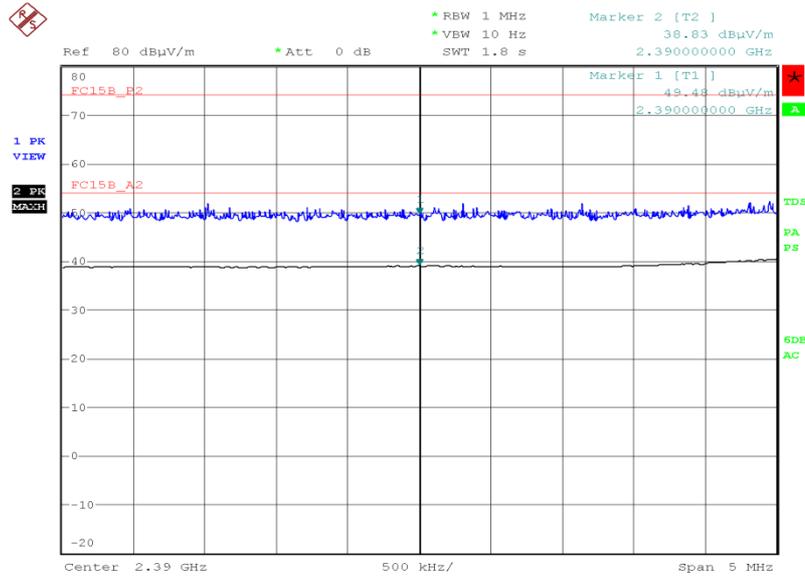


Product Service

Band Edge Emissions

2412 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Vertical	54.54	40.74

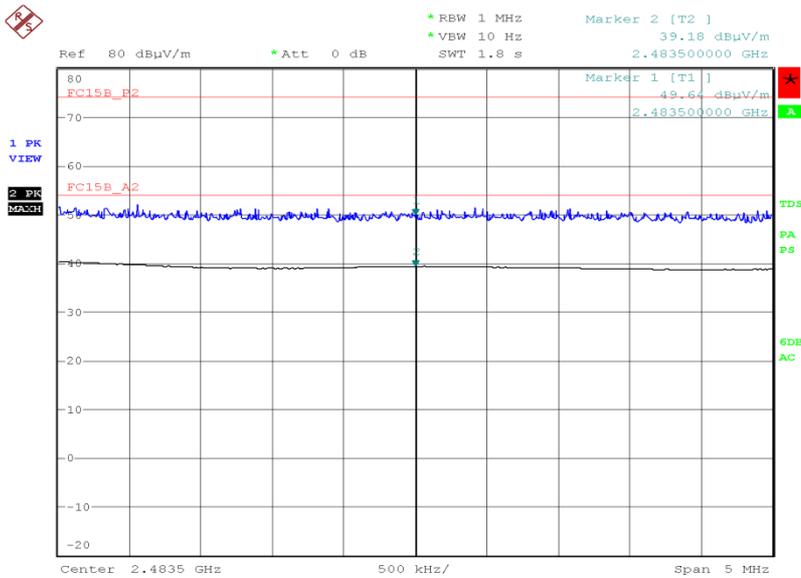


Date: 28.OCT.2012 07:27:50



2462 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	59.13	44.64



Date: 28.OCT.2012 08:08:11

Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

Conducted measurements have been performed on a different sample to the sample used for radiated measurements. The sample used for radiated measurements was reduced in output power to achieve compliance with the specification.

The sample used for conducted measurements was not reduced in output power but the test was not repeated because it was deemed as the worst case.



Product Service

Bluetooth Low Energy

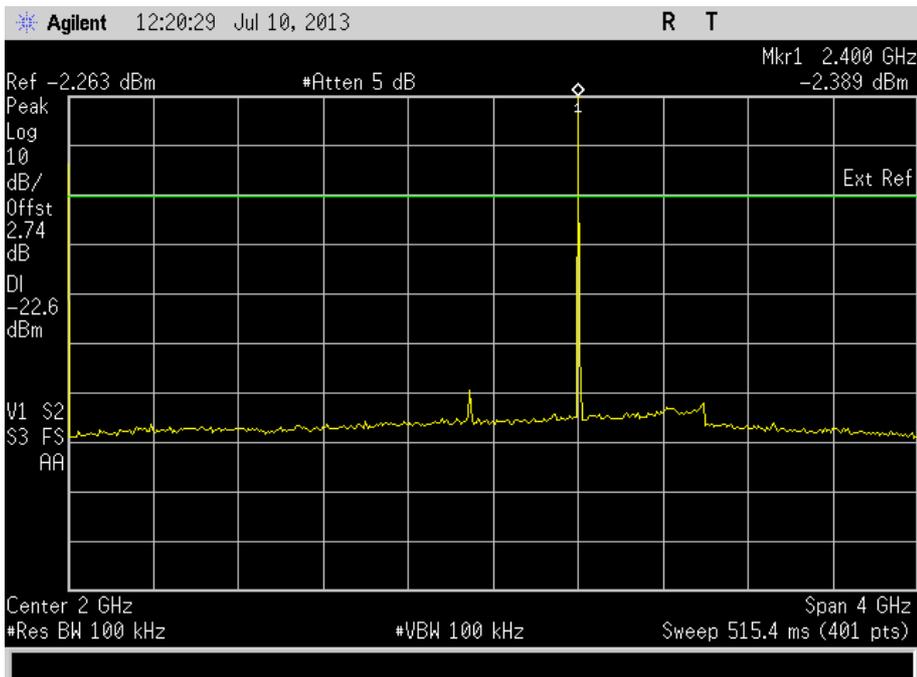
4.0 V DC Supply

Spurious Conducted Emissions

37oct/prbs9

2402 MHz

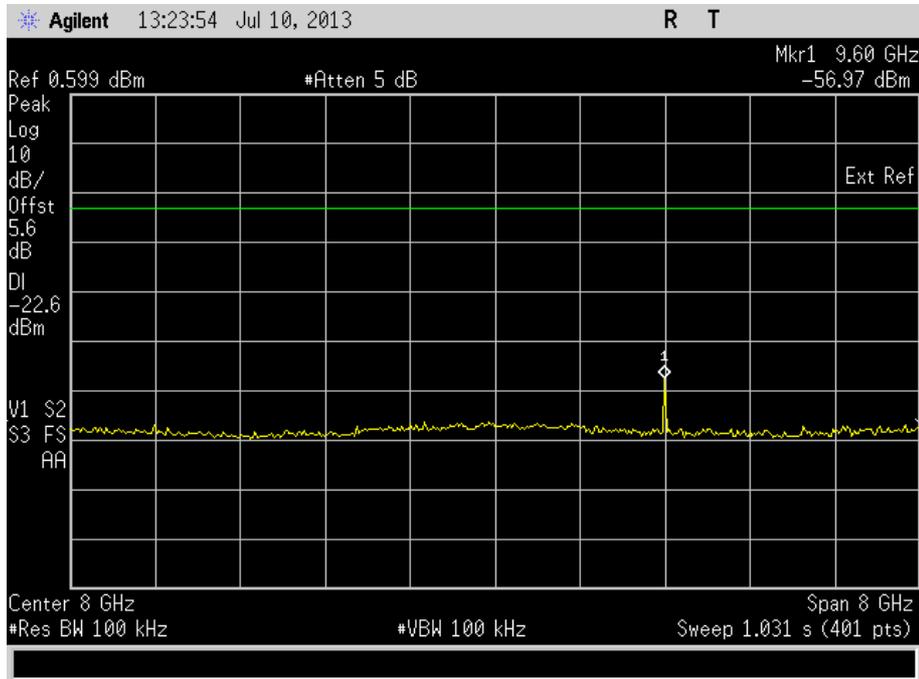
9 kHz to 4 GHz



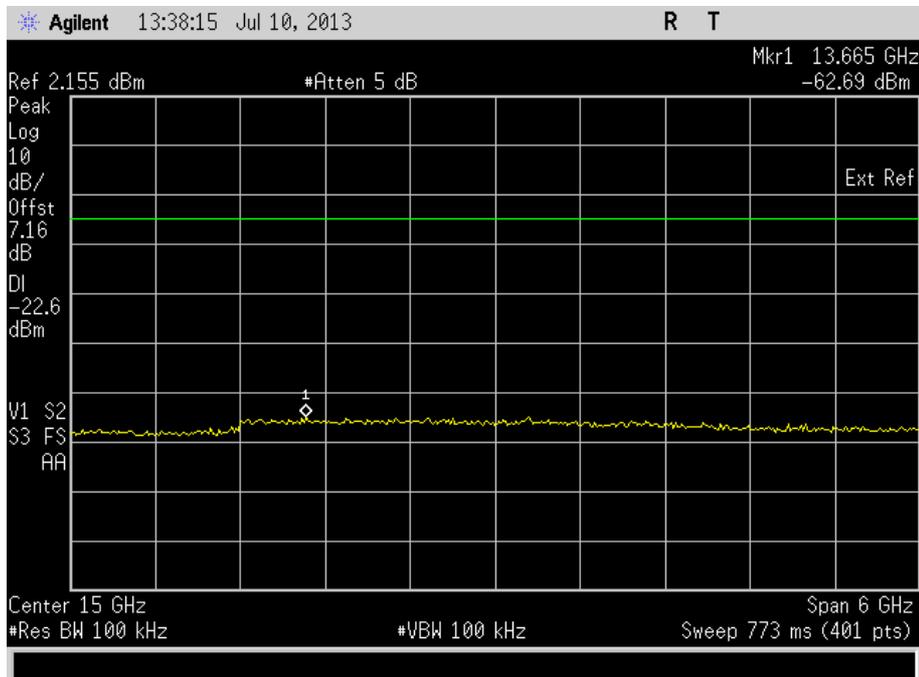


Product Service

4 GHz to 12 GHz



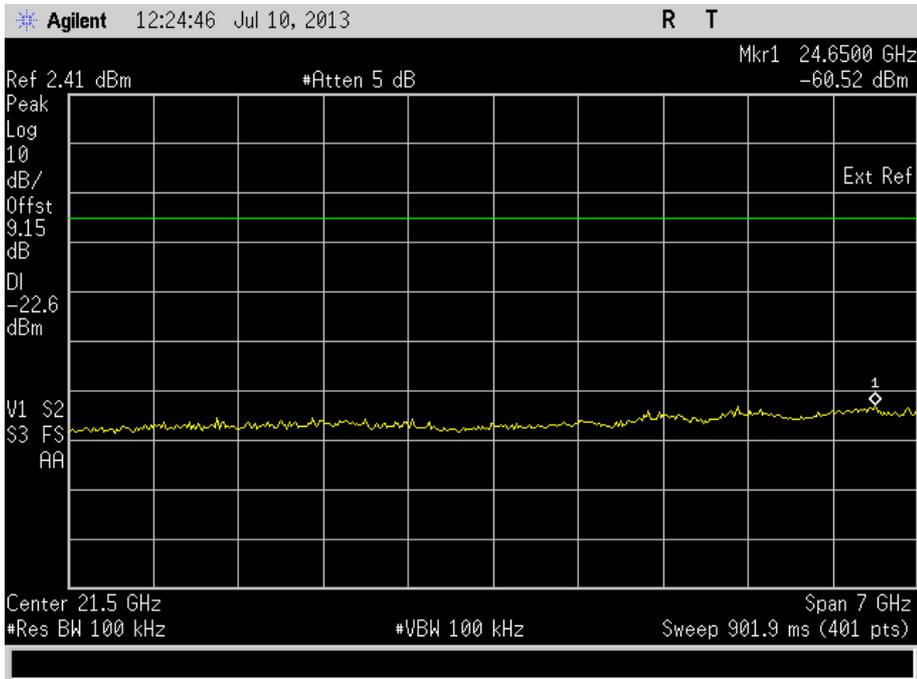
12 GHz to 18 GHz





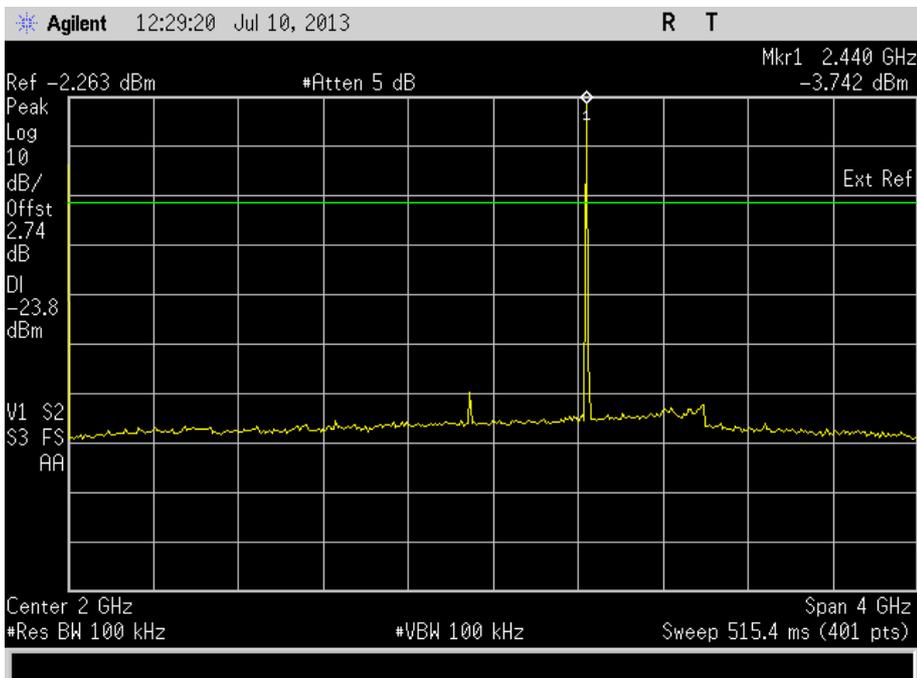
Product Service

18 GHz to 25 GHz



2441 MHz

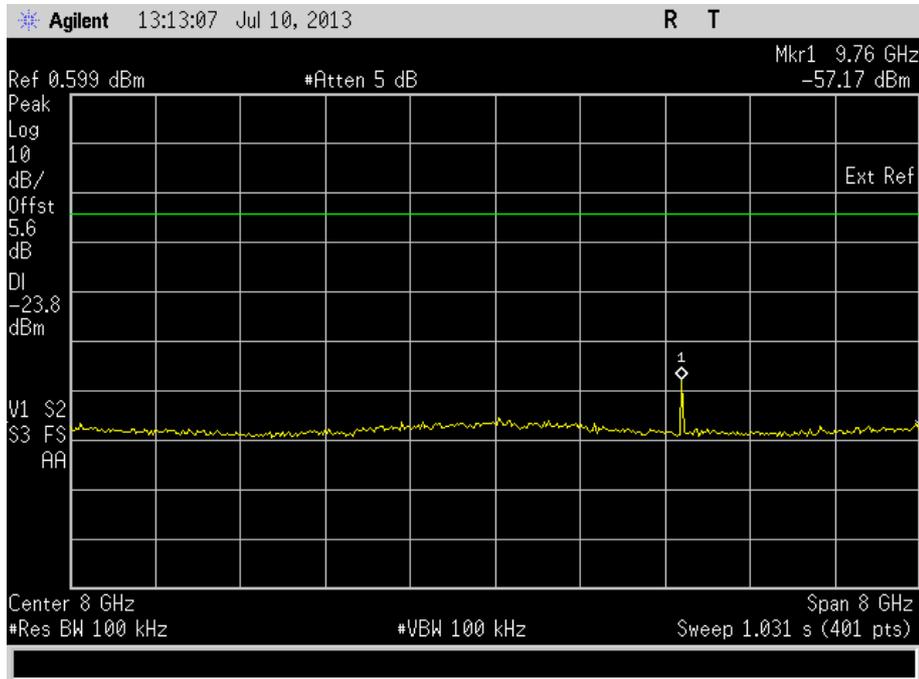
9 kHz to 4 GHz



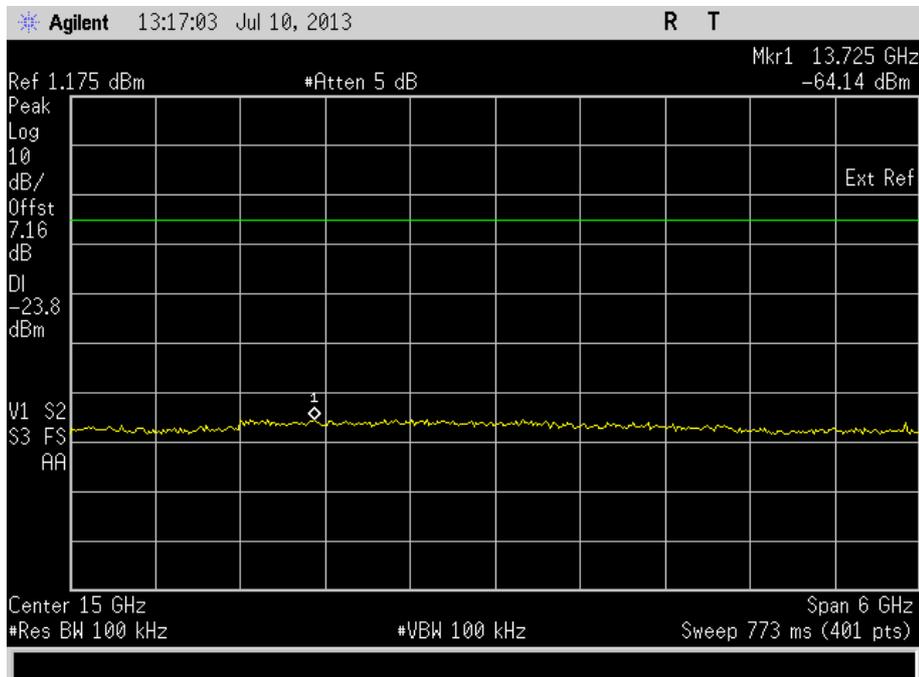


Product Service

4 GHz to 12 GHz



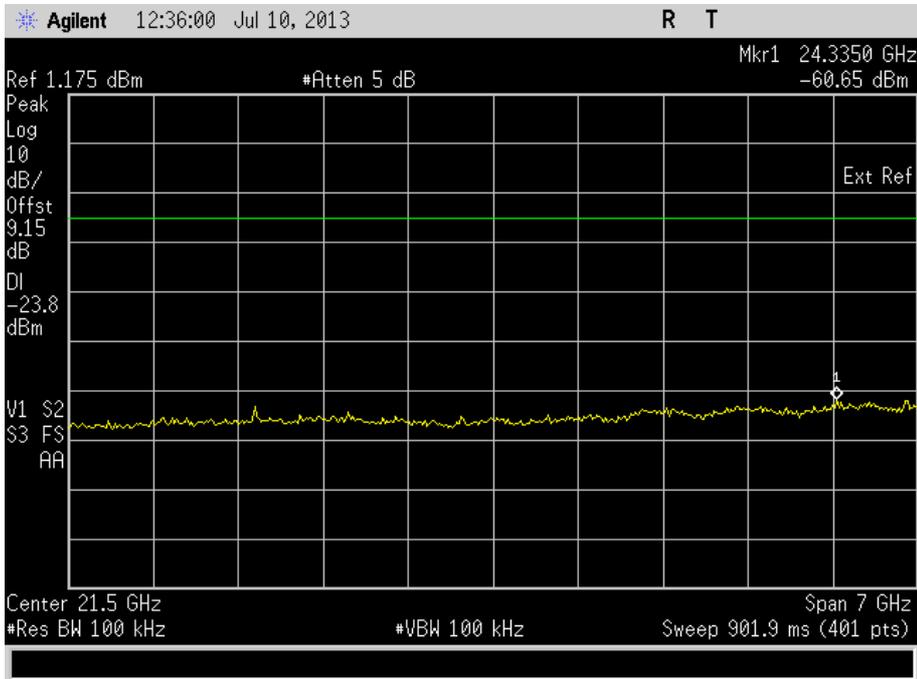
12 GHz to 18 GHz





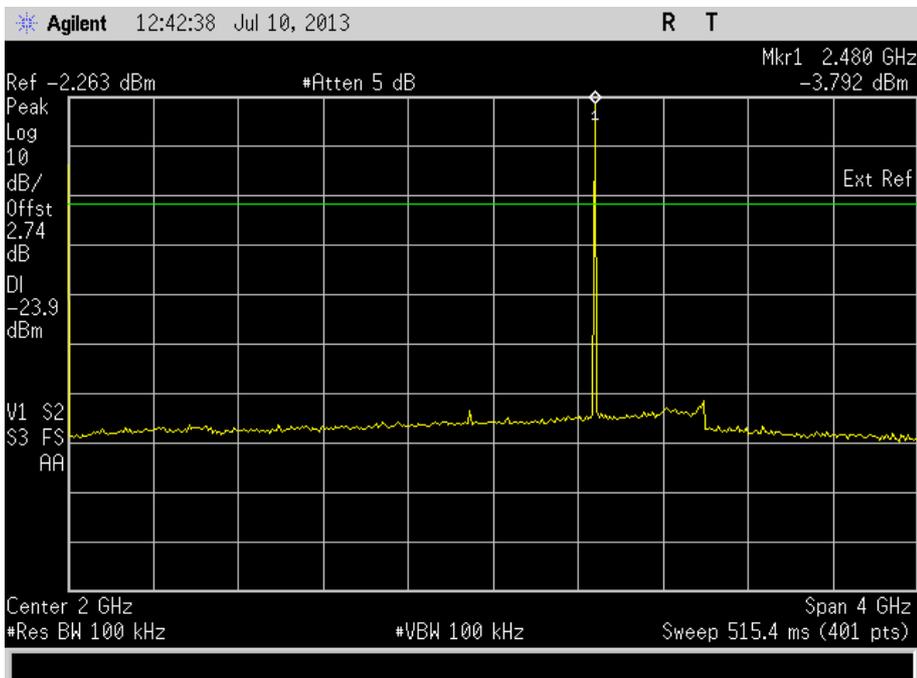
Product Service

18 GHz to 25 GHz



2480 MHz

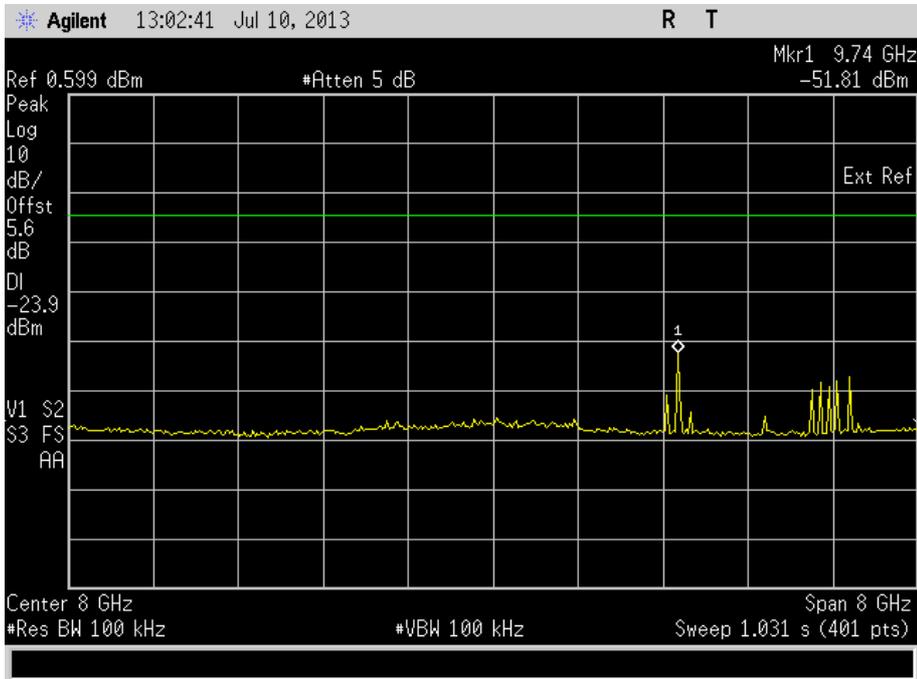
9 kHz to 4 GHz



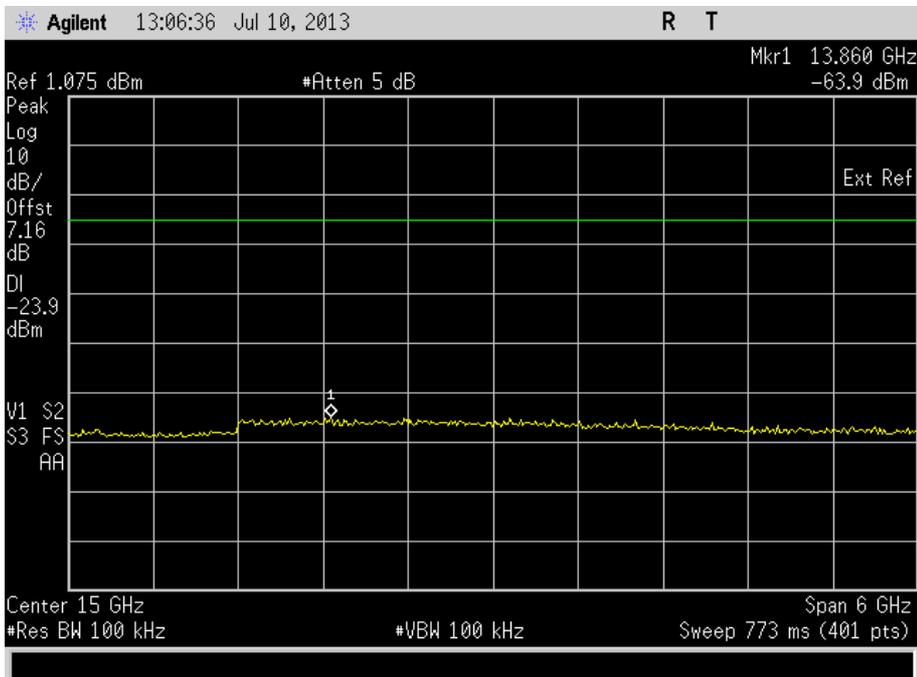


Product Service

4 GHz to 12 GHz



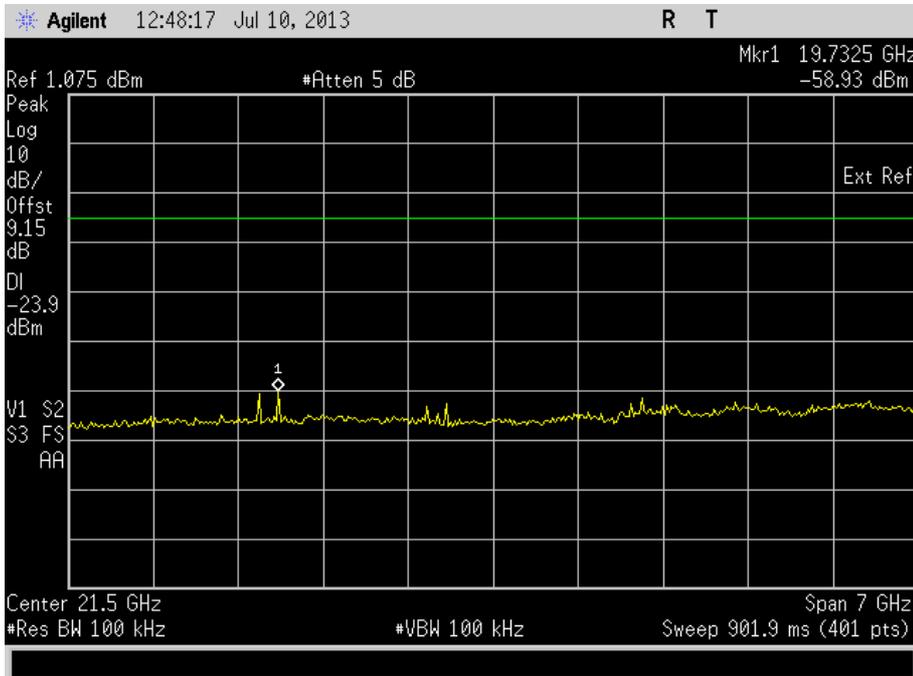
12 GHz to 18 GHz





Product Service

18 GHz to 25 GHz



Limit Clause

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

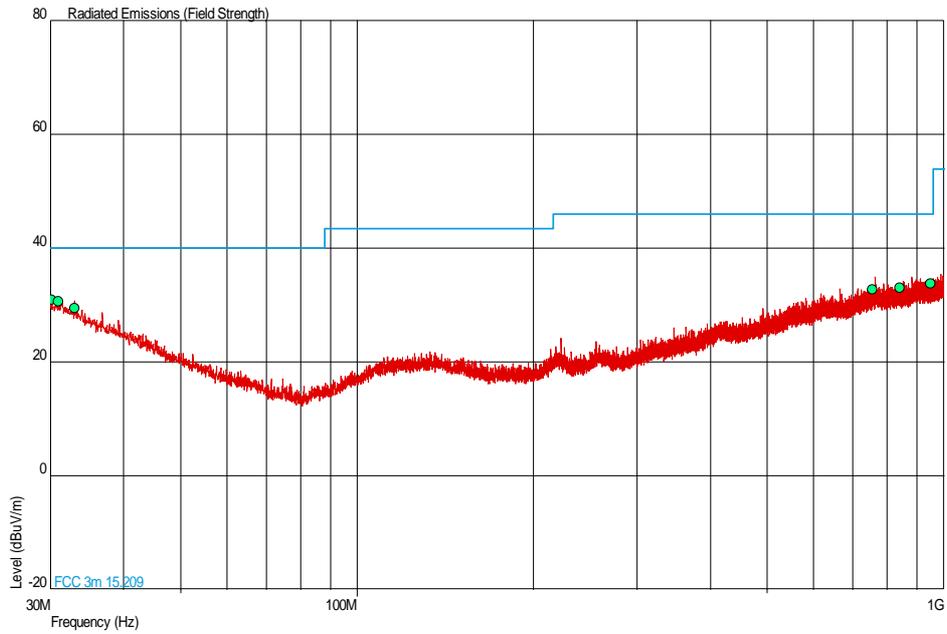
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Spurious Radiated Emissions

2402 MHz

30 MHz to 1 GHz

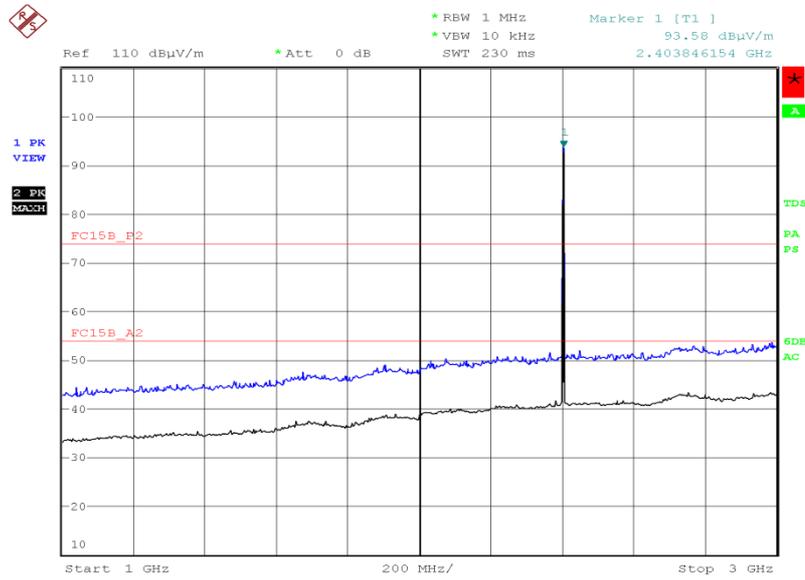


Frequency (MHz)	QP Level (dB μ V/m)	QP Level (μ V/m)	QP Limit (dB μ V/m)	QP Limit (μ V/m)	QP Margin (dB μ V/m)	QP Margin (μ V/m)	Angle (Deg)	Height (m)	Polarity
30.192	31.0	35.5	40.0	100	-9.0	64.5	0	0.00	Horizontal
30.972	30.6	33.9	40.0	100	-9.4	66.1	0	0.00	Horizontal
33.056	29.4	29.5	40.0	100	-10.6	70.5	0	1.00	Horizontal
756.288	32.8	43.7	46.0	200	-13.2	156.3	0	1.00	Horizontal
841.793	33.1	45.2	46.0	200	-12.9	154.8	270	1.00	Horizontal
950.274	33.7	48.4	46.0	200	-12.3	151.6	270	1.00	Horizontal



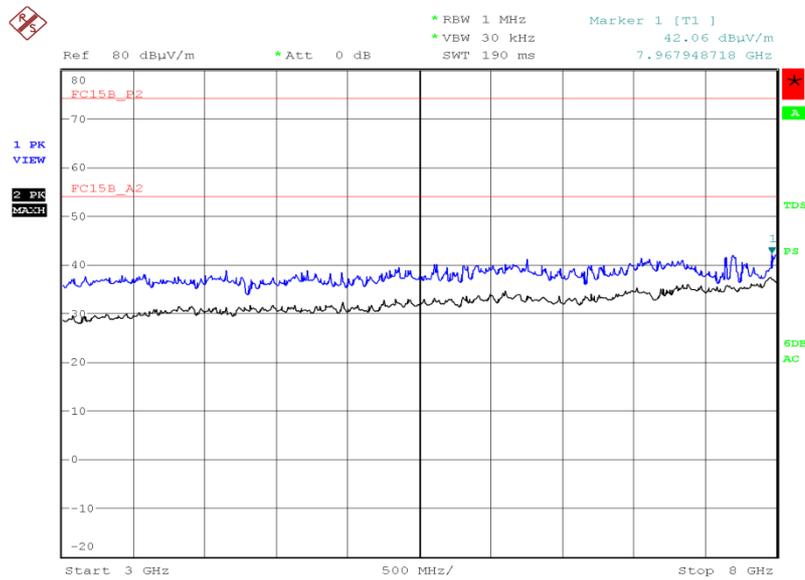
Product Service

1 GHz to 3 GHz



Date: 13.JUL.2013 10:52:12

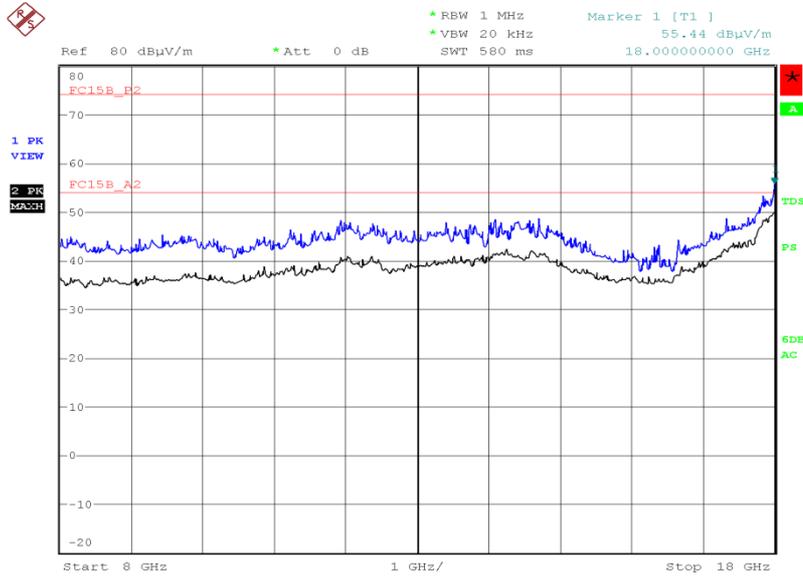
3 GHz to 8 GHz



Date: 13.JUL.2013 12:25:02

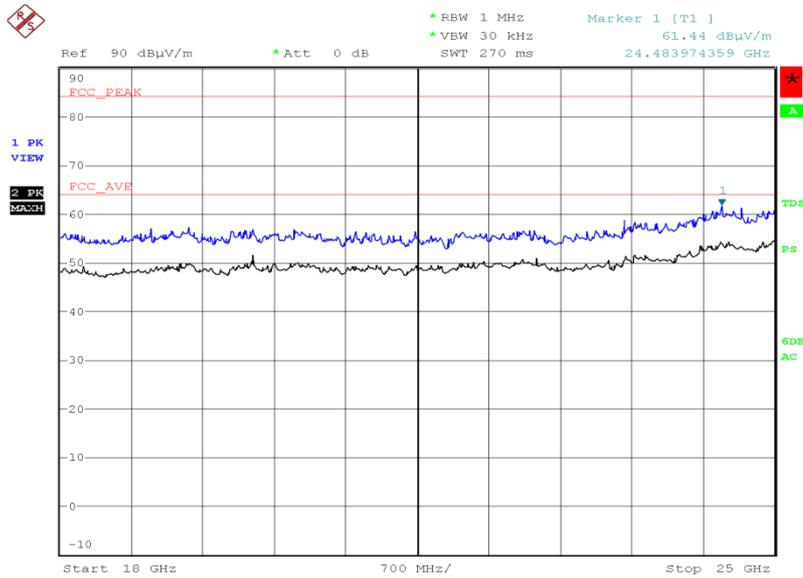


8 GHz to 18 GHz



Date: 13.JUL.2013 13:38:42

18 GHz to 25 GHz

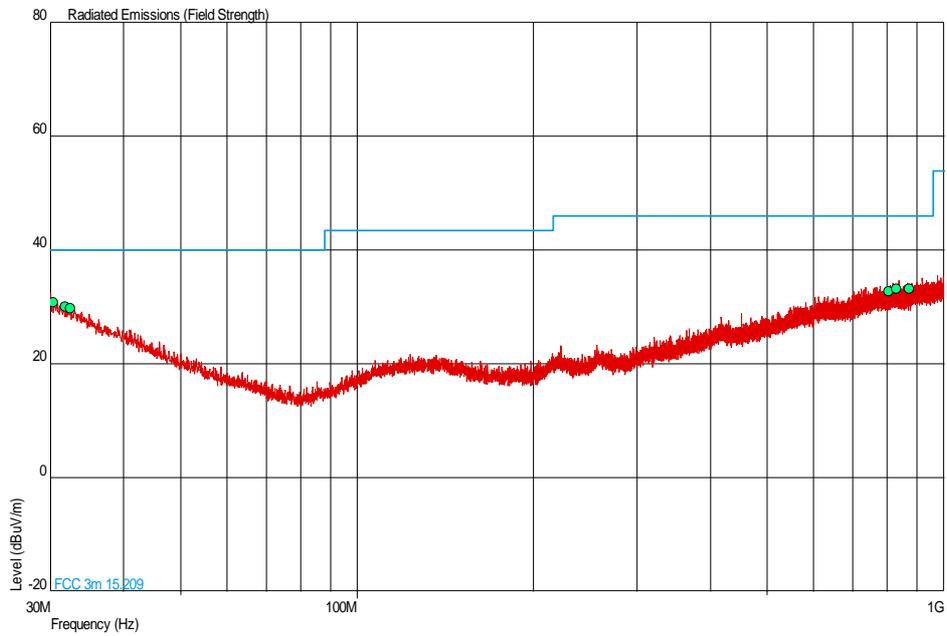


Date: 14.JUL.2013 08:14:11



2441 MHz

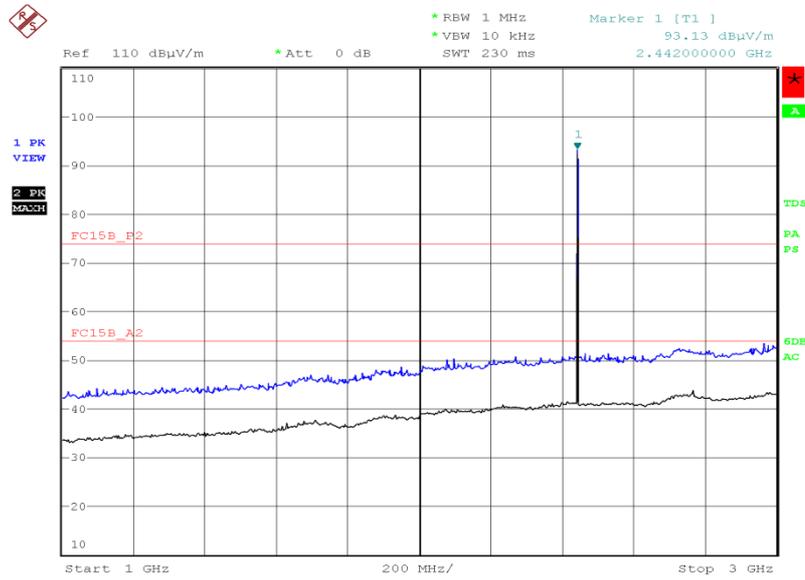
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
30.388	30.8	34.7	40.0	100	-9.2	65.3	270	1.00	Horizontal
31.795	30.1	32.0	40.0	100	-9.9	68.0	0	1.00	Horizontal
32.425	29.8	30.9	40.0	100	-10.2	69.1	180	1.00	Horizontal
806.194	32.8	43.7	46.0	200	-13.2	156.3	180	1.00	Horizontal
831.220	33.2	45.7	46.0	200	-12.8	154.3	270	1.00	Vertical
871.475	33.2	45.7	46.0	200	-12.8	154.3	0	1.00	Vertical

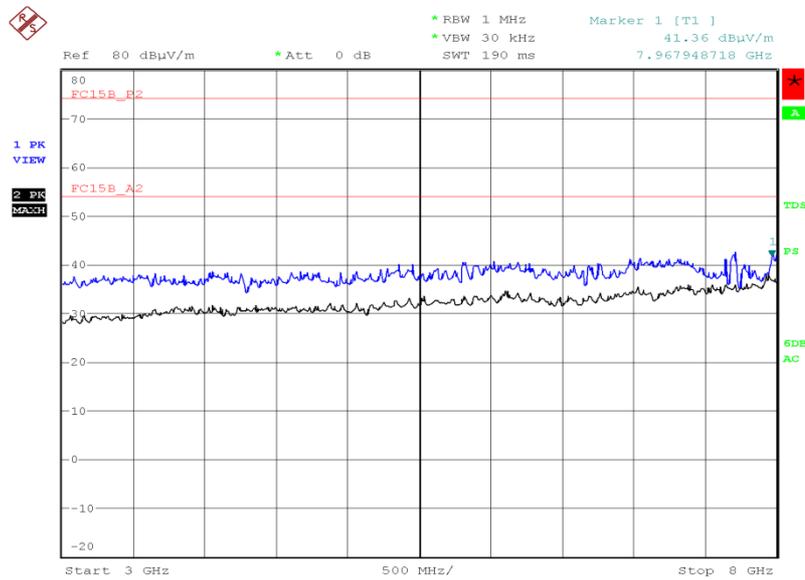


1 GHz to 3 GHz



Date: 13.JUL.2013 10:58:31

3 GHz to 8 GHz

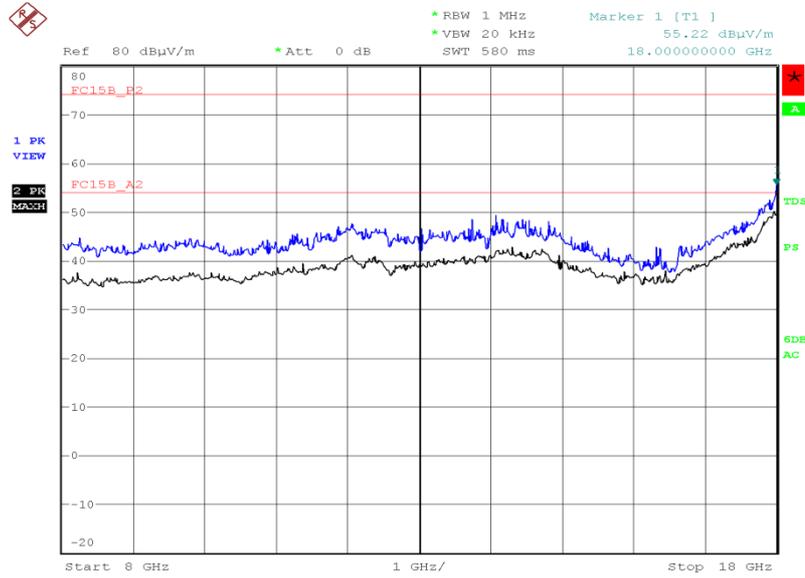


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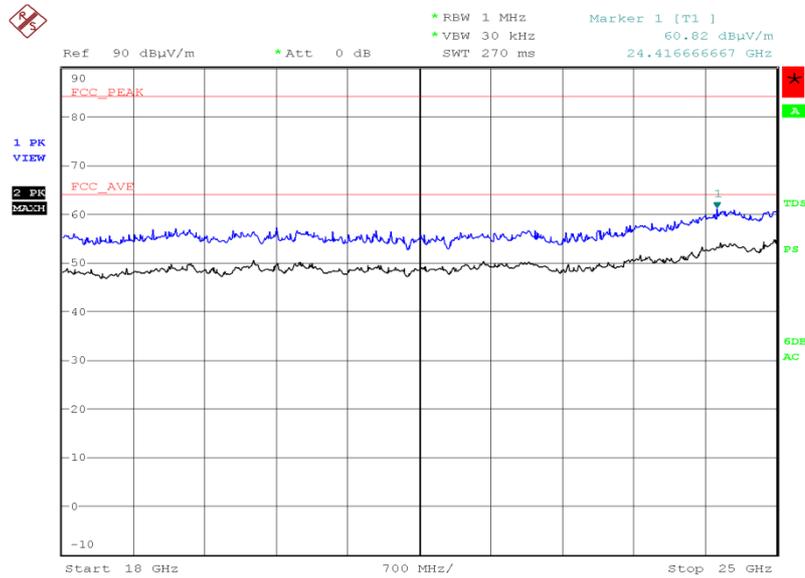
Product Service

8 GHz to 18 GHz



Date: 13.JUL.2013 13:50:34

18 GHz to 25 GHz



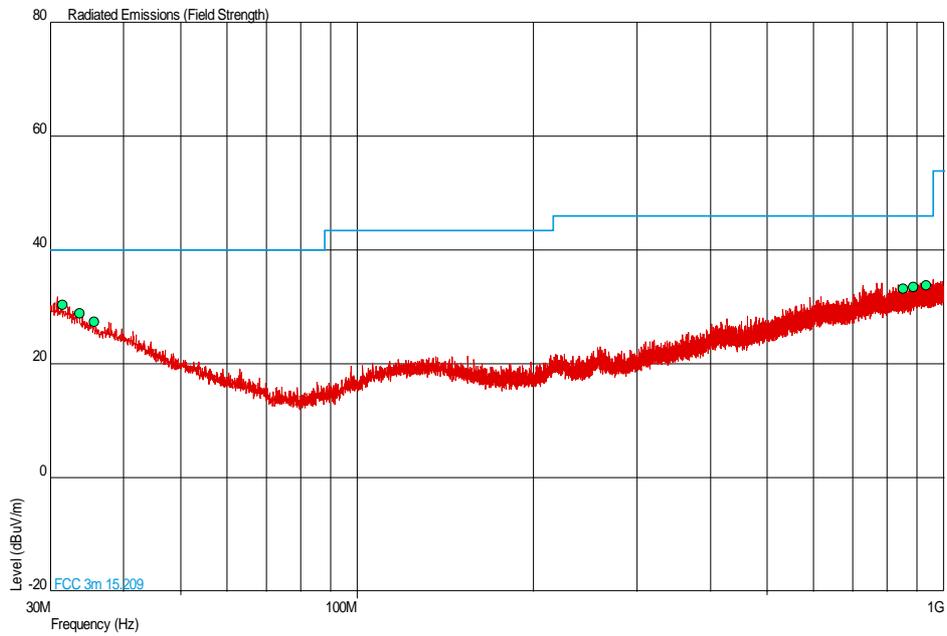
Date: 14.JUL.2013 08:17:54



Product Service

2480 MHz

30 MHz to 1 GHz

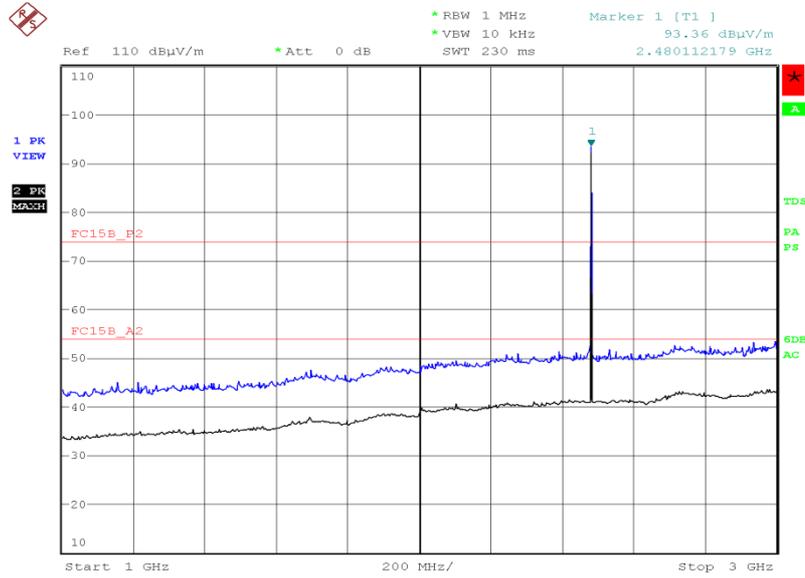


Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
31.455	30.3	32.7	40.0	100	-9.7	67.3	180	1.00	Vertical
33.686	28.9	27.9	40.0	100	-11.1	72.1	180	1.00	Horizontal
35.675	27.4	23.4	40.0	100	-12.6	76.6	0	1.00	Horizontal
852.803	33.2	45.7	46.0	200	-12.8	154.3	180	1.00	Horizontal
886.171	33.6	47.9	46.0	200	-12.4	152.1	180	1.00	Horizontal
932.828	33.8	49.0	46.0	200	-12.2	151.0	0	1.00	Vertical



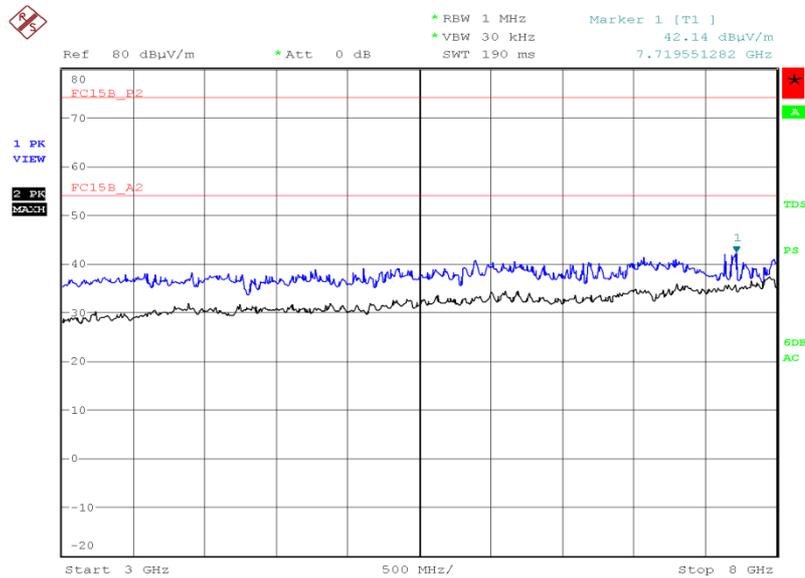
Product Service

1 GHz to 3 GHz



Date: 13.JUL.2013 11:22:50

3 GHz to 8 GHz

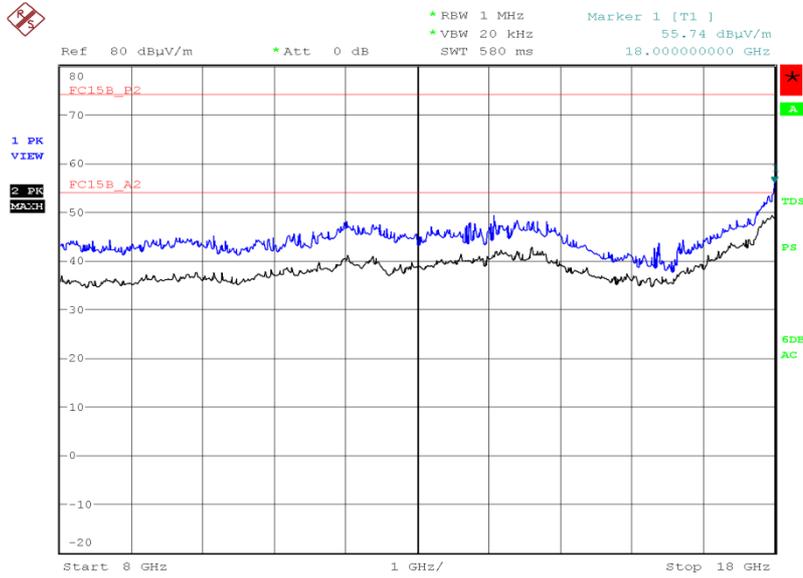


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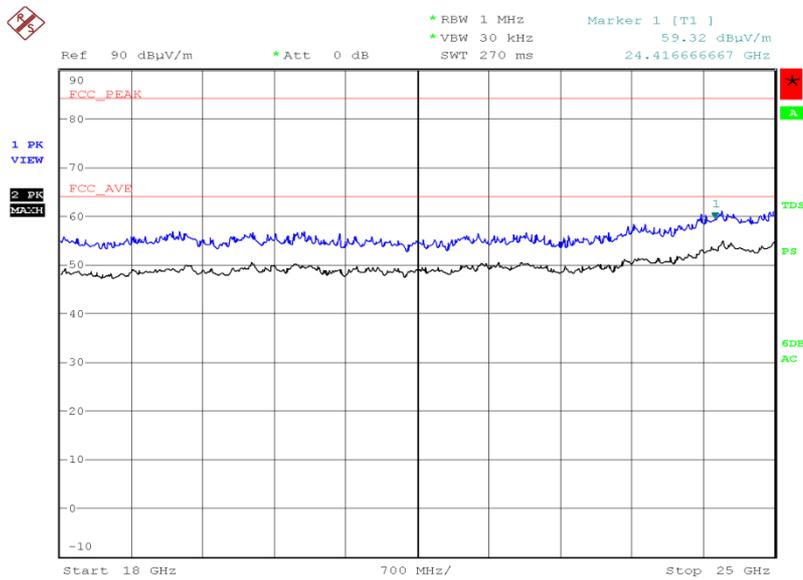
Product Service

8 GHz to 18 GHz



Date: 13.JUL.2013 14:03:30

18 GHz to 25 GHz



Date: 14.JUL.2013 08:23:10

Limit

Peak (dBμV/m)	Average (dBμV/m)
74.0	54.0

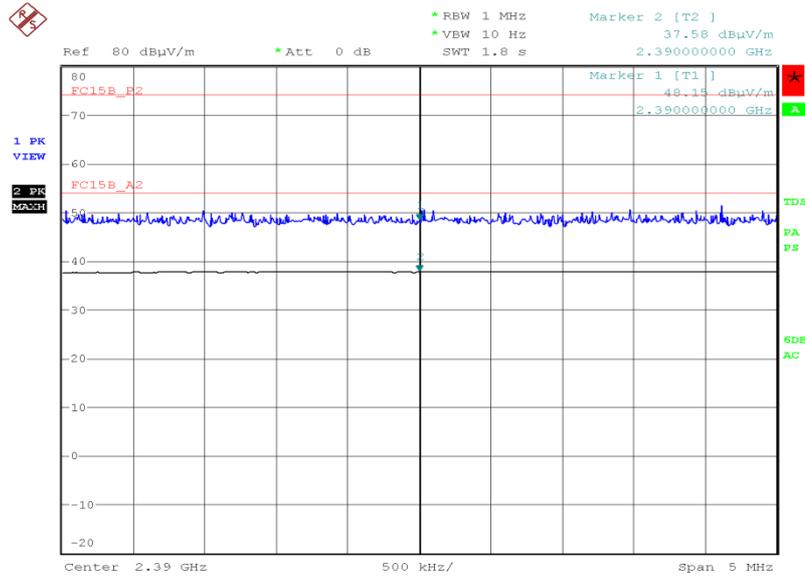


Product Service

Band Edge Emissions

2402 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	48.15	37.57

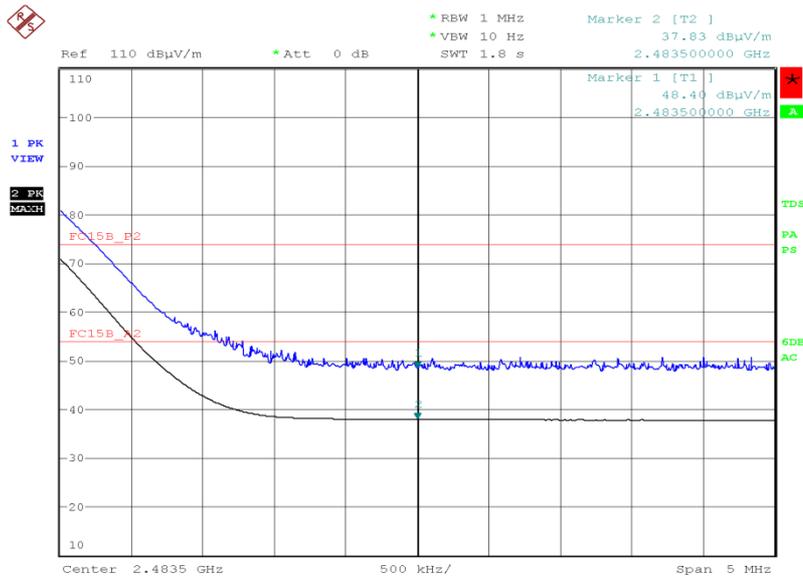


Date: 13.JUL.2013 10:41:28



2480 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	48.40	37.83



Date: 13.JUL.2013 11:15:14

Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0



2.5 POWER SPECTRAL DENSITY

2.5.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (e)

2.5.2 Equipment Under Test and Modification State

CDMA SHT21 S/N: IMEI 004401114403773 - Modification State 0

CDMA SHT21 S/N: IMEI 004401114403781 - Modification State 0

2.5.3 Date of Test

17 October 2012 , 18 October 2012 and 10 July 2013

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

The EUT was connected to a spectrum analyser via a 10 dB attenuator. The path loss was measured between the EUT and the spectrum analyser and entered as a reference level offset. The trace was set to max hold and using a peak detector the maximum response was established. With the spectrum analyser RBW at 3 kHz and VBW at 10 kHz, the power spectral density in a 3 kHz bandwidth was measured.

2.5.6 Environmental Conditions

Ambient Temperature 21.2 - 25.3°C

Relative Humidity 38.9 - 54.4%



Product Service

2.5.7 Test Results

802.11(b)

4.0 V DC Supply

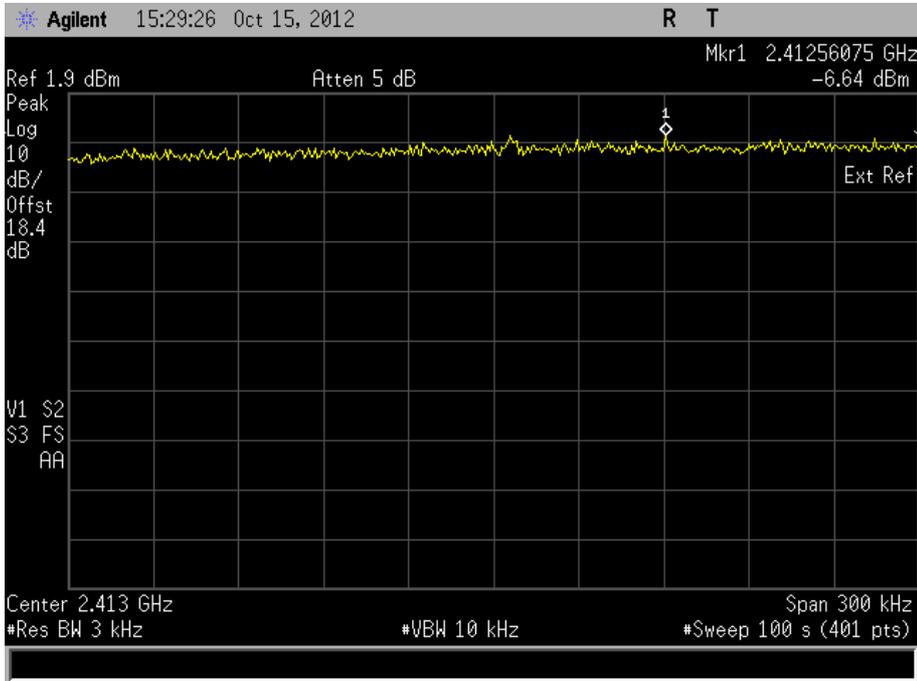
Frequency	Data Rate (Mbps)	Power Spectral Density in 3 kHz Bands (dBm)
2412 MHz	1	-6.64
	2	-6.43
	5	-7.32
	11	-7.8
2437 MHz	1	-6.46
	2	-7.26
	5	-7.38
	11	-7.85
2462 MHz	1	-7.00
	2	-7.17
	5	-7.35
	11	-7.98



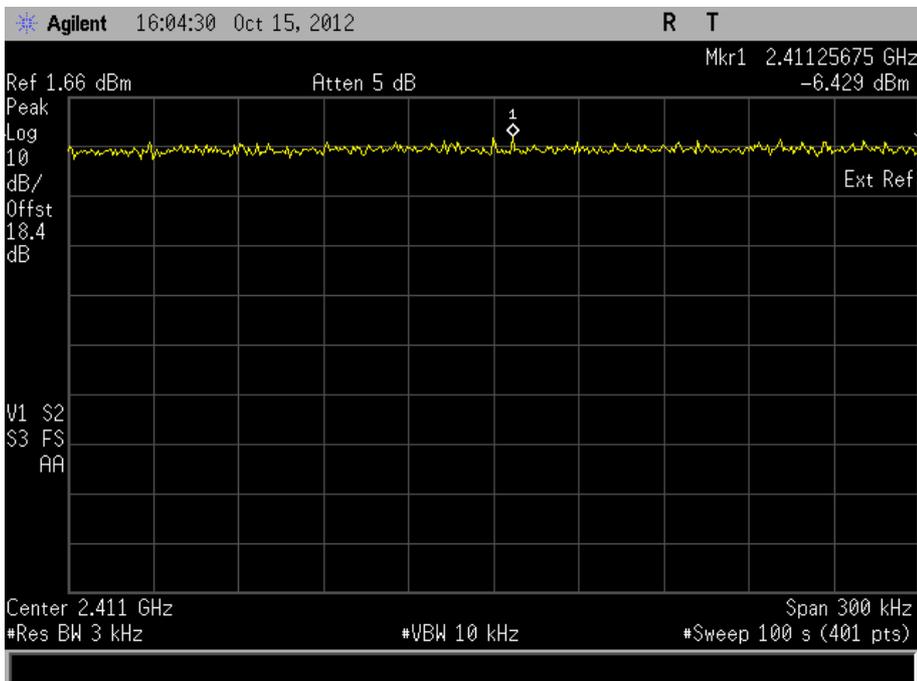
Product Service

2412 MHz

1 Mbps



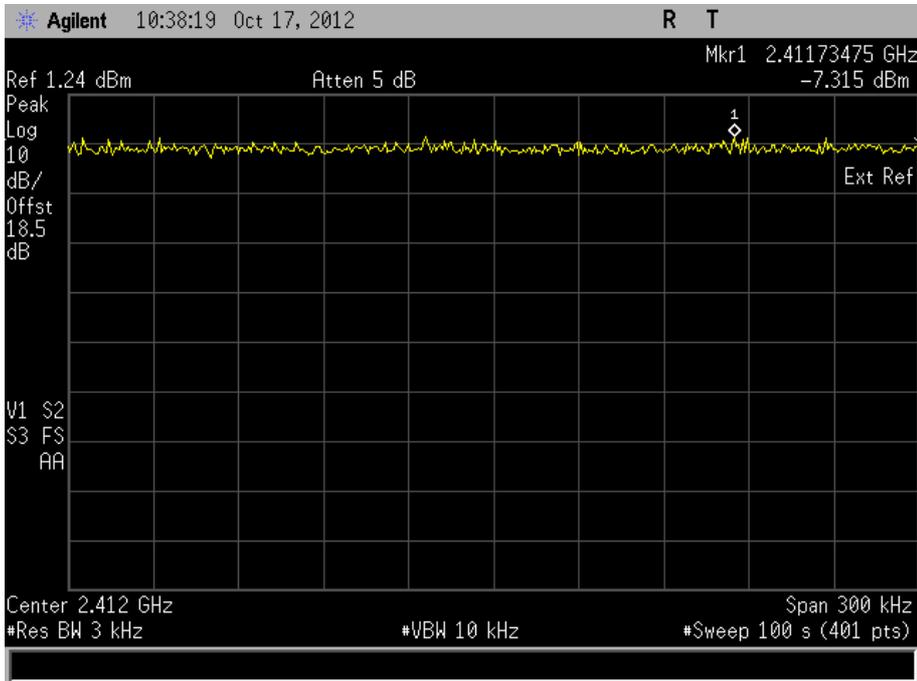
2 Mbps



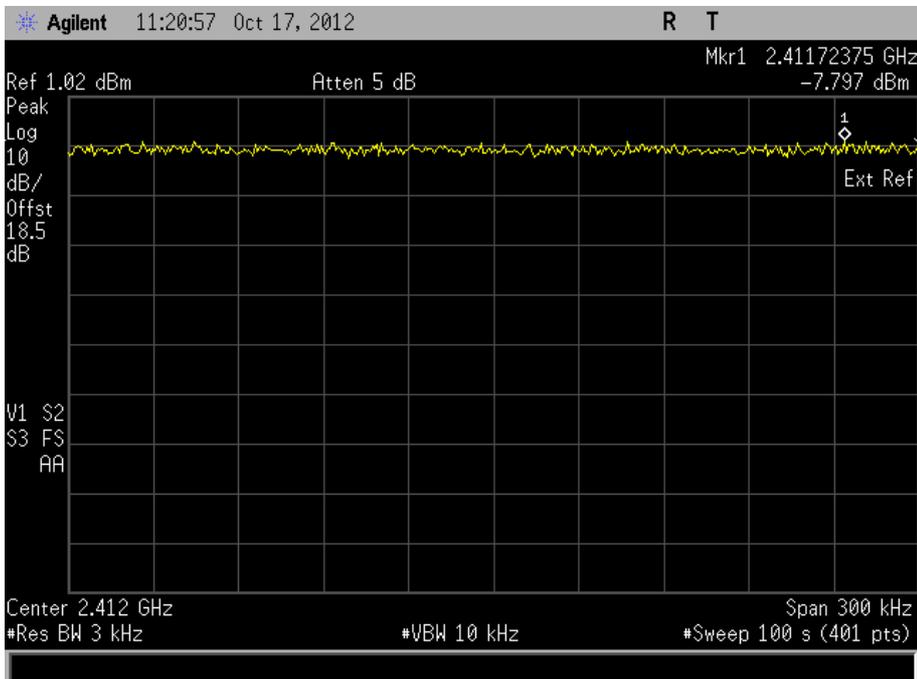


Product Service

5.5 Mbps



11 Mbps

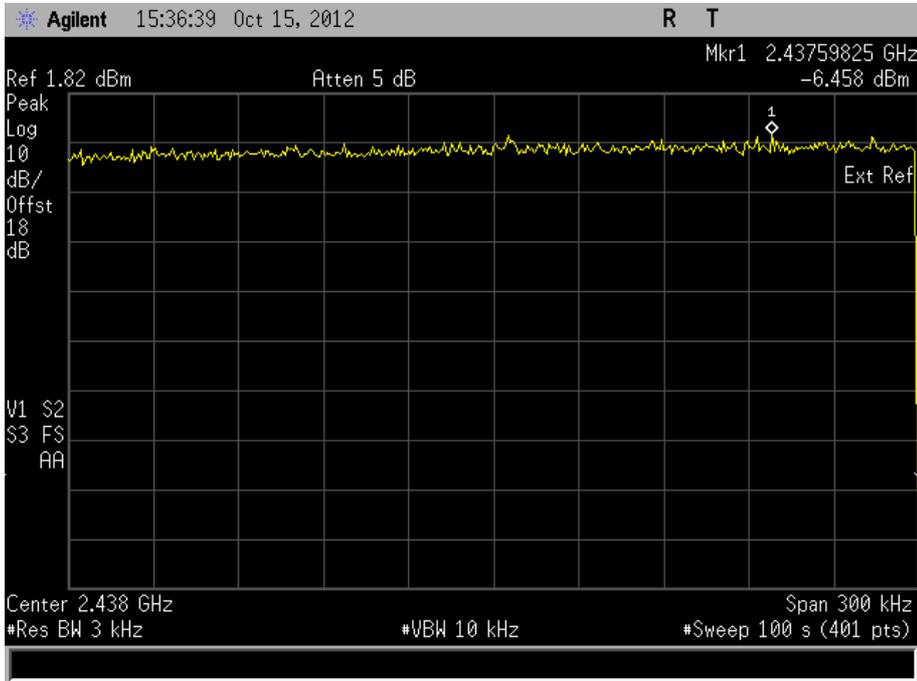




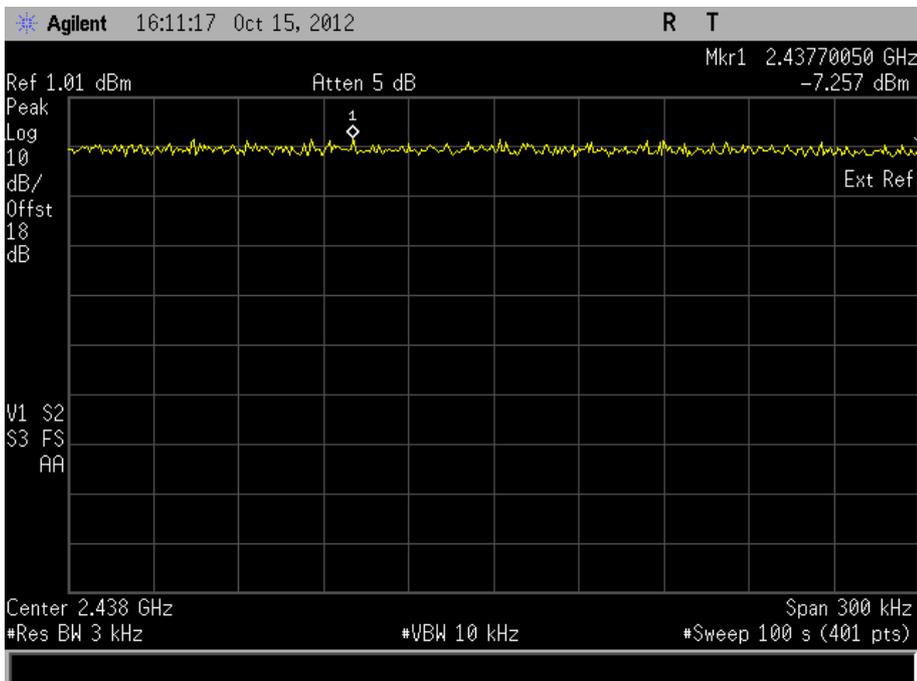
Product Service

2437 MHz

1 Mbps



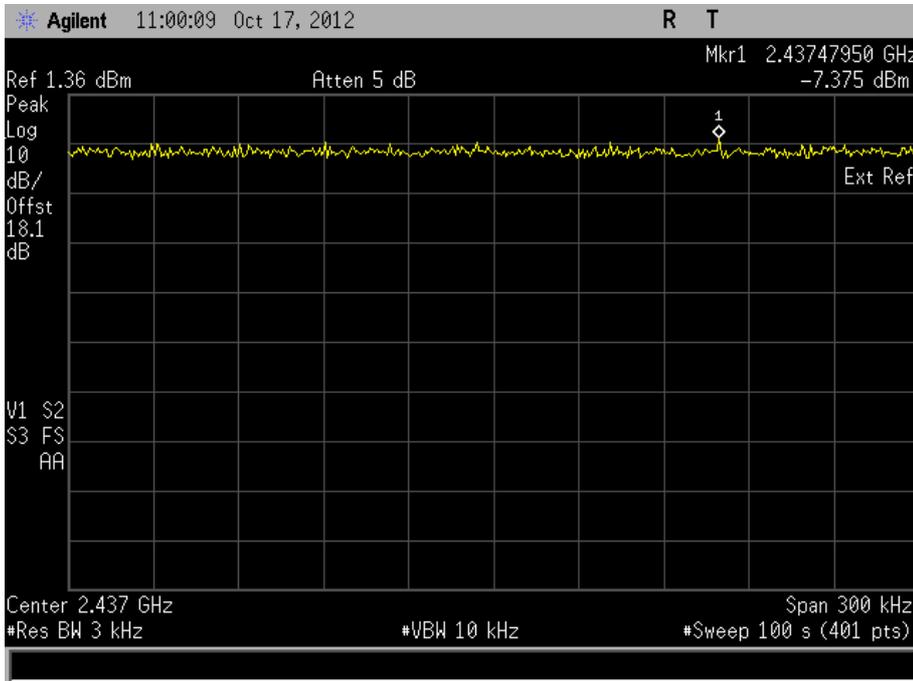
2 Mbps



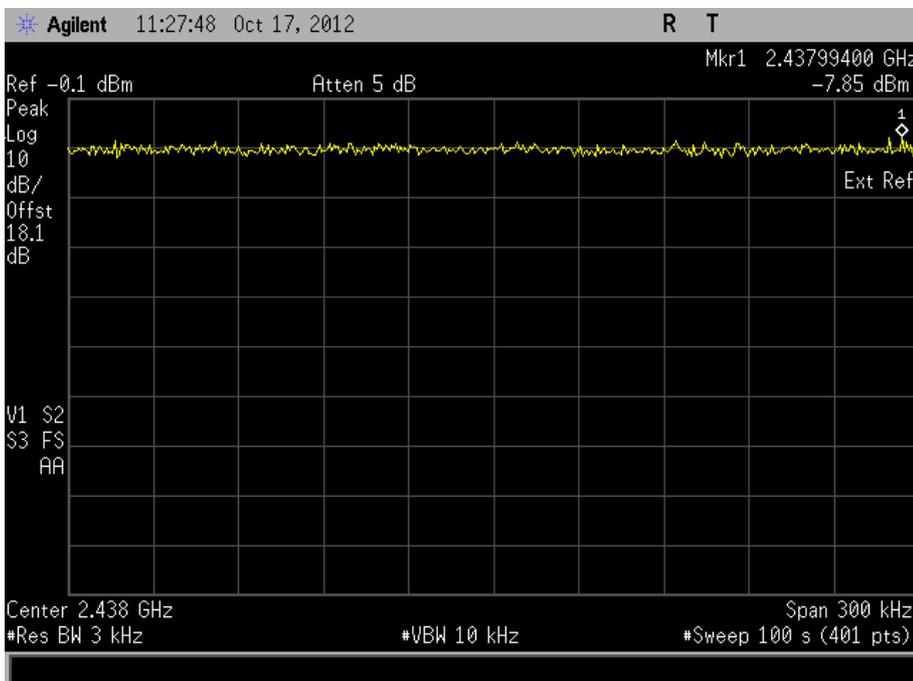


Product Service

5.5 Mbps



11 Mbps

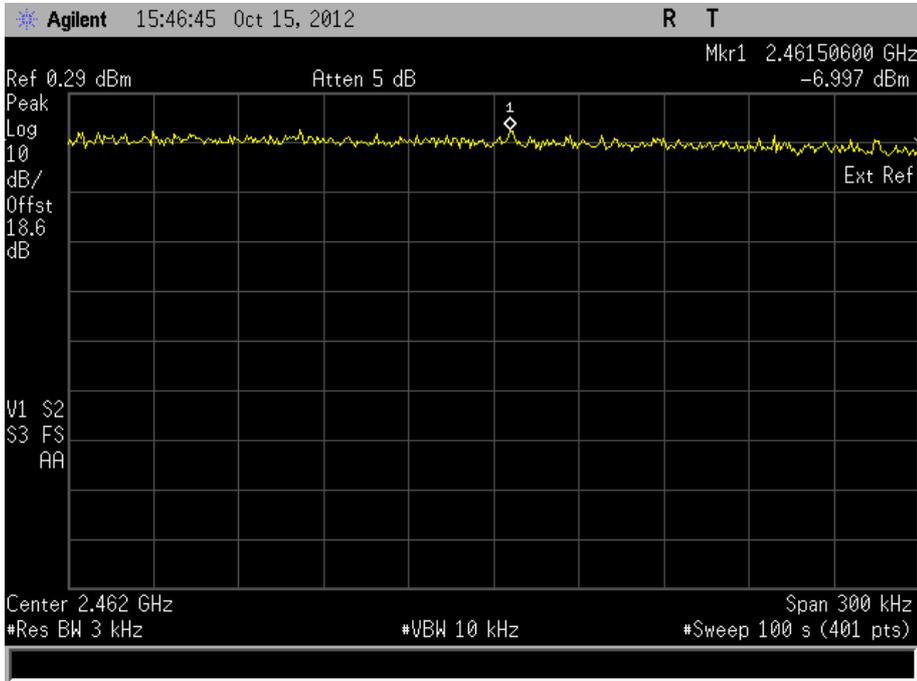




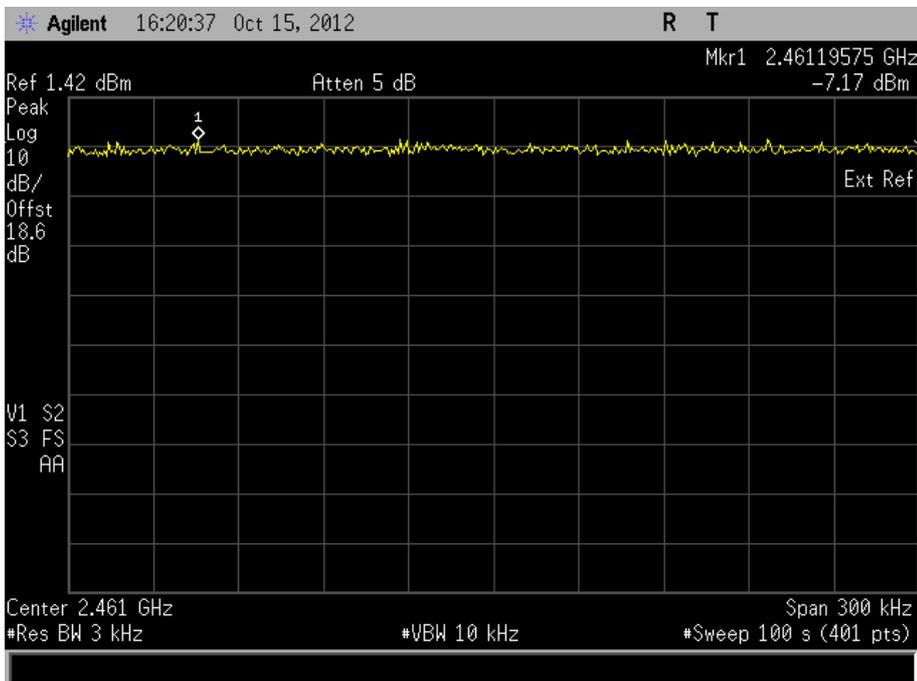
Product Service

2462 MHz

1 Mbps



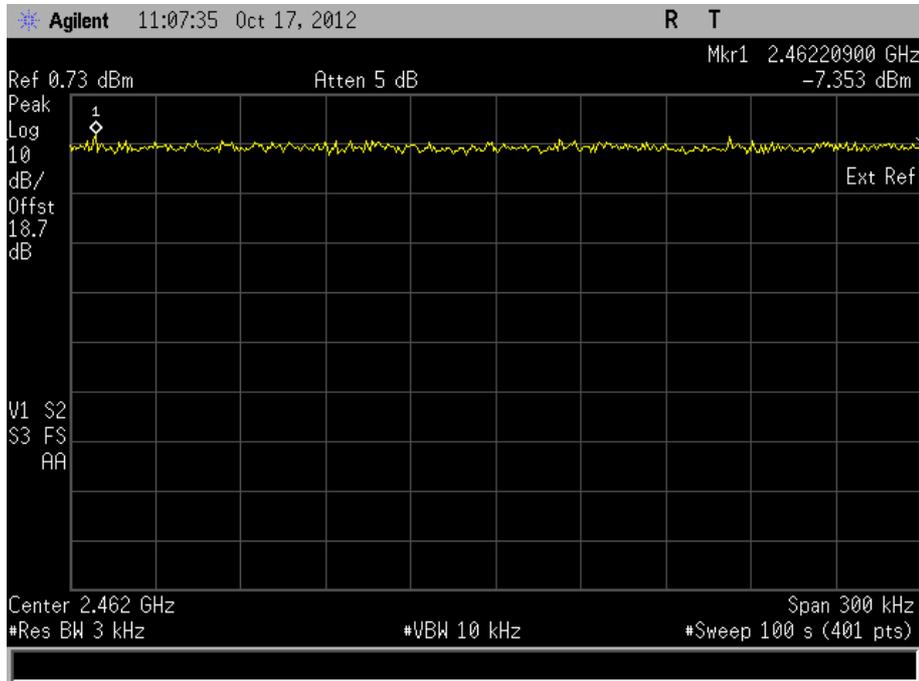
2 Mbps



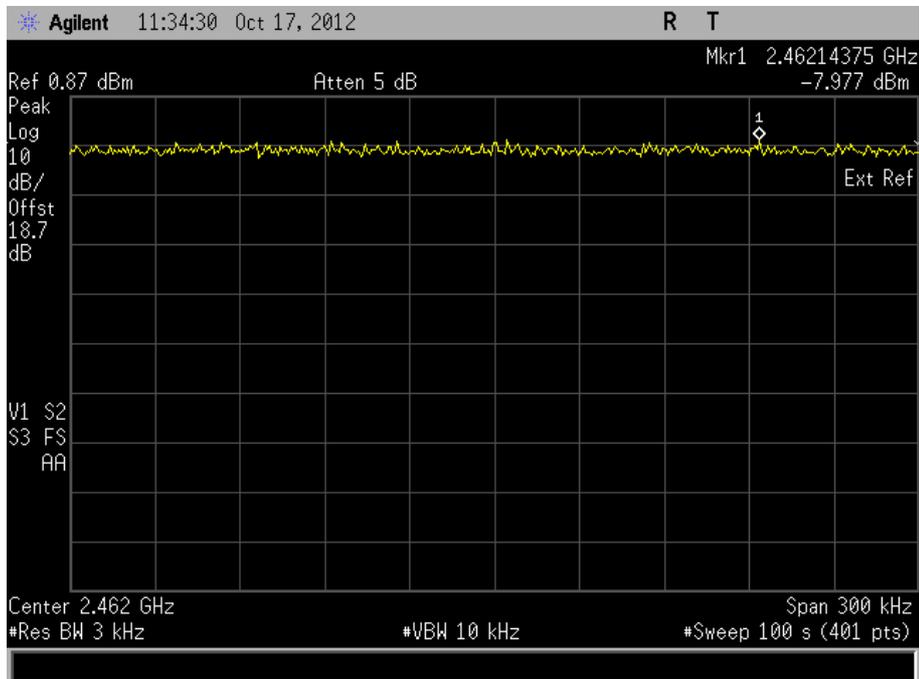


Product Service

5.5 Mbps



11 Mbps





Product Service

These results have been performed on a different sample to the sample used for radiated measurements. The sample used for radiated measurements was reduced in output power to achieve compliance with the specification.

The sample used for this test was not reduced in output power but the test was not repeated because it was deemed the worst case.

Limit Clause

The minimum 6 dB Bandwidth shall be at least 500 kHz.



Product Service

802.11(g)

4.0 V DC Supply

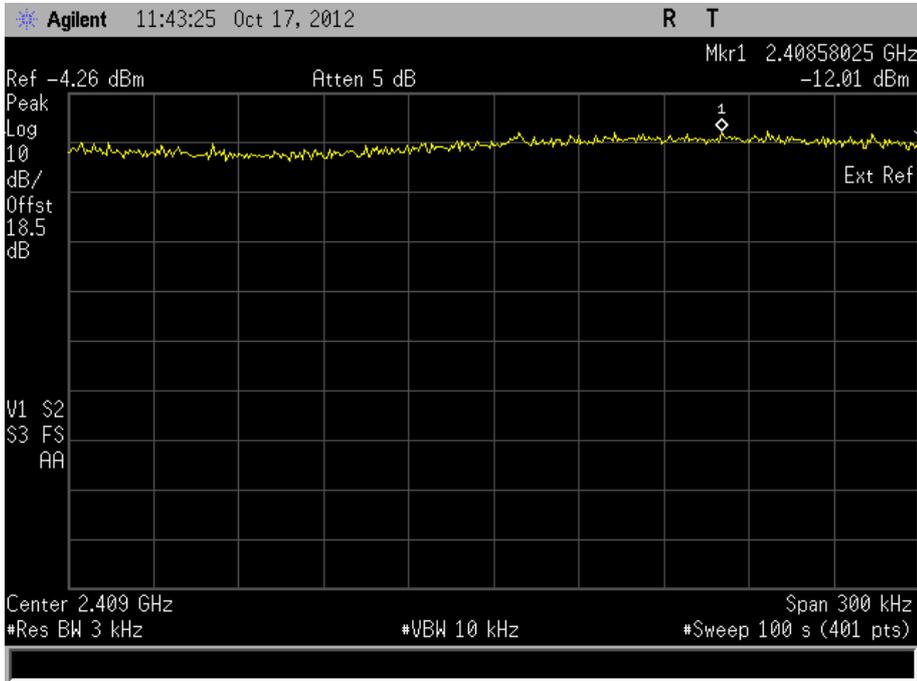
Frequency	Data Rate (Mbps)	Power Spectral Density in 3 kHz Bands (dBm)
2412 MHz	6	-12.01
	9	-11.59
	12	-11.53
	18	-13.25
	24	-13.12
	36	-13.94
	48	-13.68
	54	-13.89
2437 MHz	6	-14.69
	9	-11.58
	12	-14.01
	18	-14.31
	24	-13.82
	36	-14.32
	48	-14.48
	54	-14.11
2462 MHz	6	-11.29
	9	-11.99
	12	-11.66
	18	-13.18
	24	-12.73
	36	-13.68
	48	-13.23
	54	-12.46



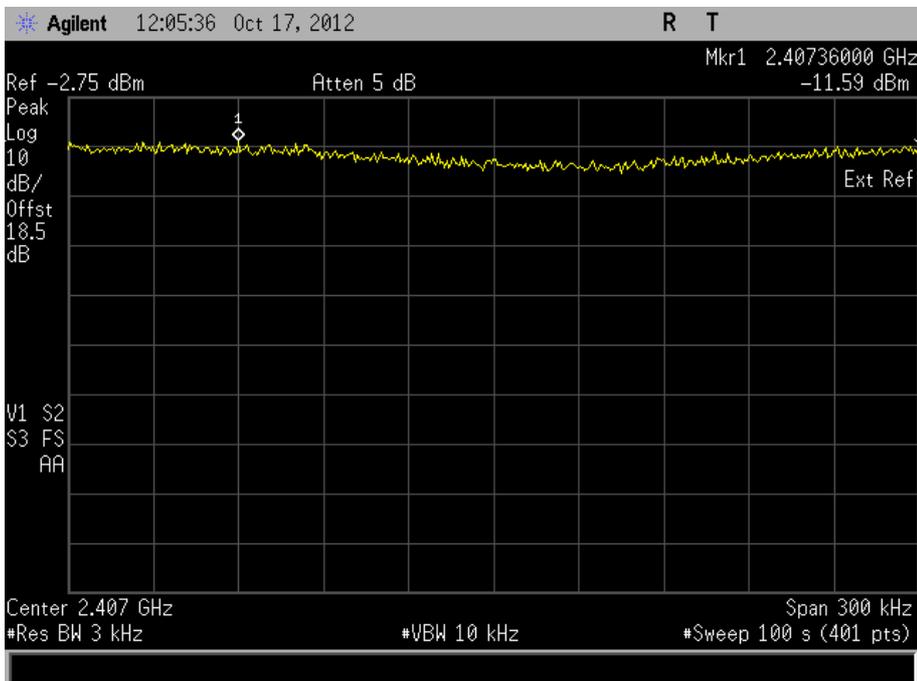
Product Service

2412 MHz

6 Mbps



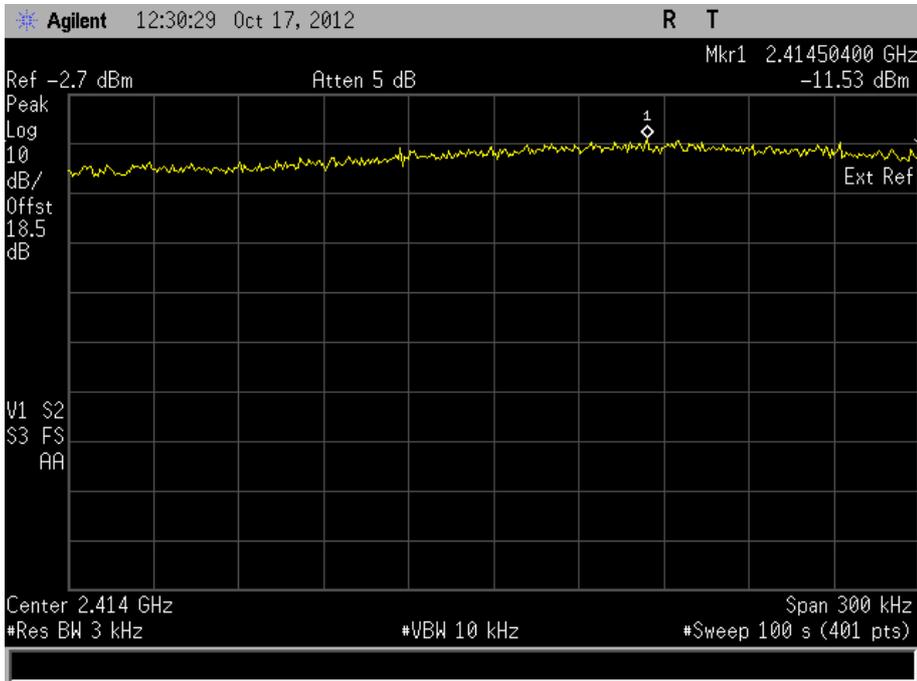
9 Mbps



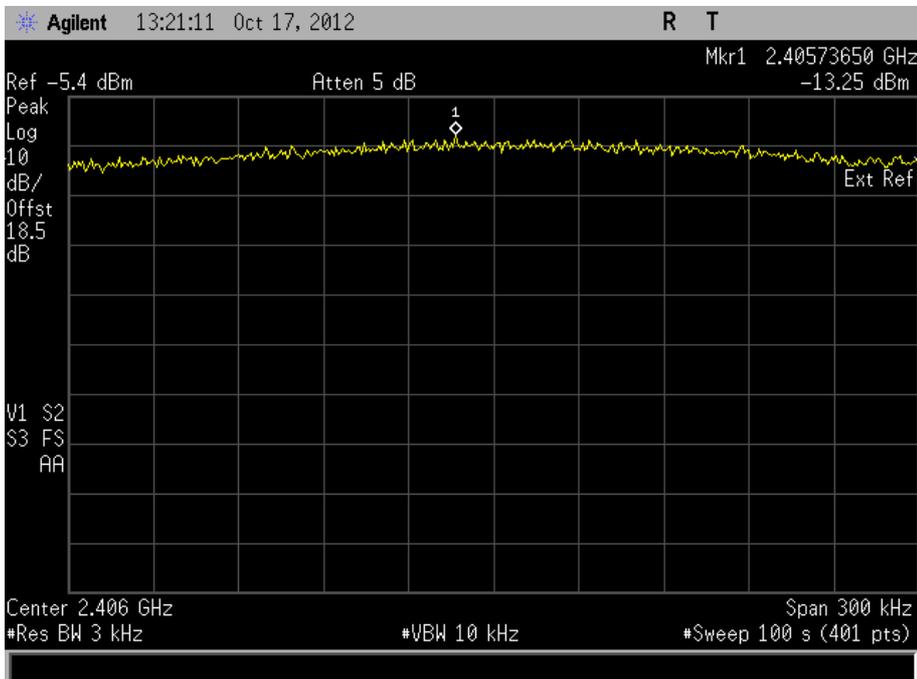


Product Service

12 Mbps



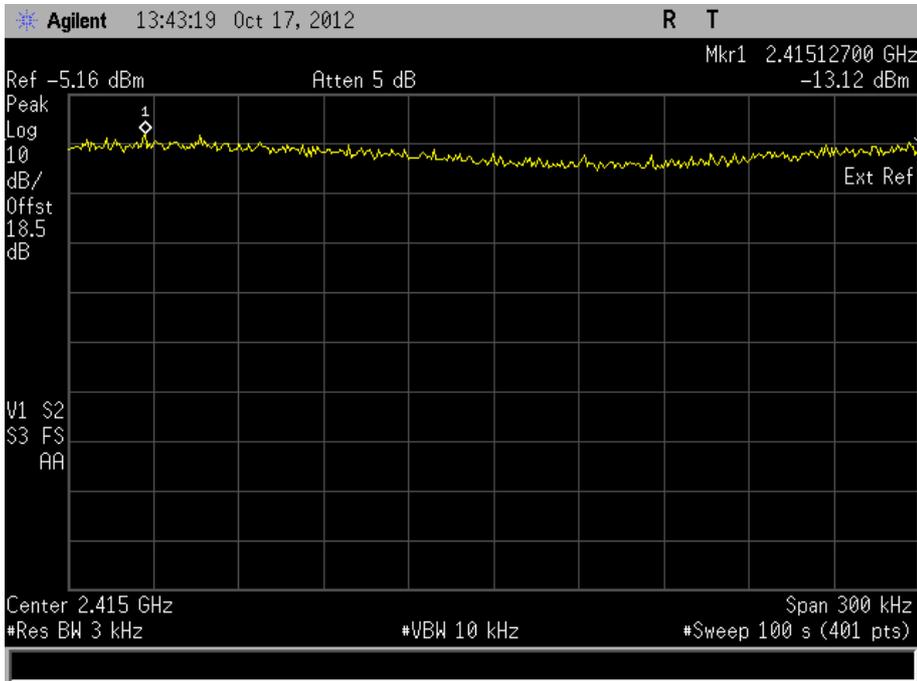
18 Mbps



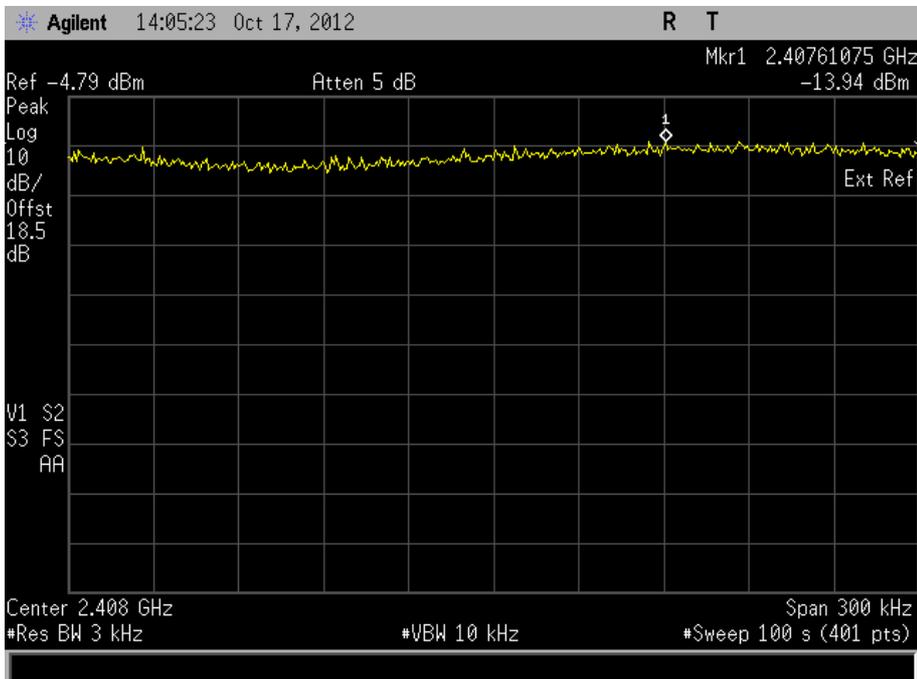


Product Service

24 Mbps



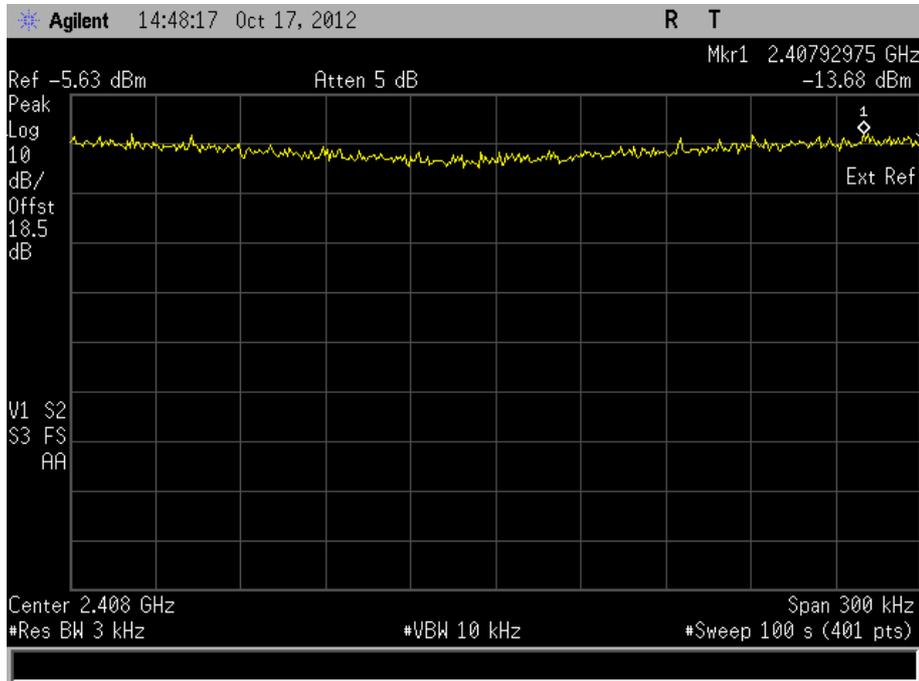
36 Mbps



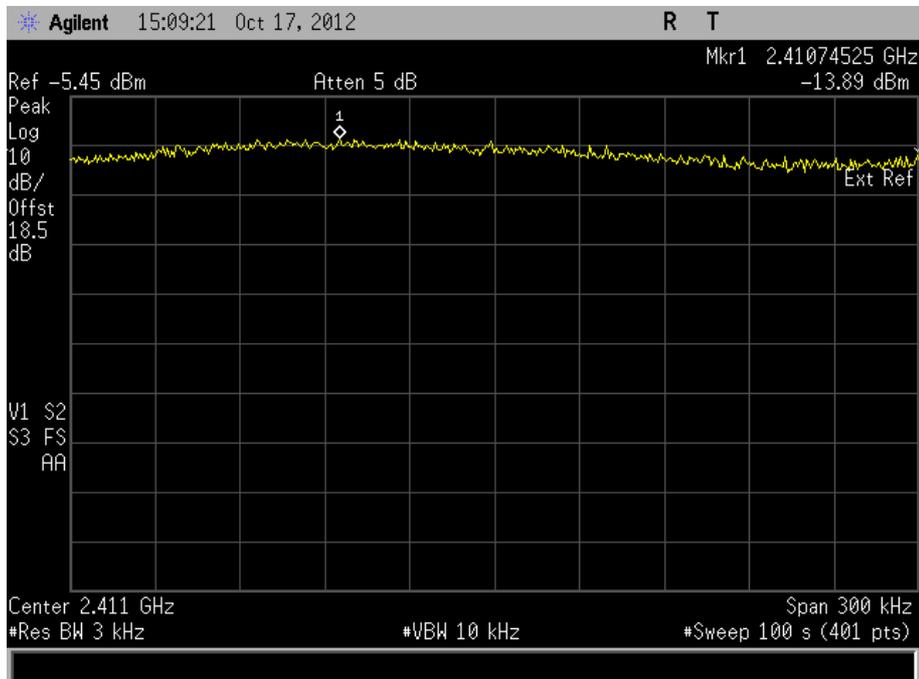


Product Service

48 Mbps



54 Mbps

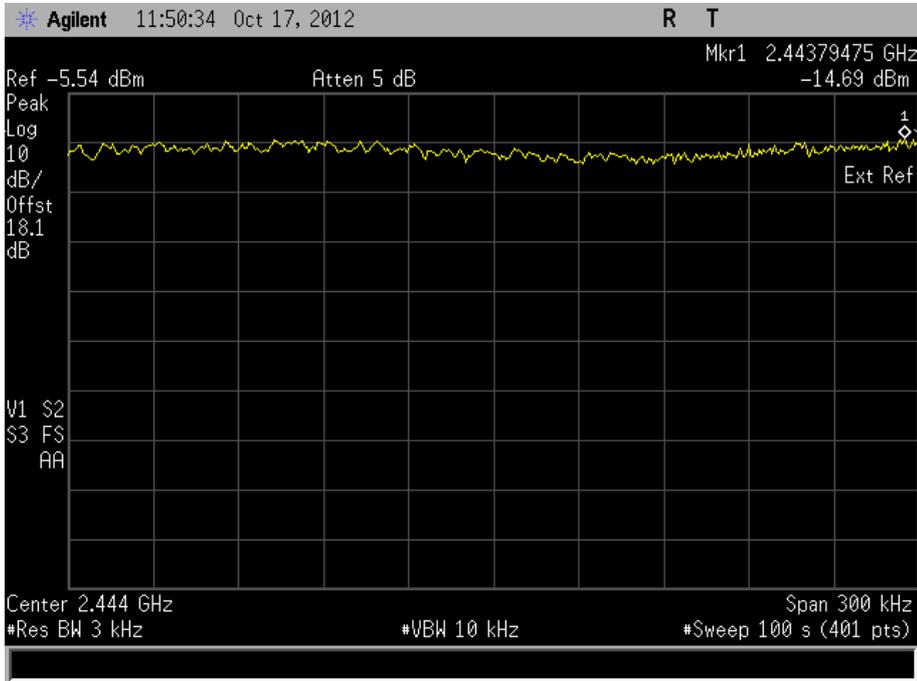




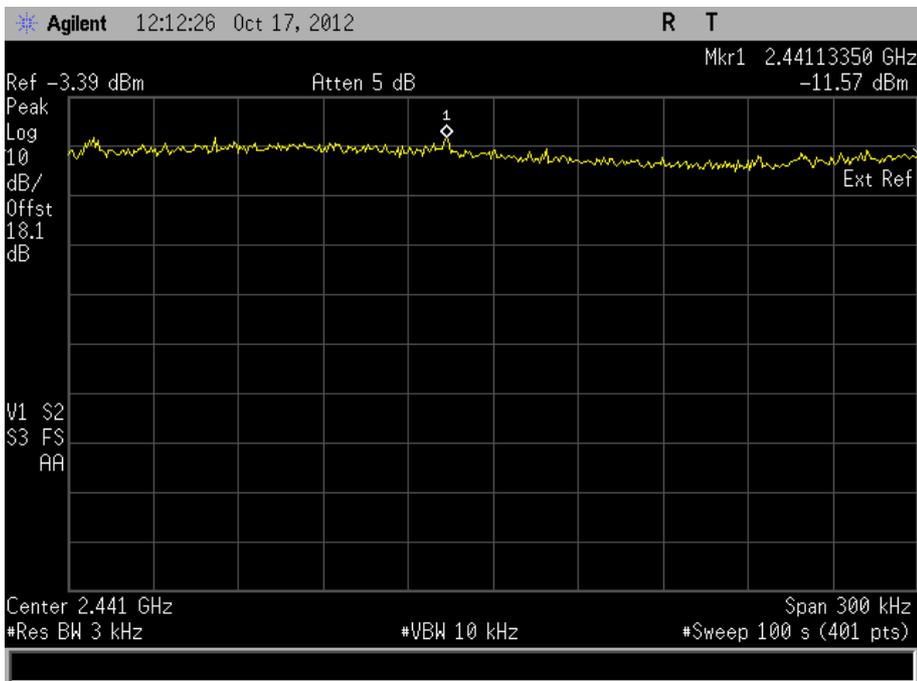
Product Service

2437 MHz

6 Mbps



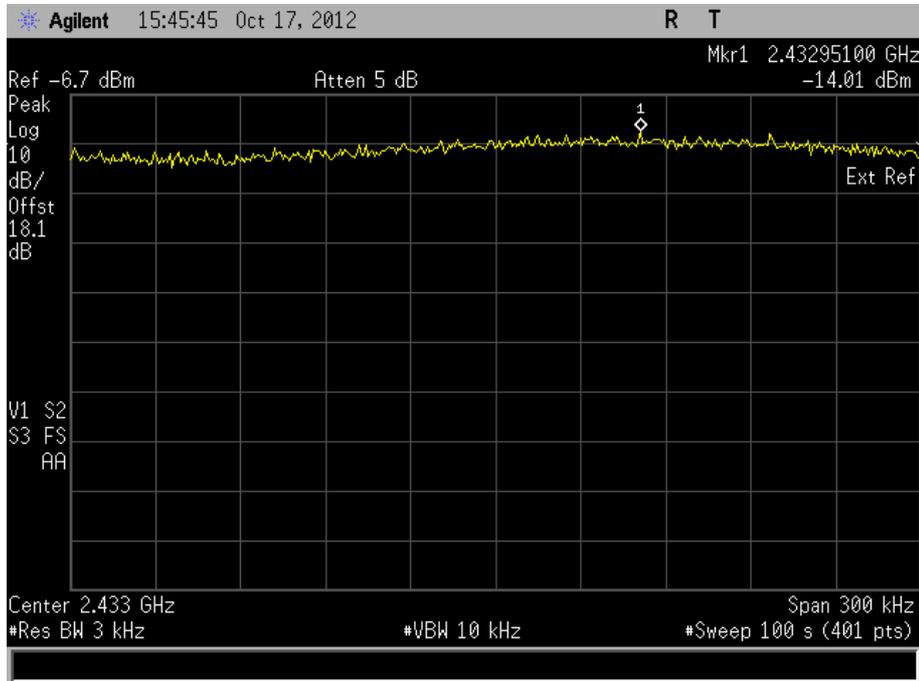
9 Mbps



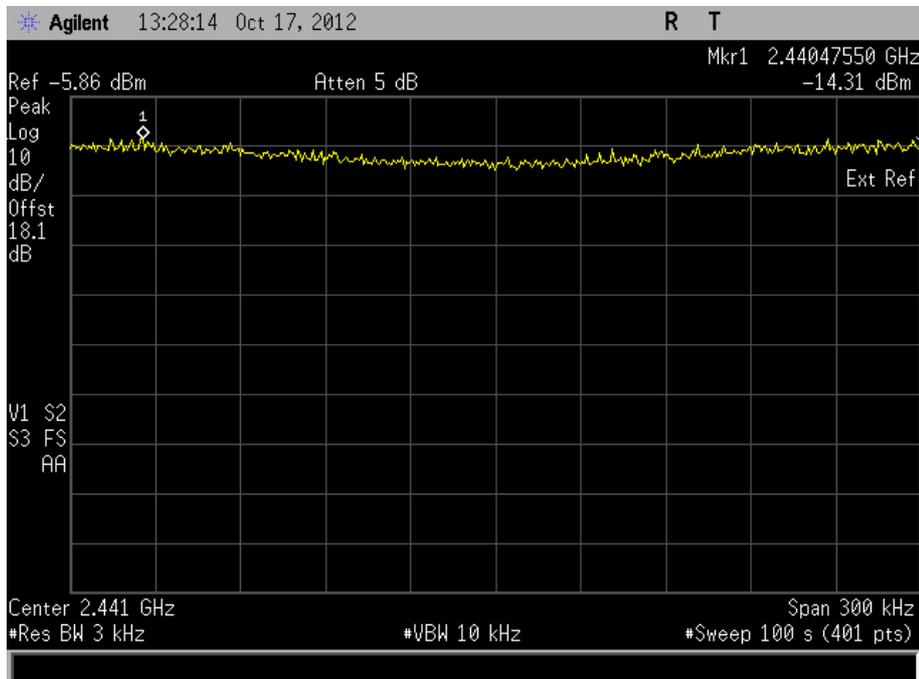


Product Service

12 Mbps



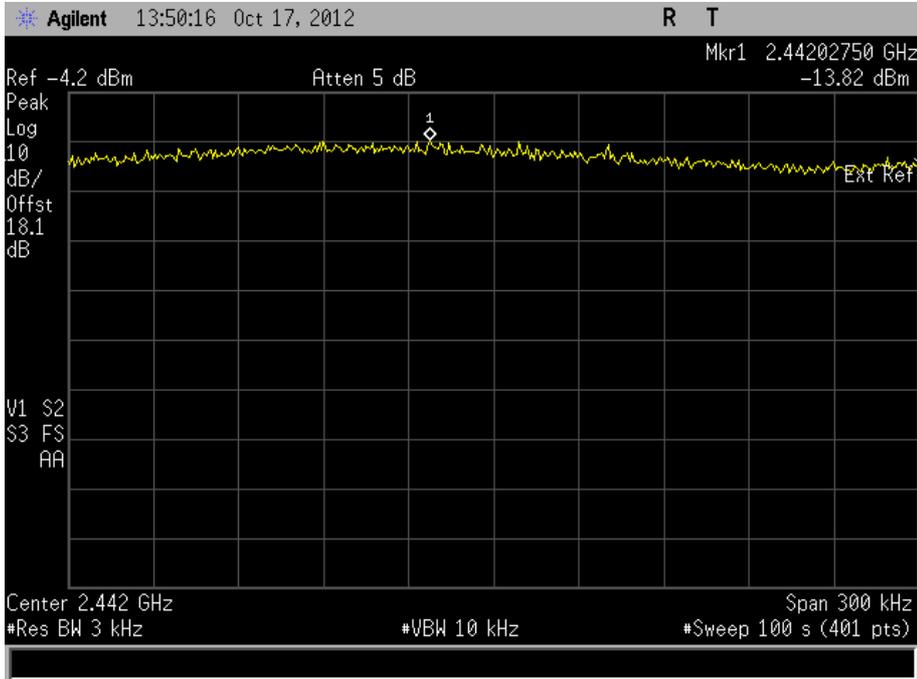
18 Mbps



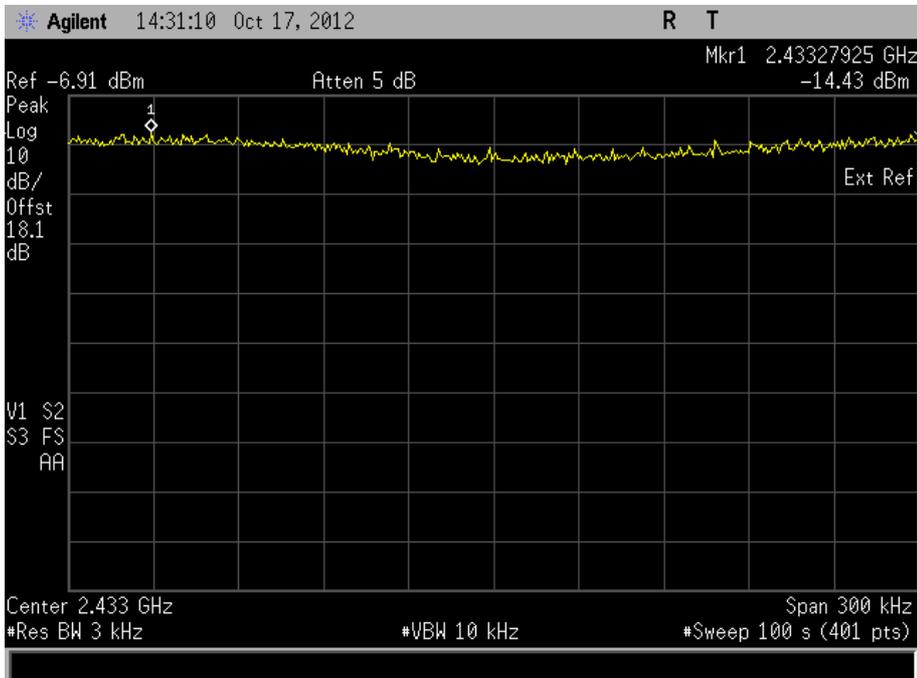


Product Service

24 Mbps



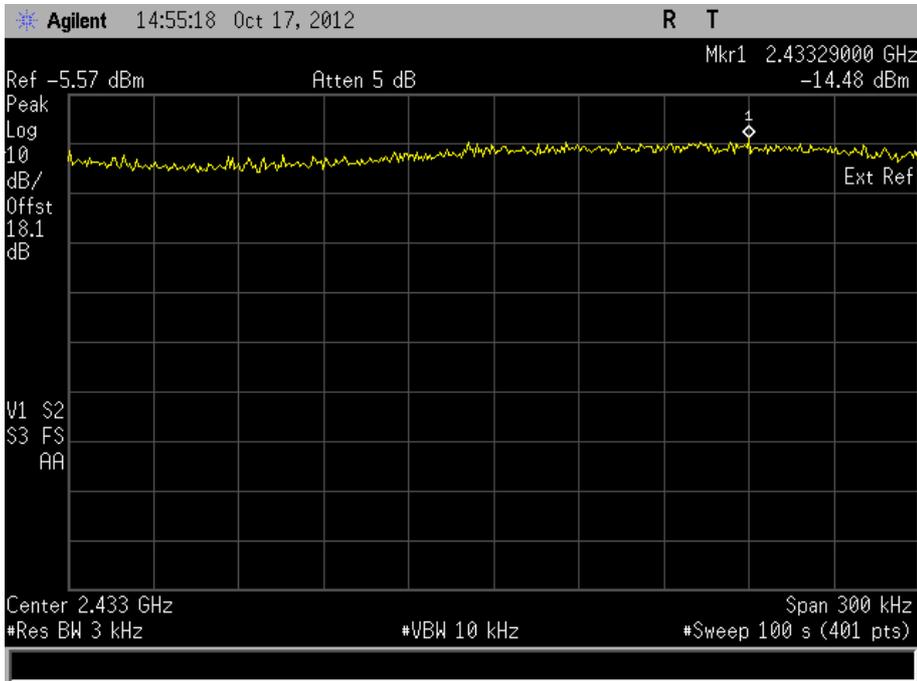
36 Mbps



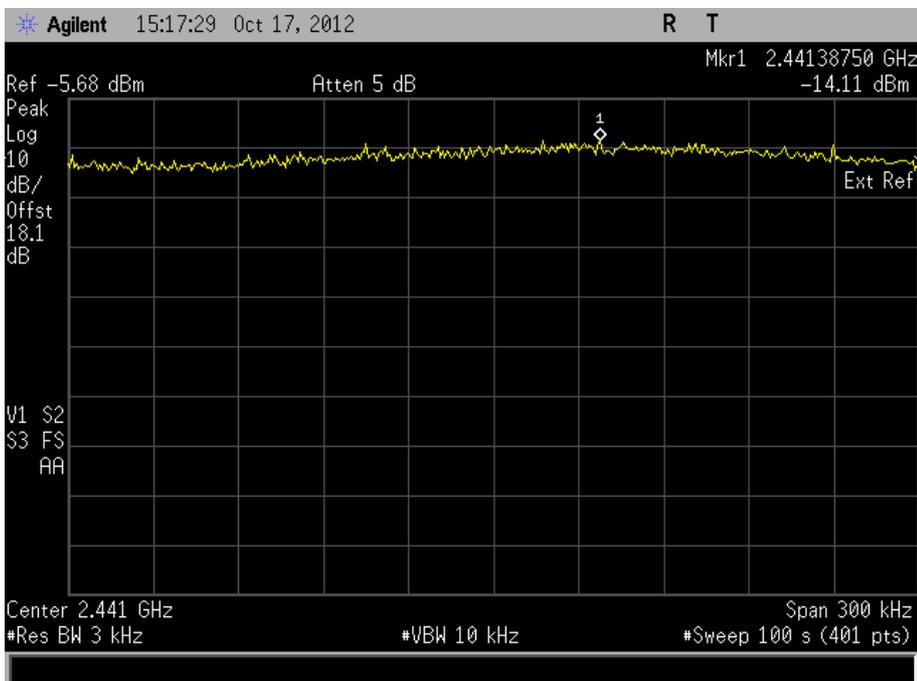


Product Service

48 Mbps



54 Mbps

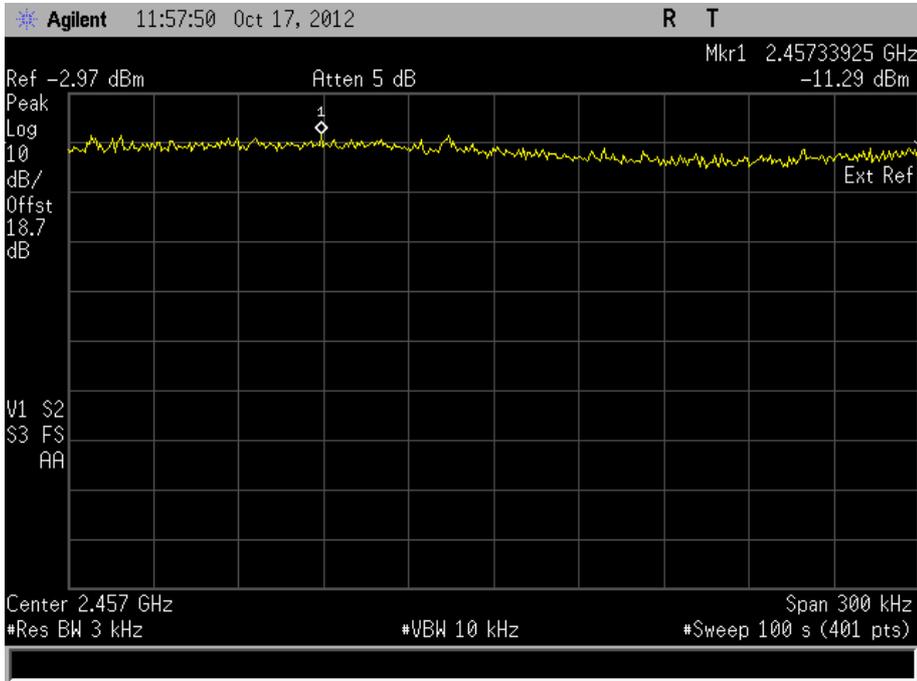




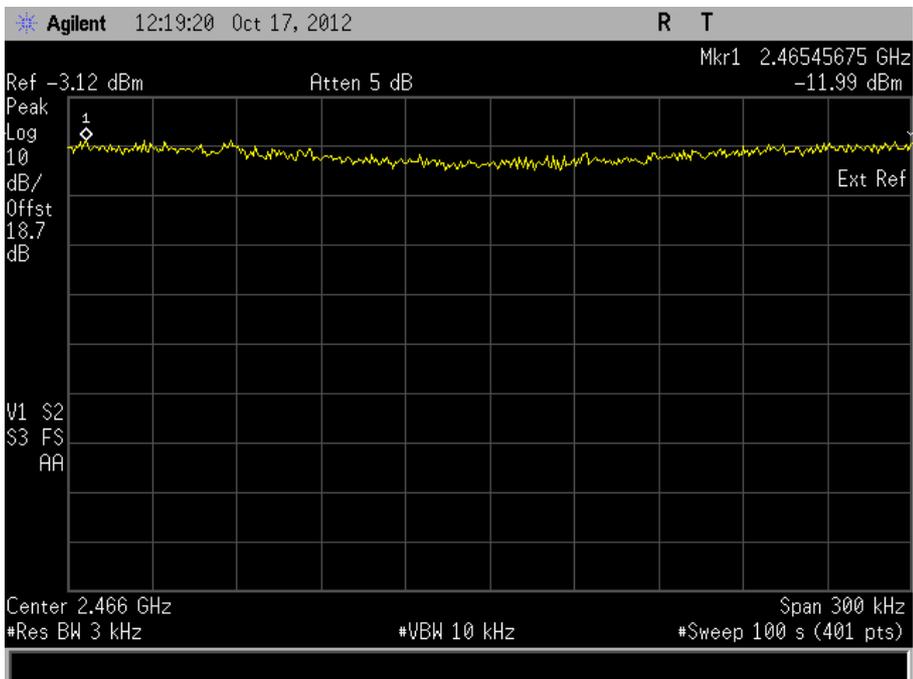
Product Service

2462 MHz

6 Mbps



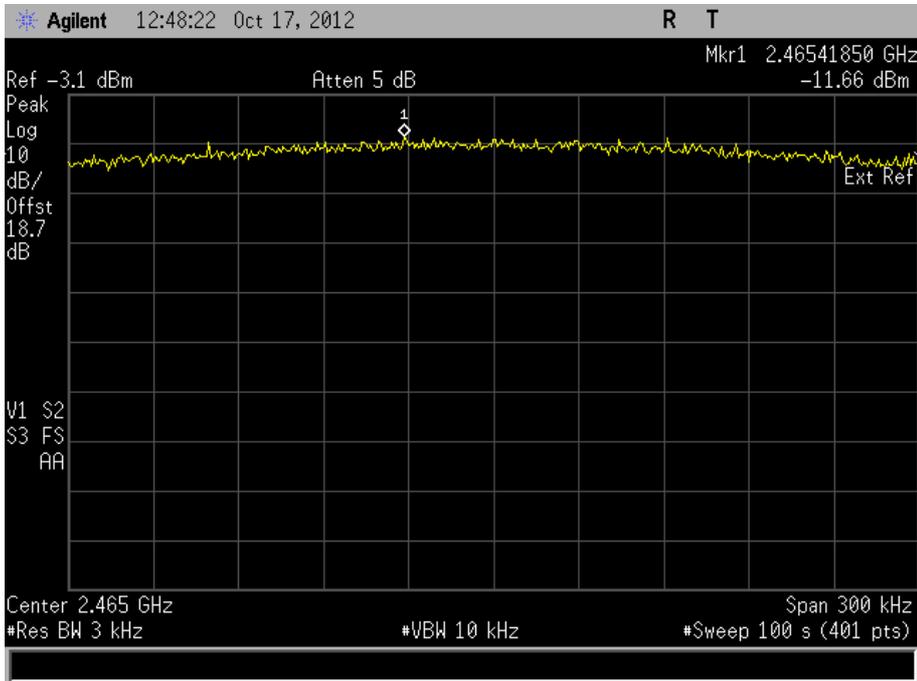
9 Mbps



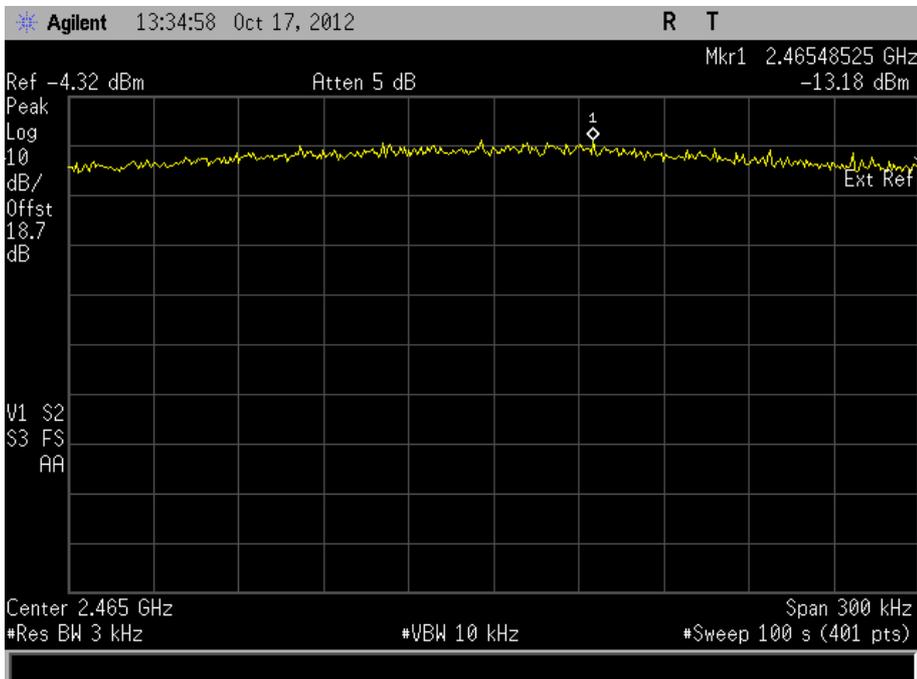


Product Service

12 Mbps



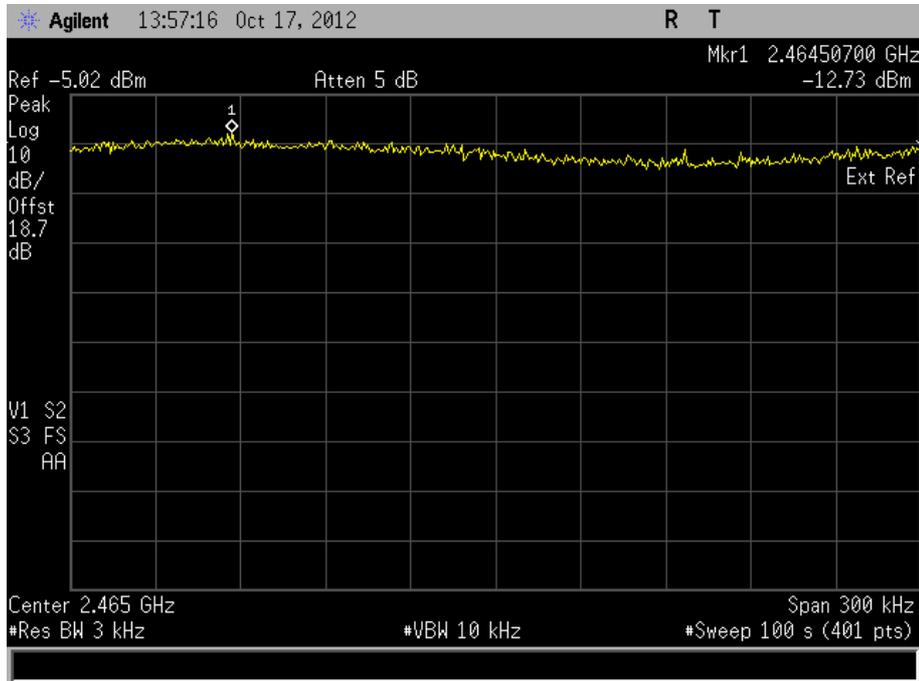
18 Mbps



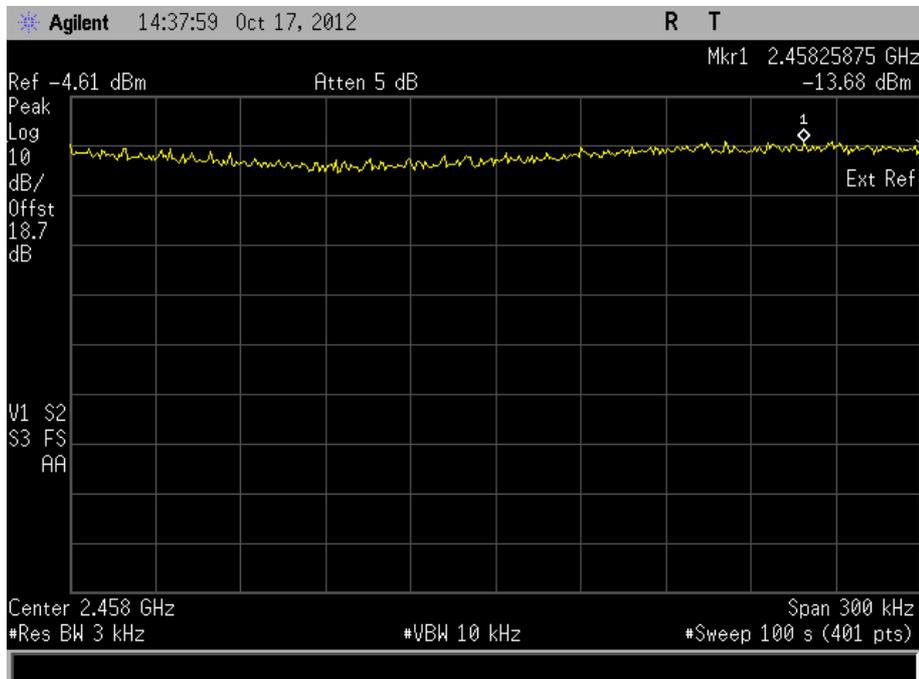


Product Service

24 Mbps



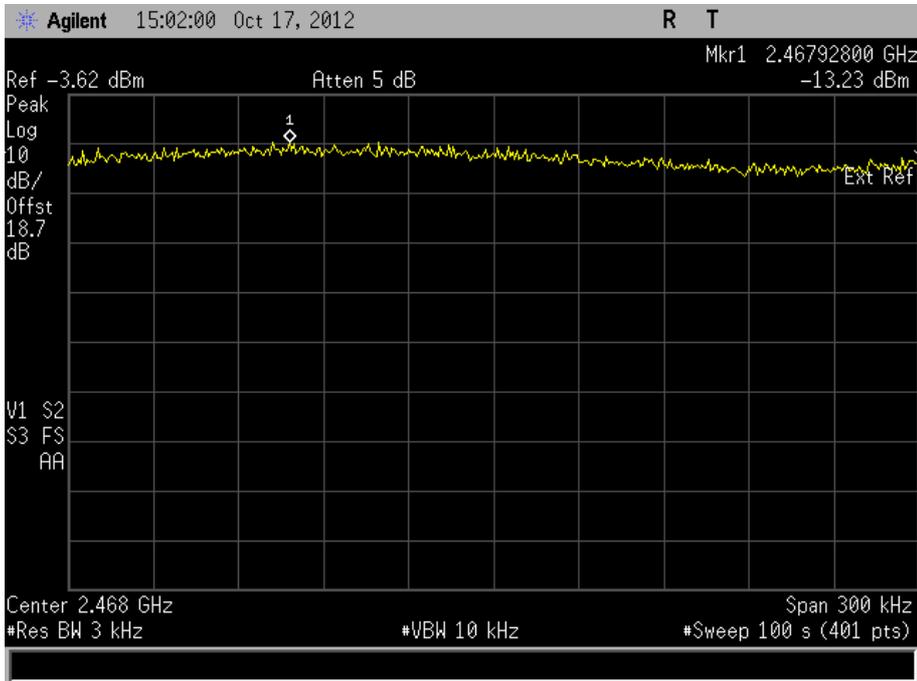
36 Mbps



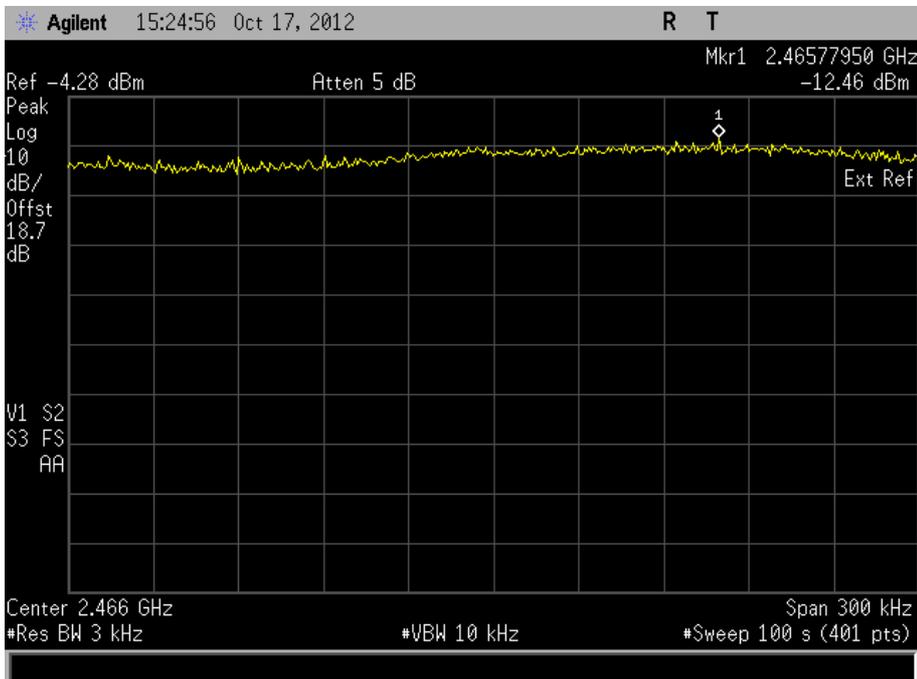


Product Service

48 Mbps



54 Mbps





Product Service

These results have been performed on a different sample to the sample used for radiated measurements. The sample used for radiated measurements was reduced in output power to achieve compliance with the specification.

The sample used for this test was not reduced in output power but the test was not repeated because it was deemed the worst case.

Limit Clause

The minimum 6 dB Bandwidth shall be at least 500 kHz.



Product Service

802.11(n)

4.0 V DC Supply

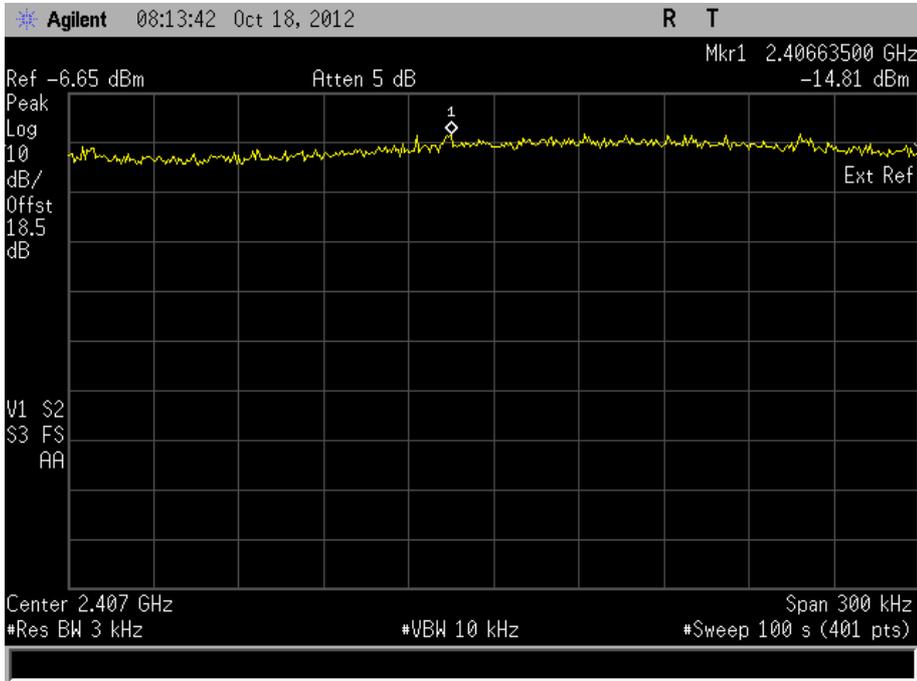
Frequency	Data Rate (Mbps)	Power Spectral Density in 3 kHz Bands (dBm)
2412 MHz	6.5	-14.81
	13	-15.48
	19.5	-15.44
	26	-15.17
	39	-15.21
	52	-15.02
	58.5	-14.21
	65	-15.19
2437 MHz	6.5	-16.38
	13	-15.55
	19.5	-15.50
	26	-14.78
	39	-14.49
	52	-13.12
	58.5	-15.82
	65	-15.58
2462 MHz	6.5	-14.55
	13	-15.08
	19.5	-14.53
	26	-14.86
	39	-14.89
	52	-15.47
	58.5	-15.19
	65	-15.53



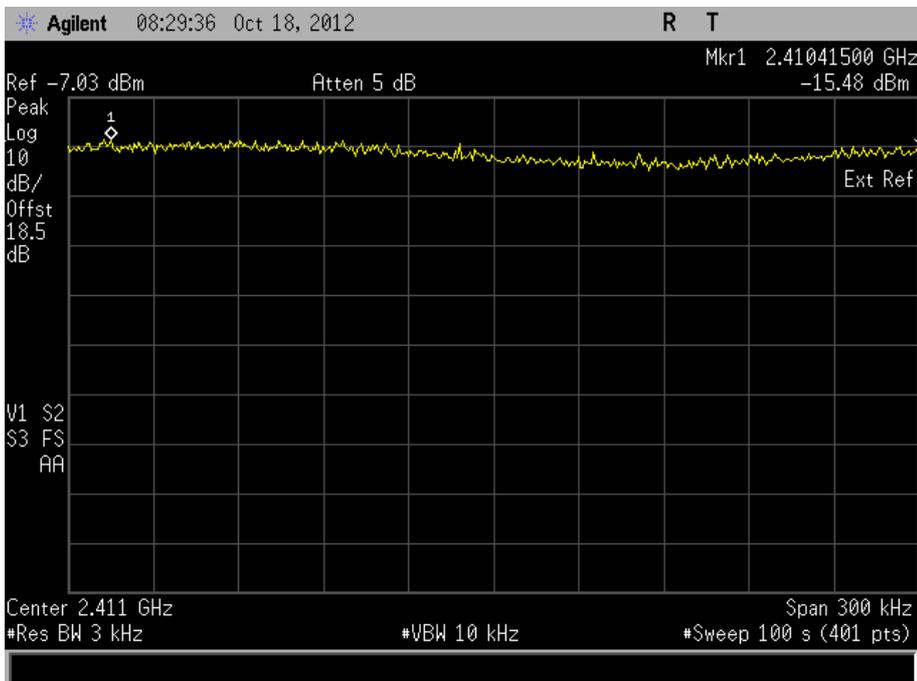
Product Service

2412 MHz

6.5 Mbps



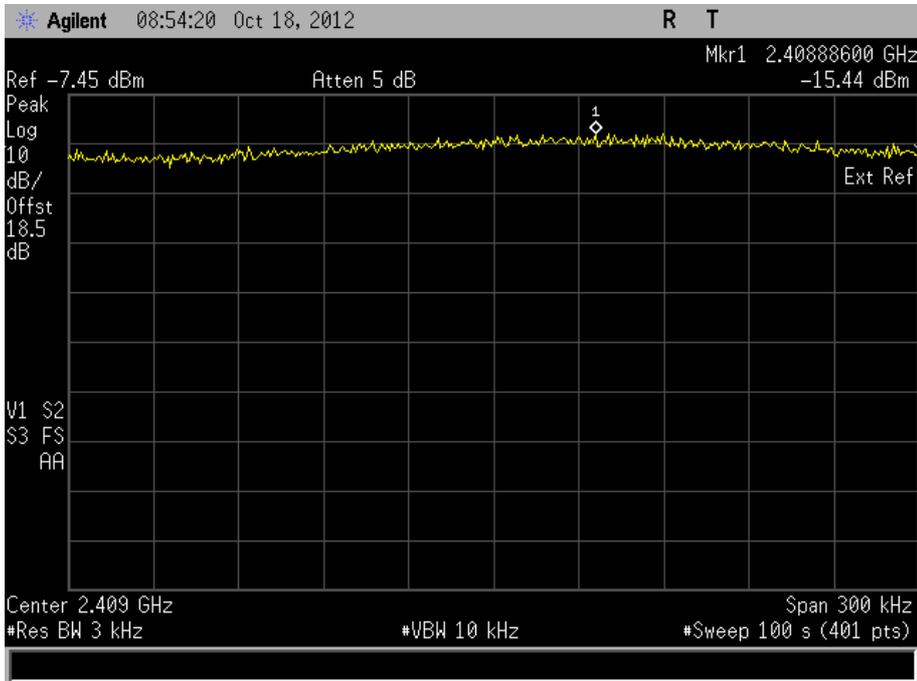
13 Mbps



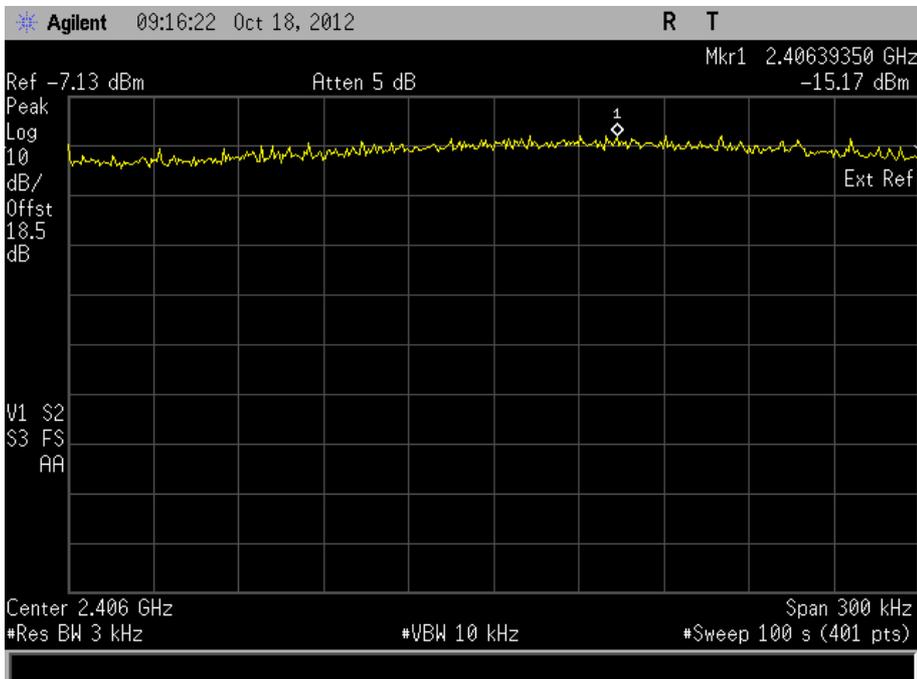


Product Service

19.5 Mbps



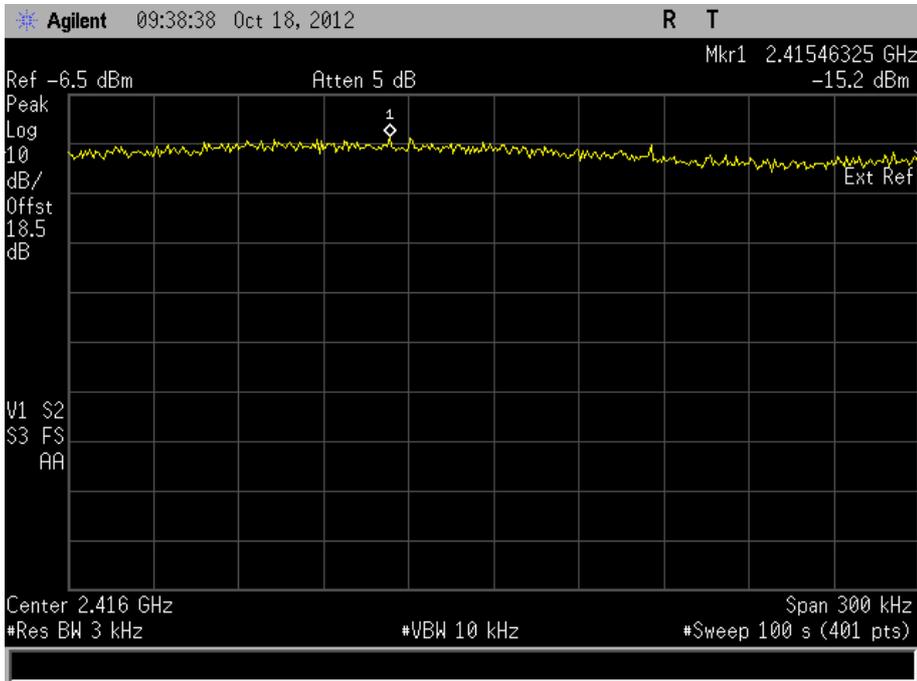
26 Mbps



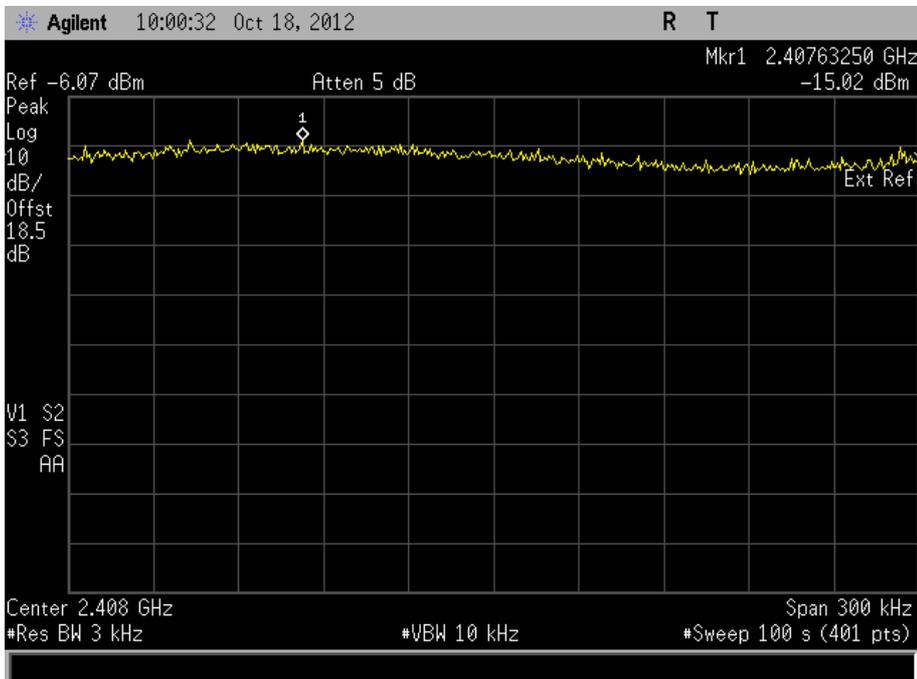


Product Service

39 Mbps



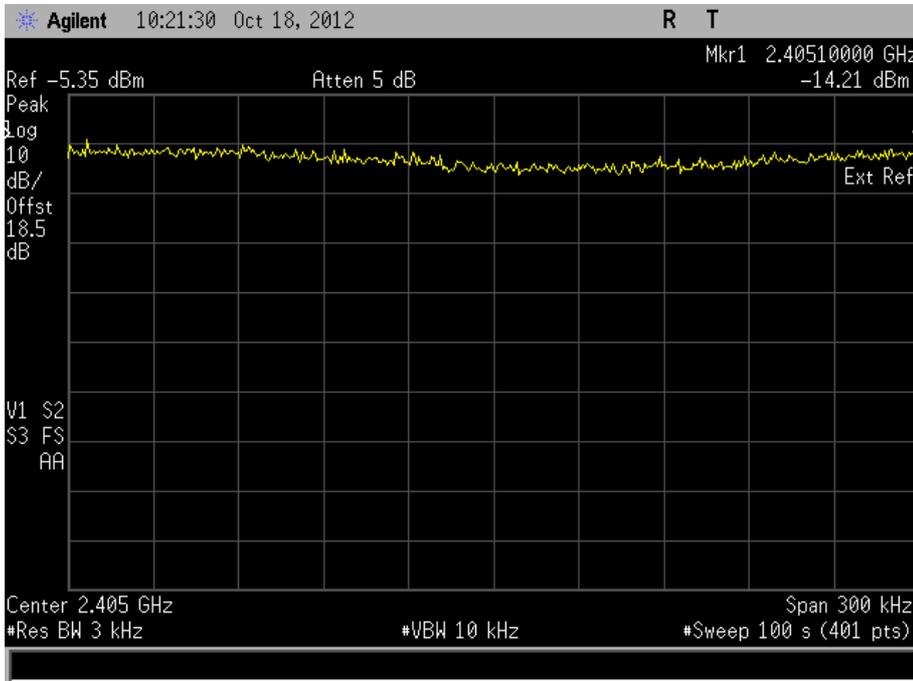
52 Mbps



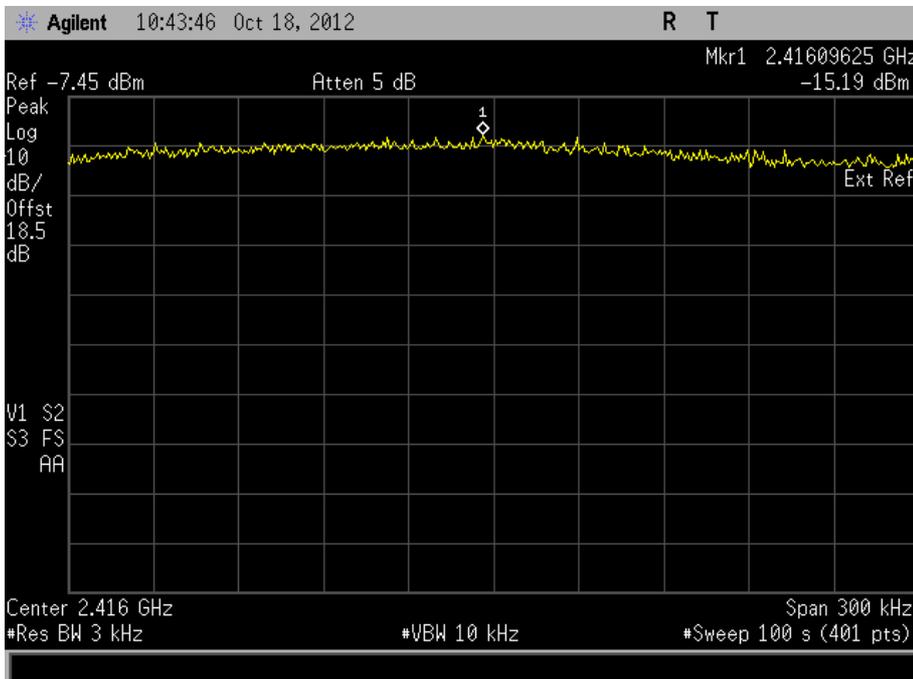


Product Service

58.5 Mbps



65 Mbps

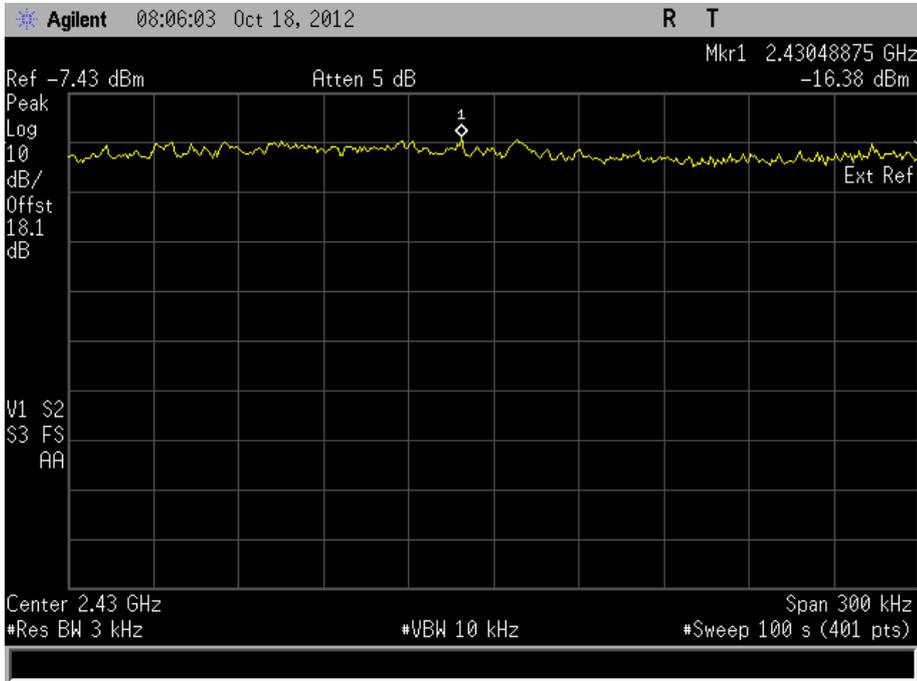




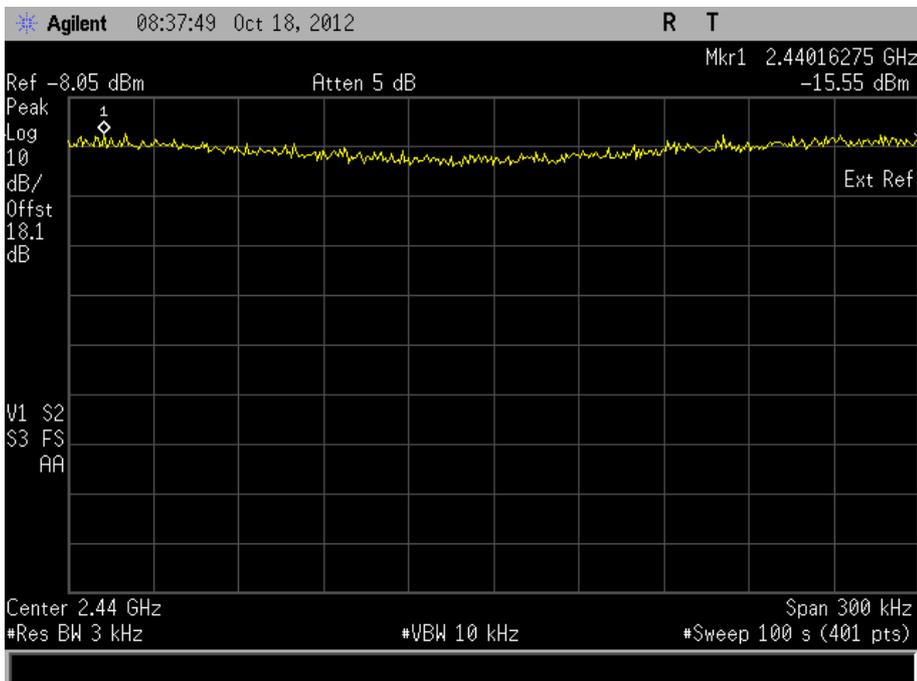
Product Service

2437 MHz

6.5 Mbps



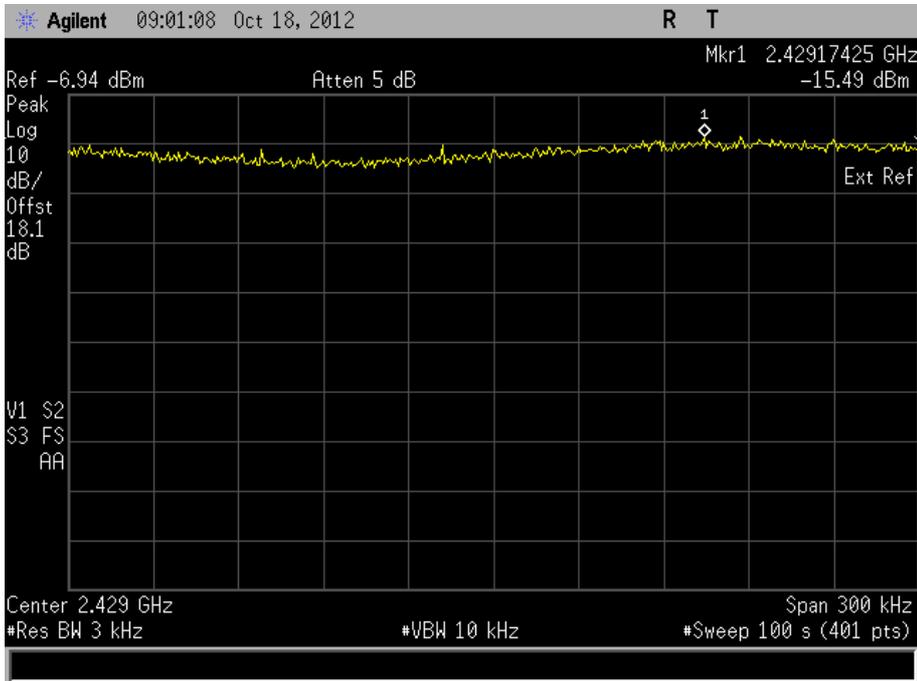
13 Mbps



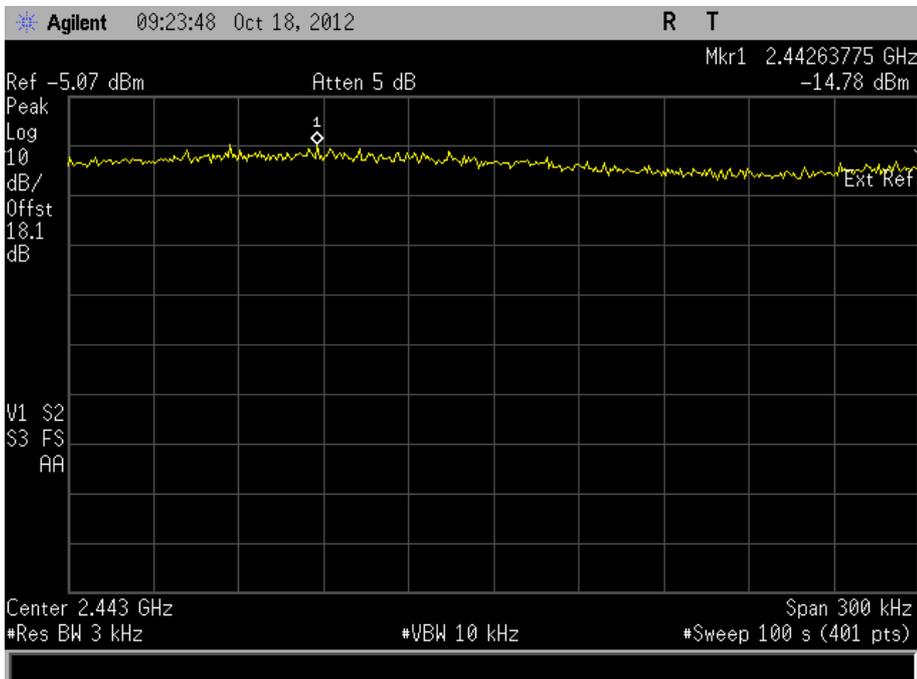


Product Service

19.5 Mbps



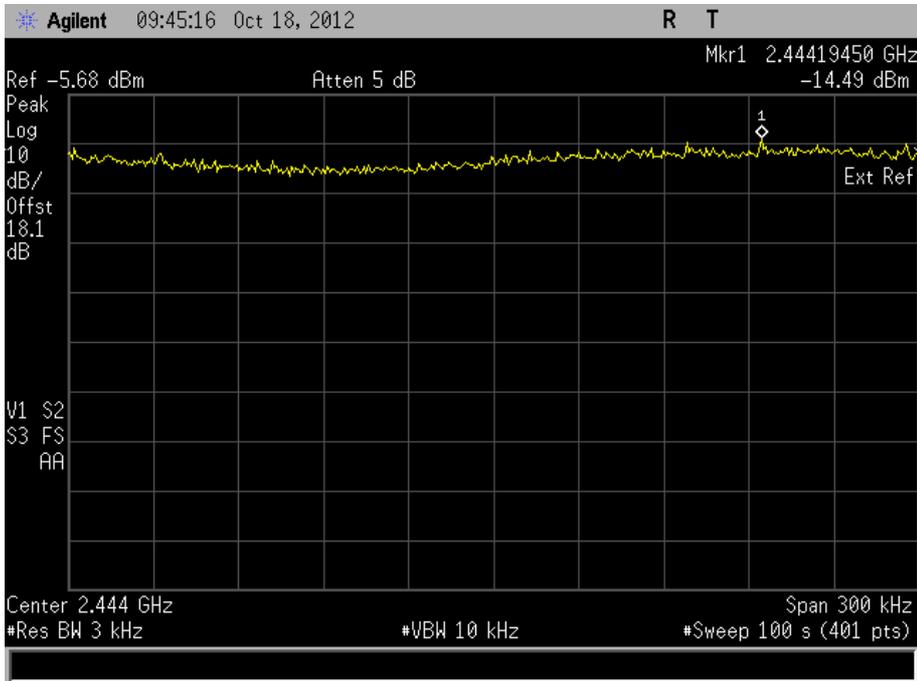
26 Mbps



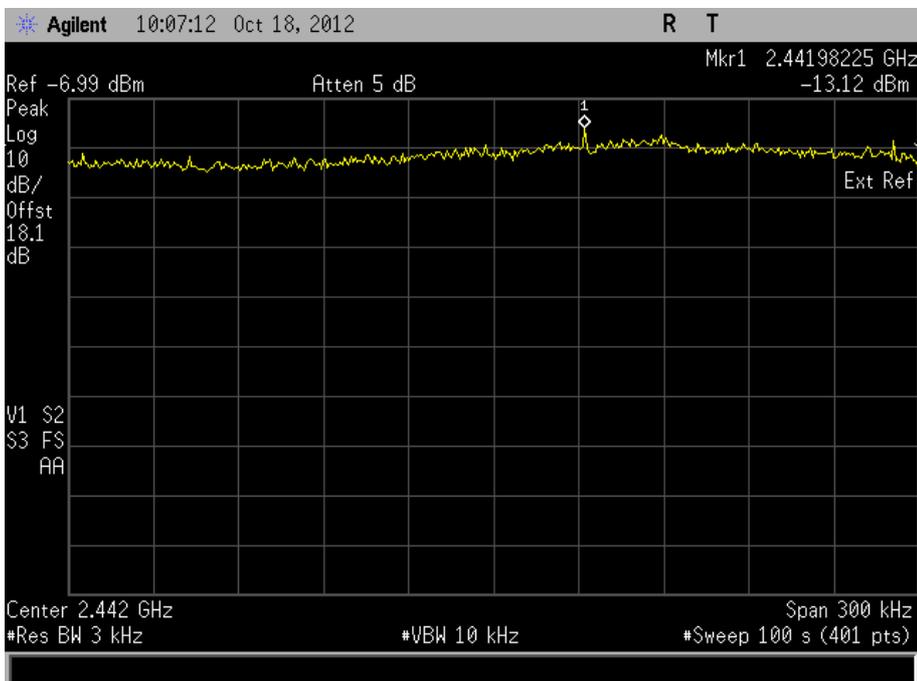


Product Service

39 Mbps



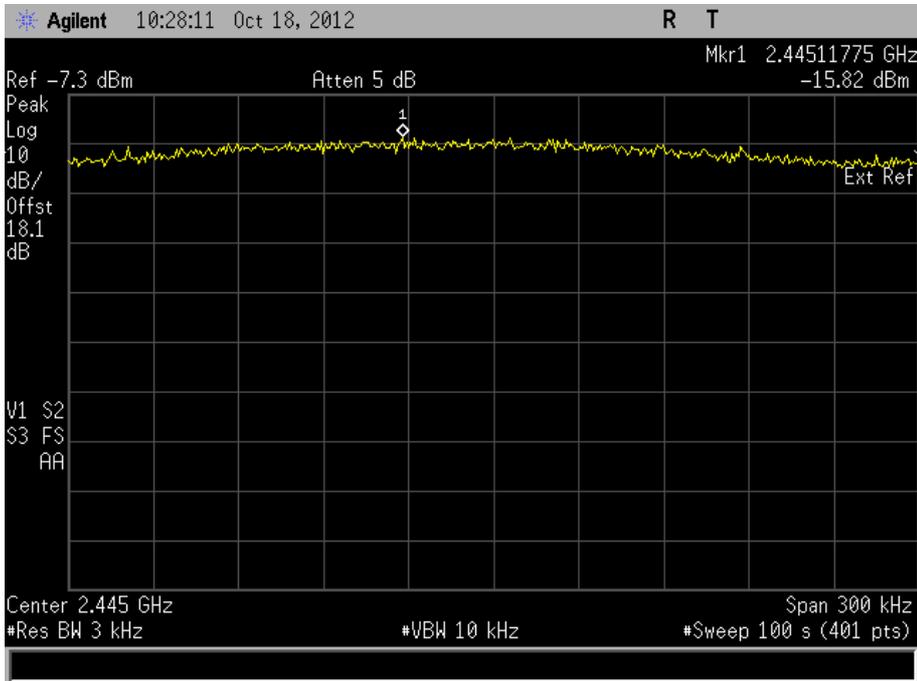
52 Mbps



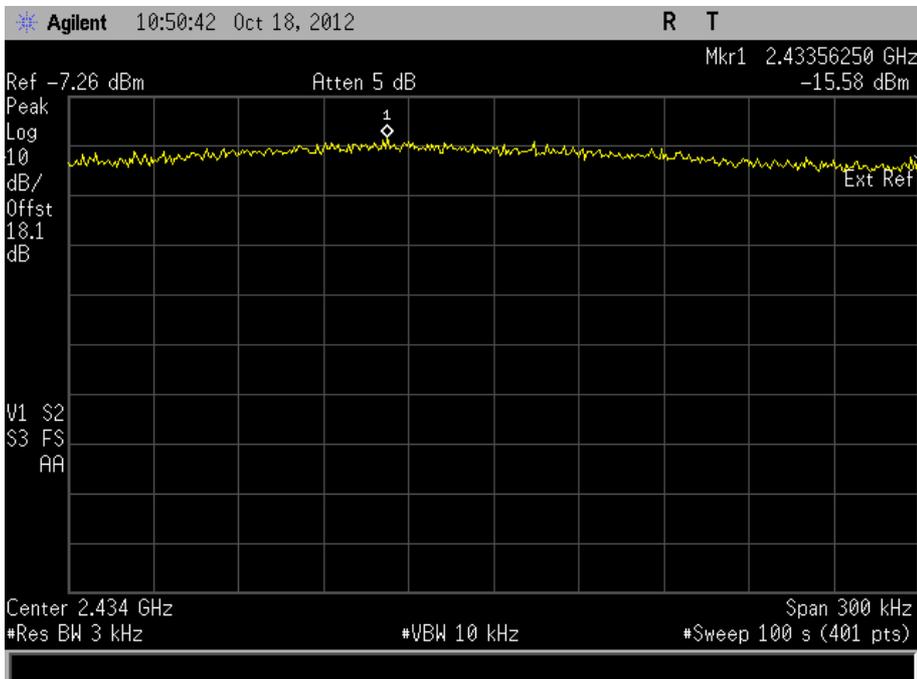


Product Service

58.5 Mbps



65 Mbps

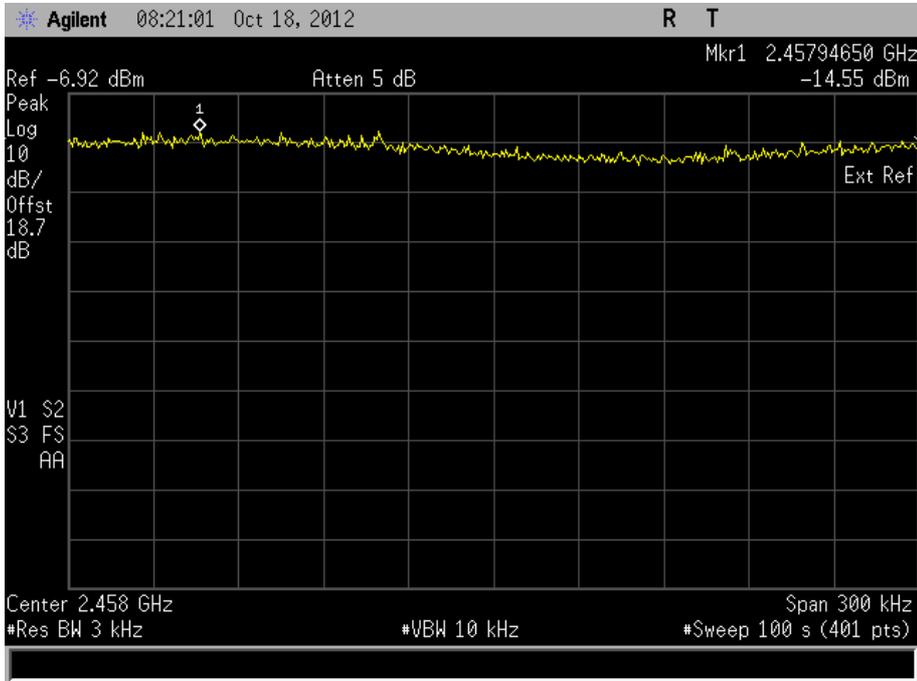




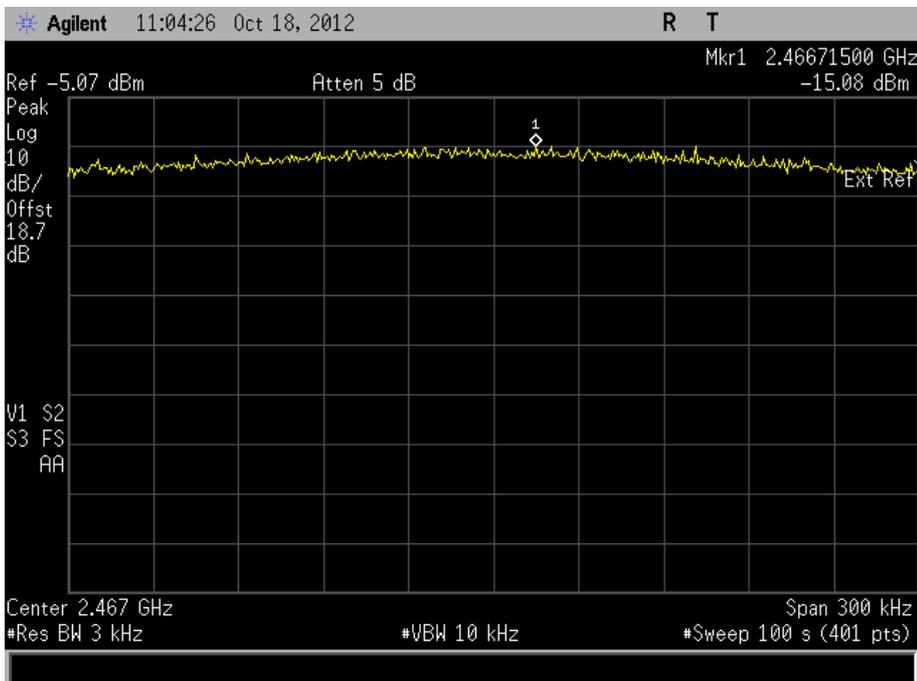
Product Service

2462 MHz

6.5 Mbps



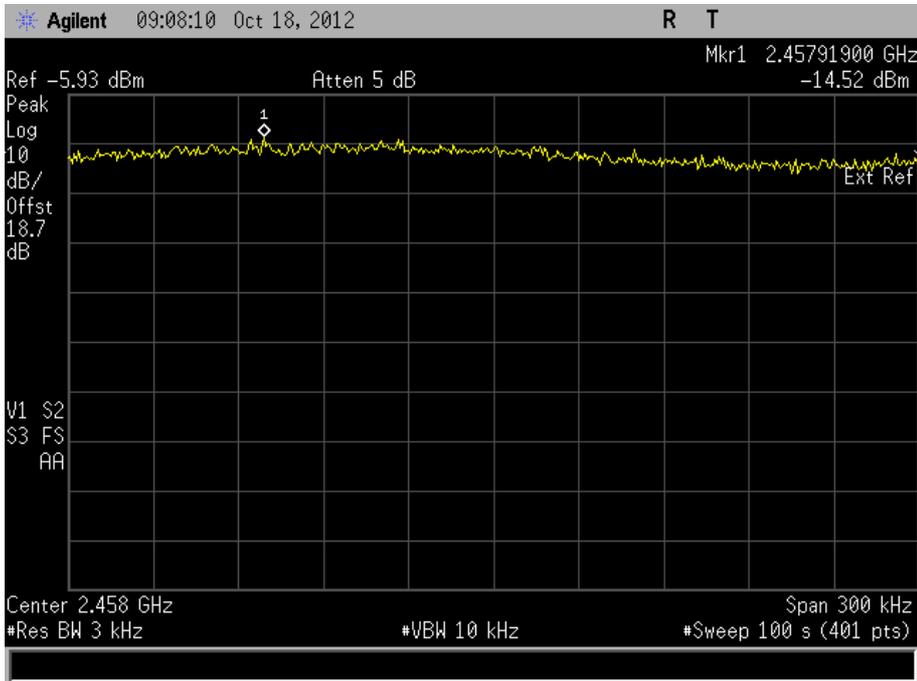
13 Mbps



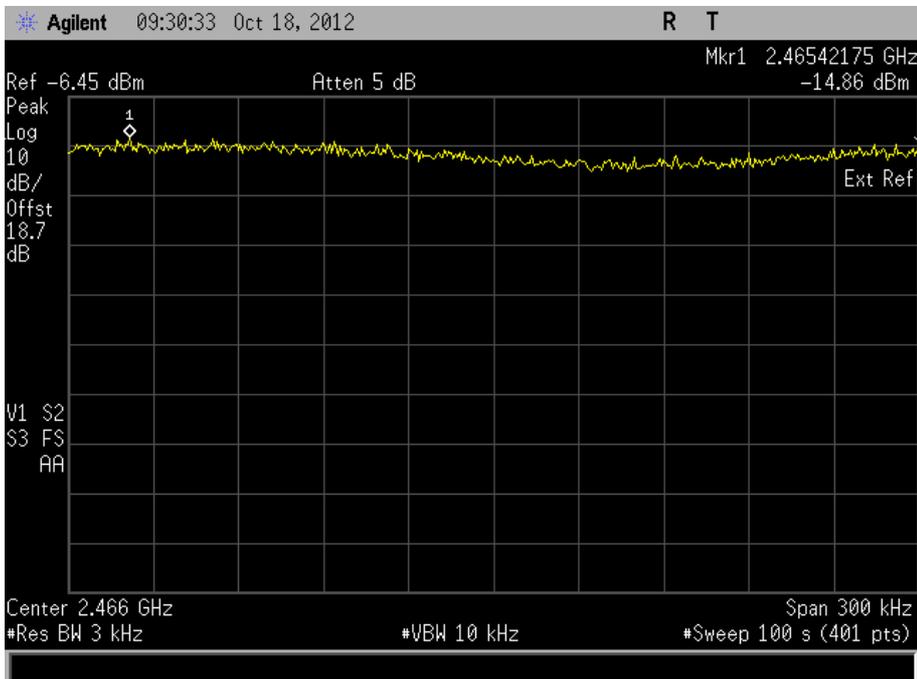


Product Service

19.5 Mbps



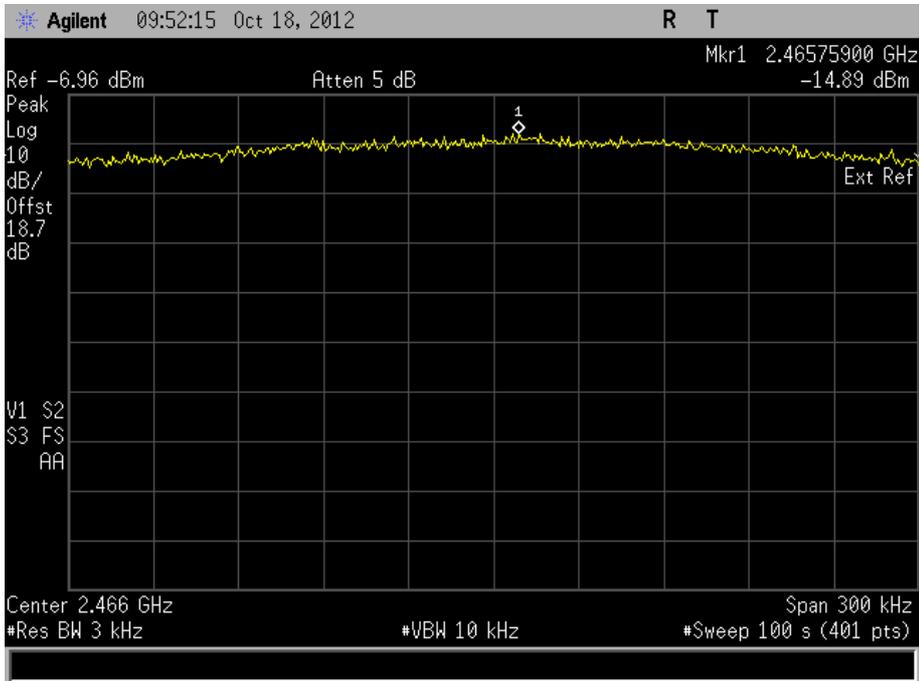
26 Mbps



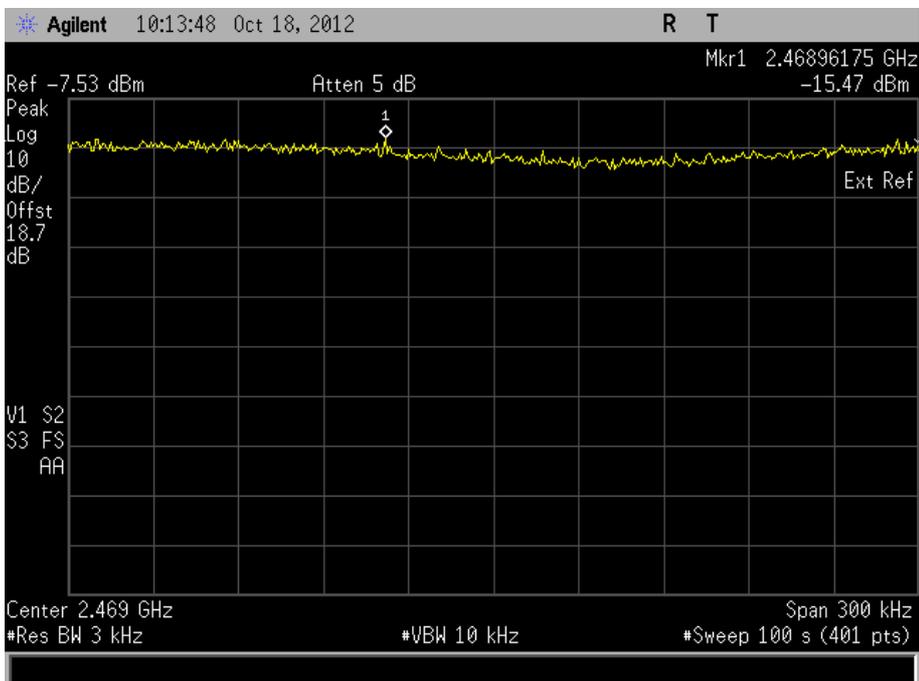


Product Service

39 Mbps



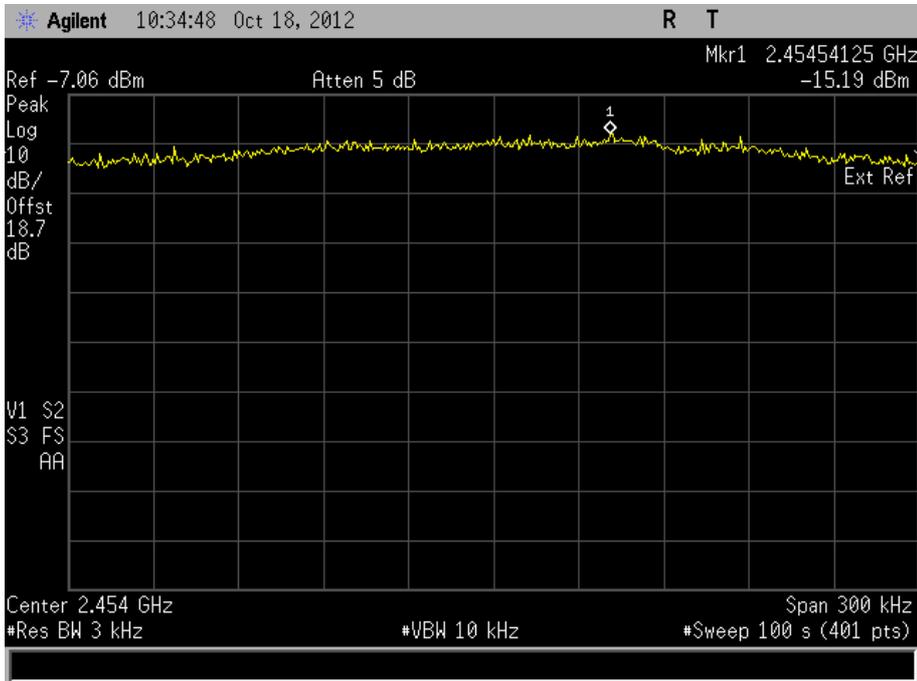
52 Mbps



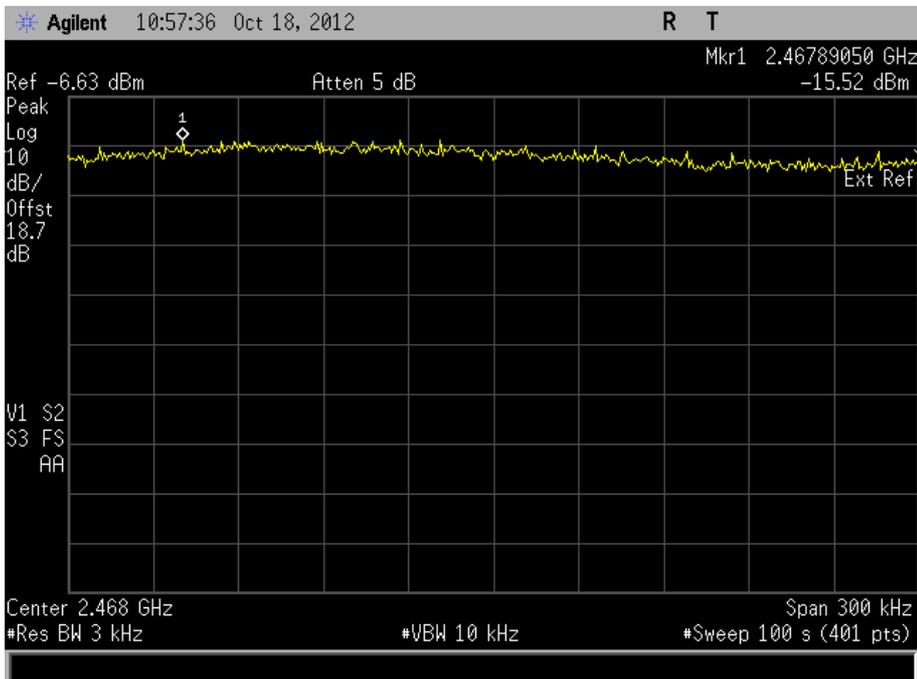


Product Service

58.5 Mbps



65 Mbps





Product Service

These results have been performed on a different sample to the sample used for radiated measurements. The sample used for radiated measurements was reduced in output power to achieve compliance with the specification.

The sample used for this test was not reduced in output power but the test was not repeated because the result of this test would not be affected.

Limit Clause

The minimum 6 dB Bandwidth shall be at least 500 kHz.

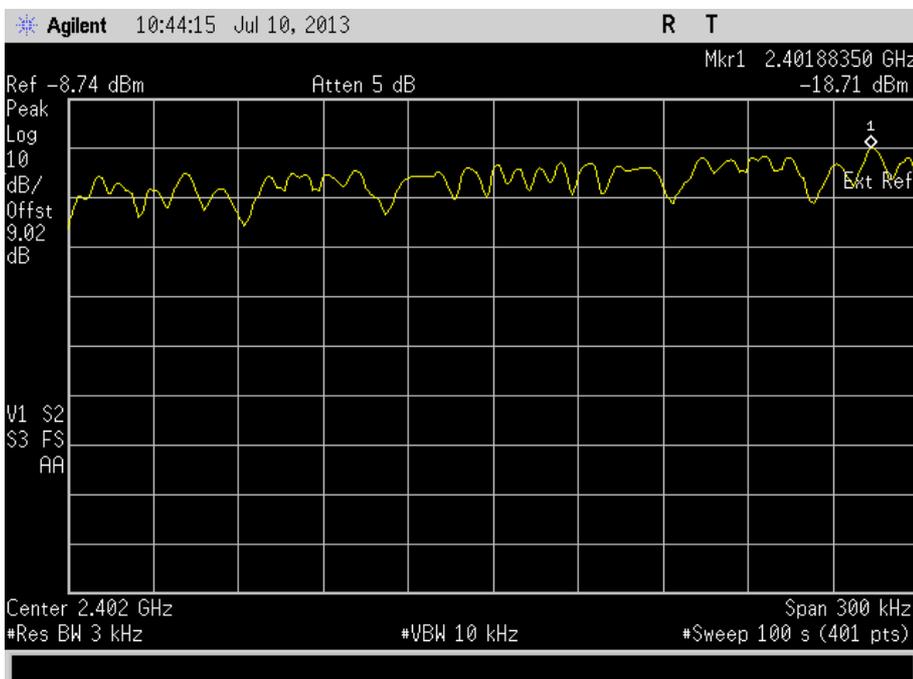
Bluetooth Low Energy

4.0 V DC Supply

Frequency	Packet Type	Power Spectral Density in 3 kHz Bands (dBm)
2402 MHz	37 oct/prbs9	-18.71
2441 MHz	37 oct/prbs9	-21.88
2480 MHz	37 oct/prbs9	-20.12

2402 MHz

37 oct/prbs9

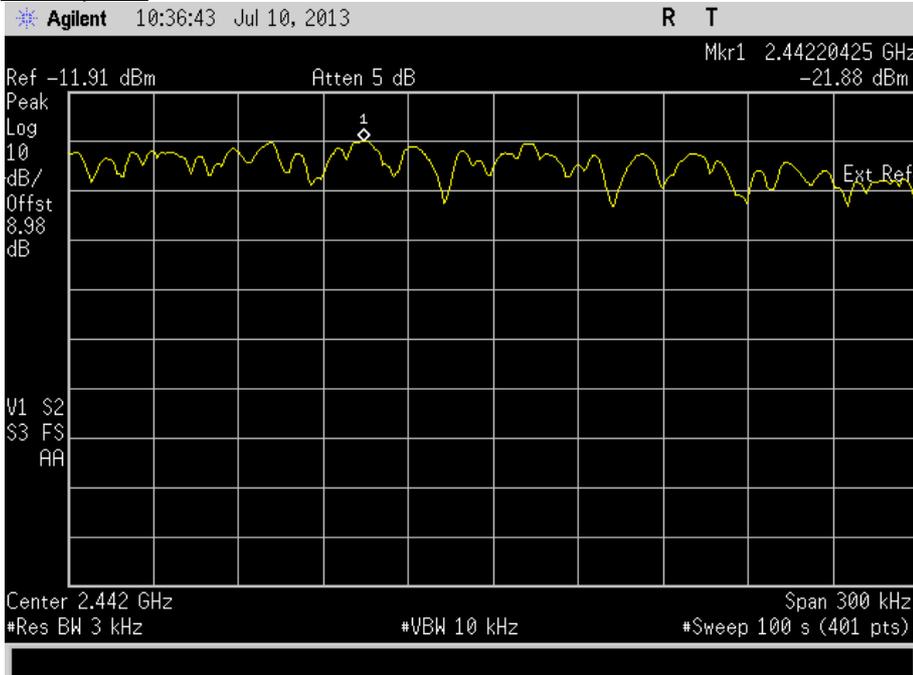




Product Service

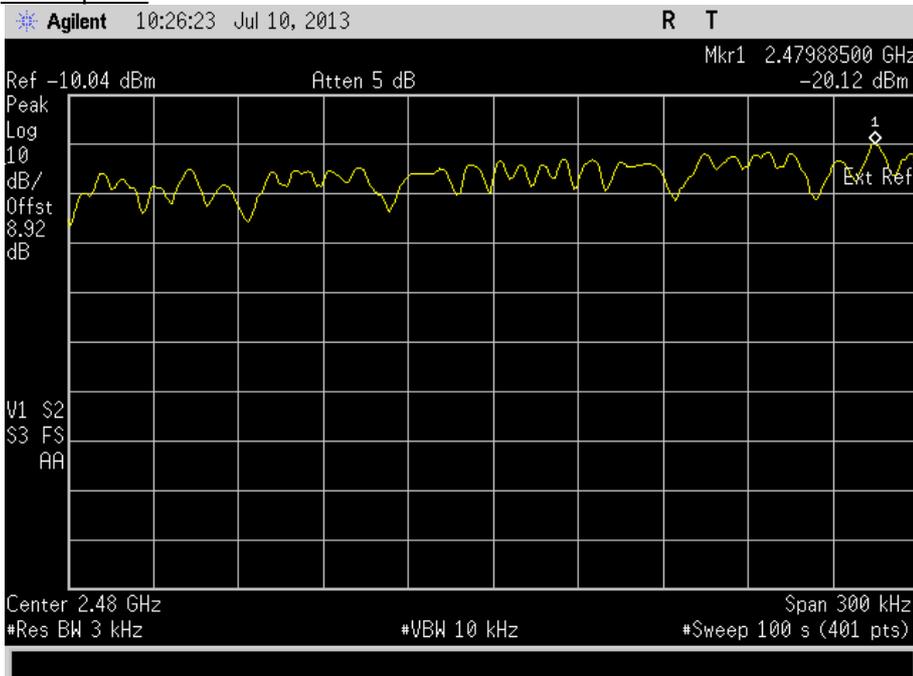
2441 MHz

37 oct/prbs9



2480 MHz

37 oct/prbs9



Limit Clause

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.



Product Service

2.6 6dB BANDWIDTH

2.6.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (2)

2.6.2 Equipment Under Test and Modification State

CDMA SHT21 S/N: IMEI 004401114403773 - Modification State 0

CDMA SHT21 S/N: IMEI 004401114403781 - Modification State 0

2.6.3 Date of Test

17 & 18 October 2012 and 10 July 2013

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

The EUT was transmitted at maximum power via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen. The peak point of the trace was measured and the markers positioned to give the -6dBc points of the displayed spectrum.

2.6.6 Environmental Conditions

Ambient Temperature	23.3 - 24.7°C
Relative Humidity	40.8 - 54.4%



Product Service

2.6.7 Test Results

802.11(b)

4.0 V DC Supply

Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412 MHz	1	8.100
	2	7.920
	5	7.875
	11	8.460
2437 MHz	1	7.830
	2	8.235
	5	8.100
	11	8.730
2462 MHz	1	8.100
	2	7.830
	5	8.775
	11	8.730



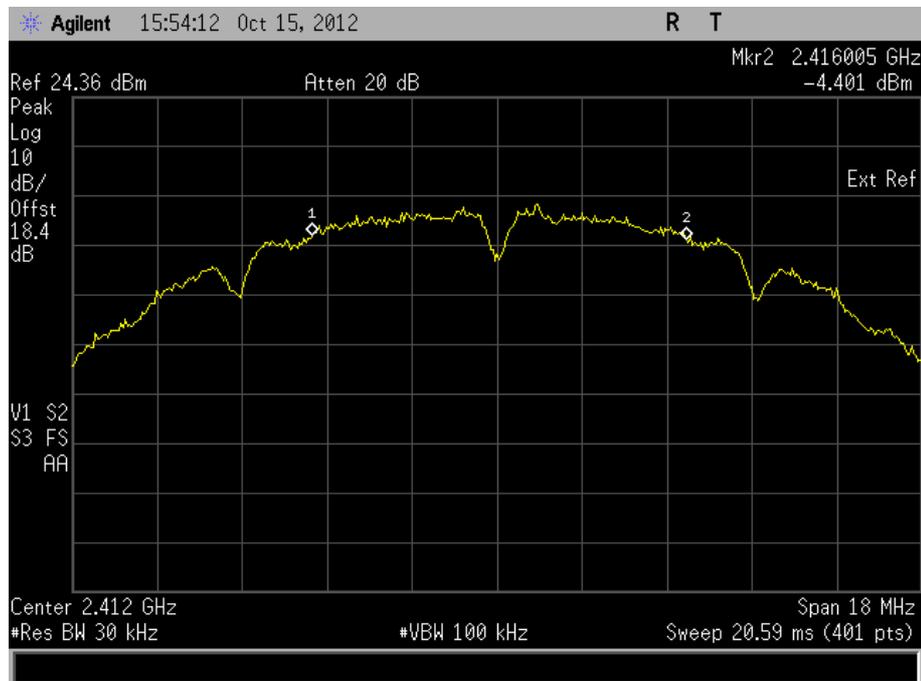
Product Service

2412 MHz

1 Mbps



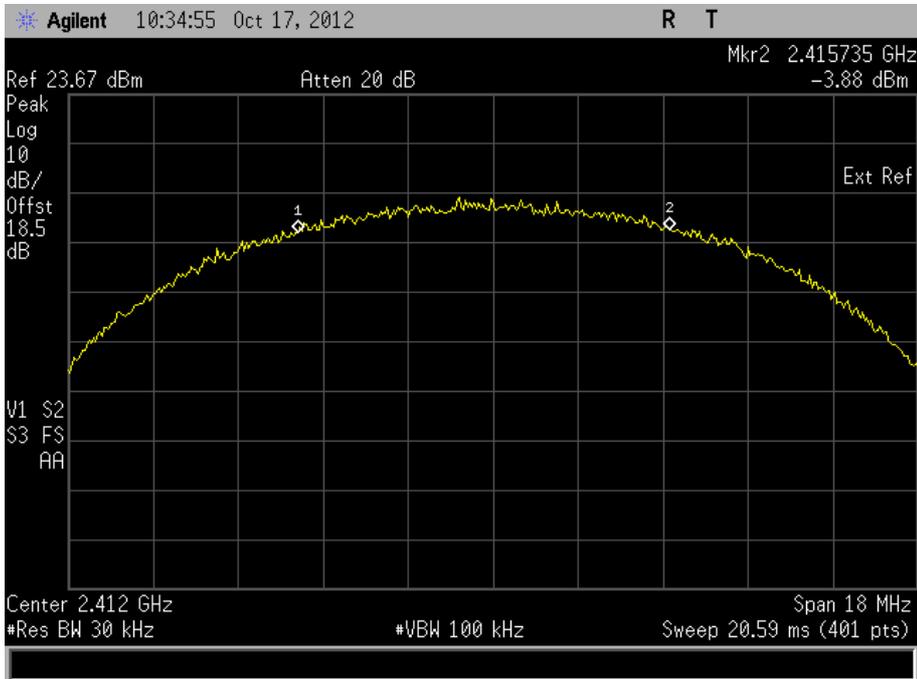
2 Mbps



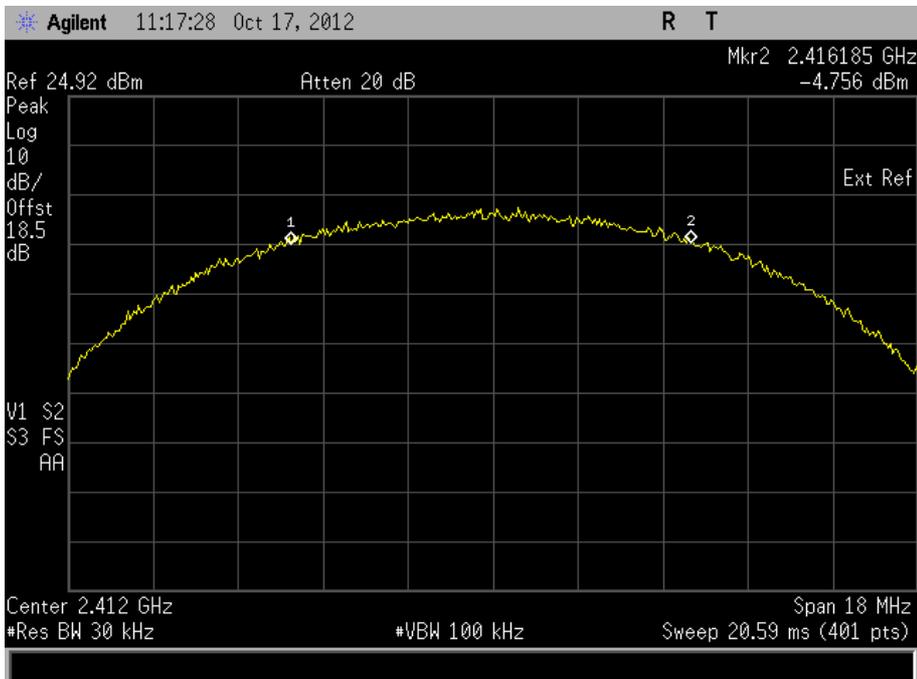


Product Service

5.5 Mbps



11 Mbps

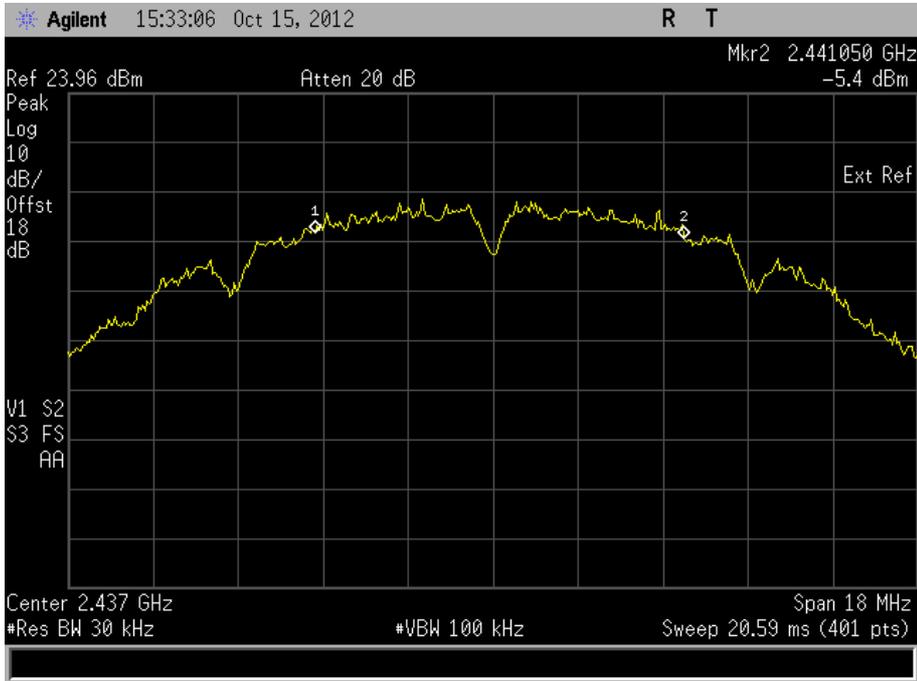




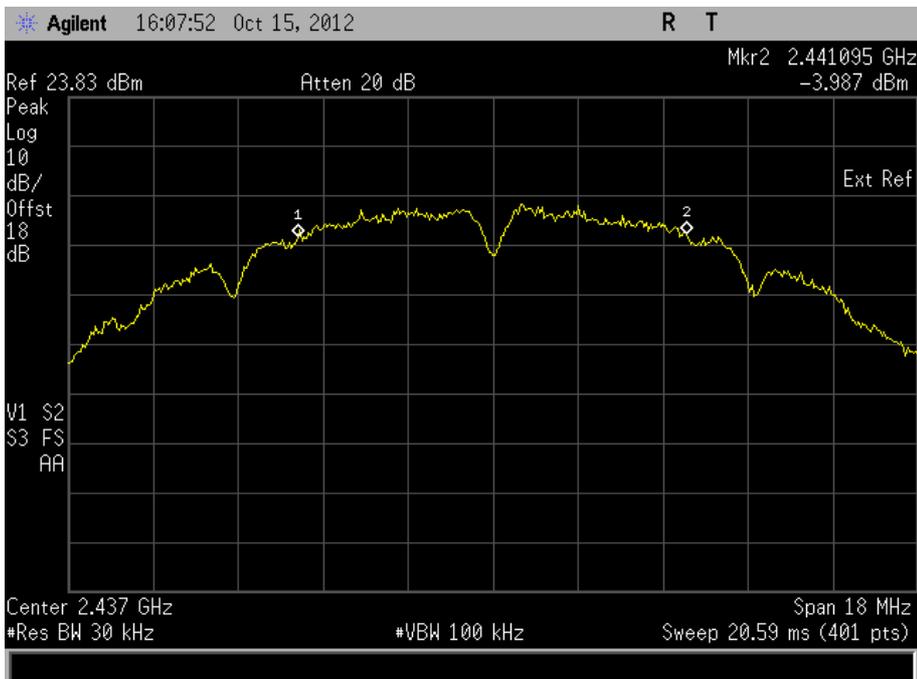
Product Service

2437 MHz

1 Mbps



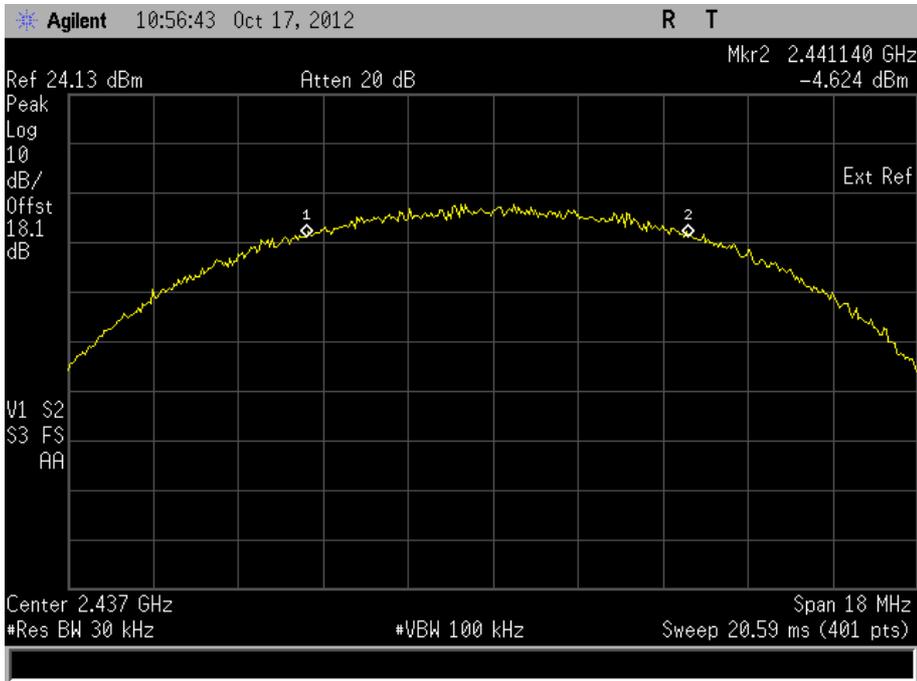
2 Mbps



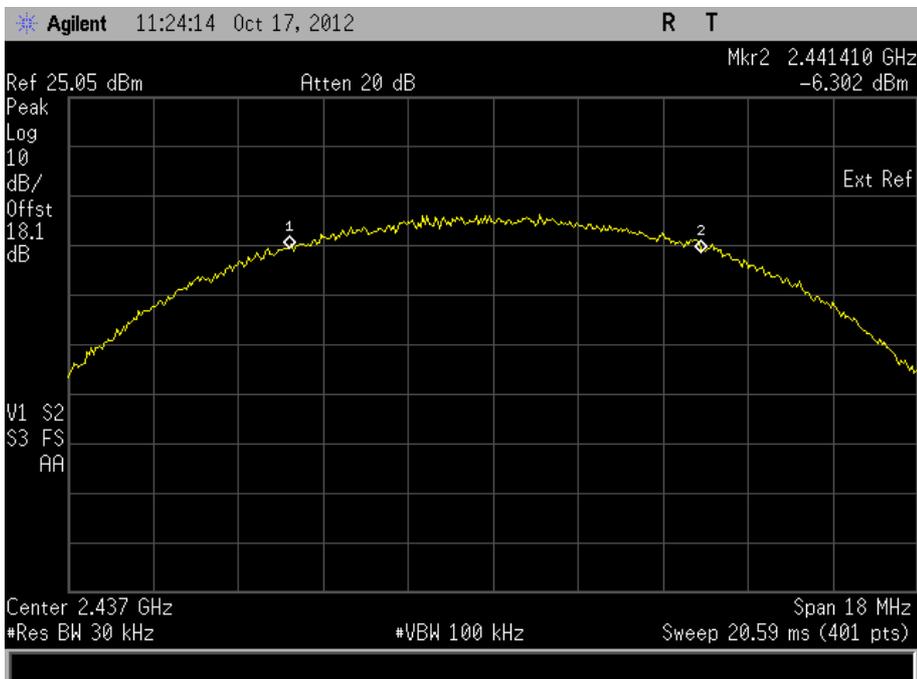


Product Service

5.5 Mbps



11 Mbps

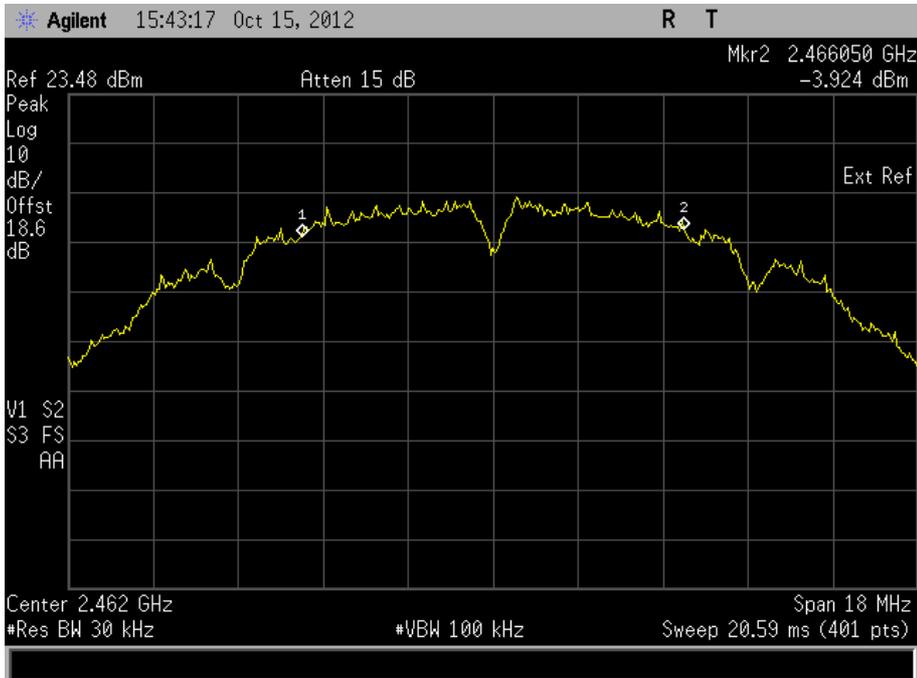




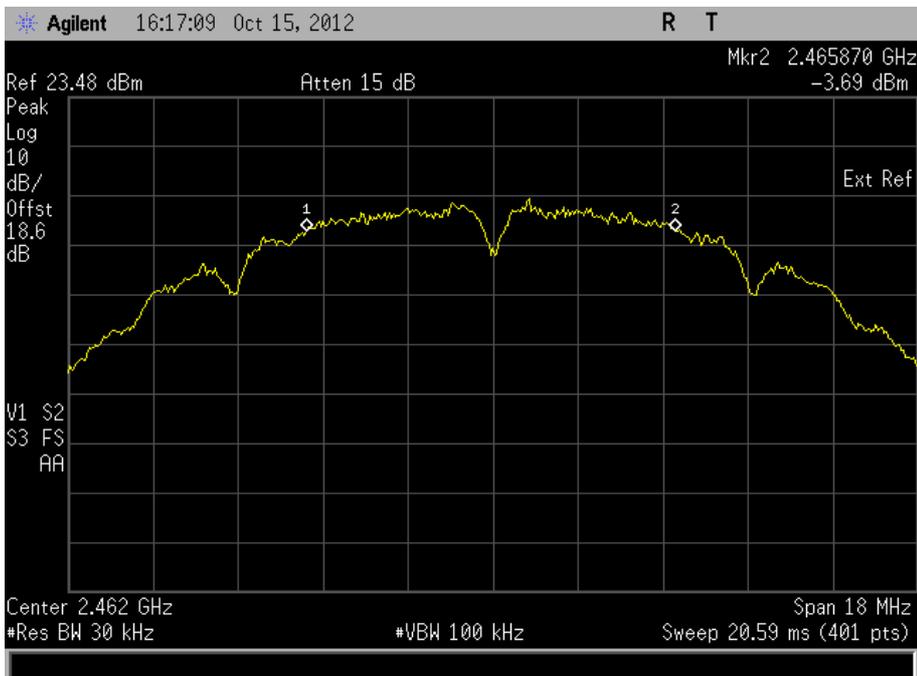
Product Service

2462 MHz

1 Mbps



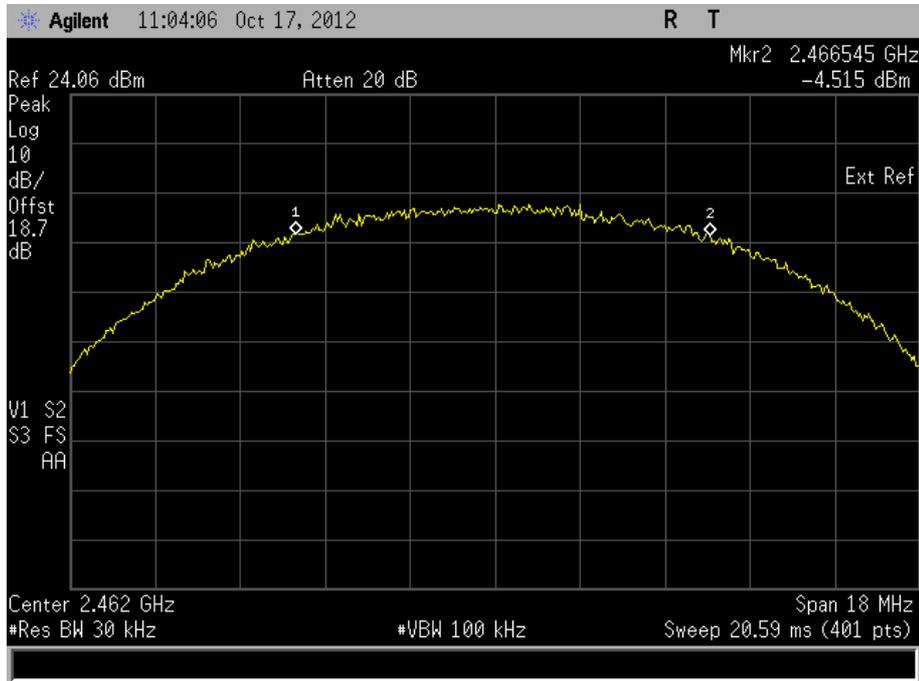
2 Mbps



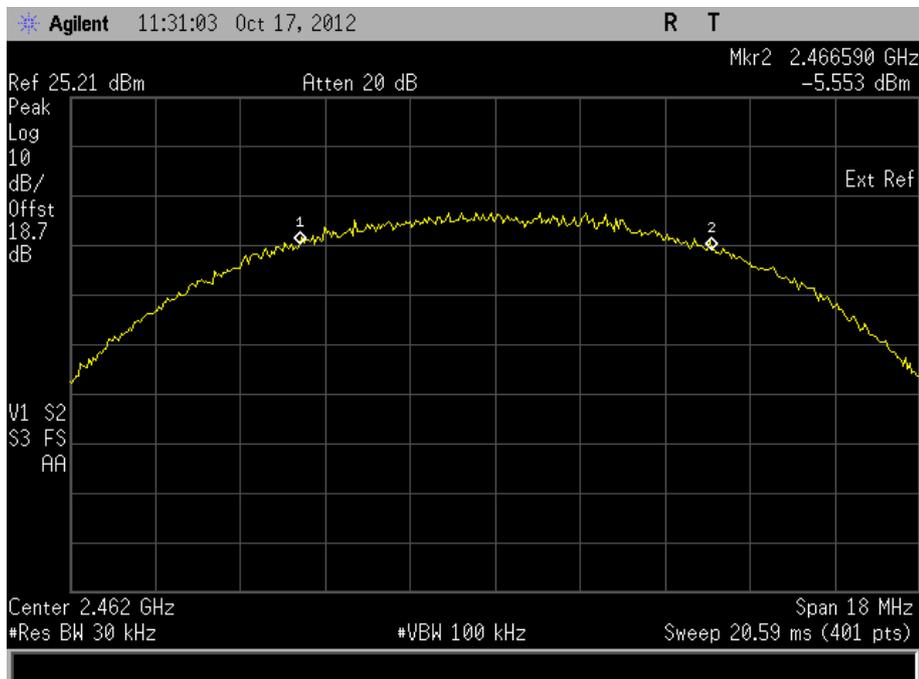


Product Service

5.5 Mbps



11 Mbps



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Product Service

Limit Clause

The minimum 6 dB Bandwidth shall be at least 500 kHz.

802.11(g)

4.0 V DC Supply

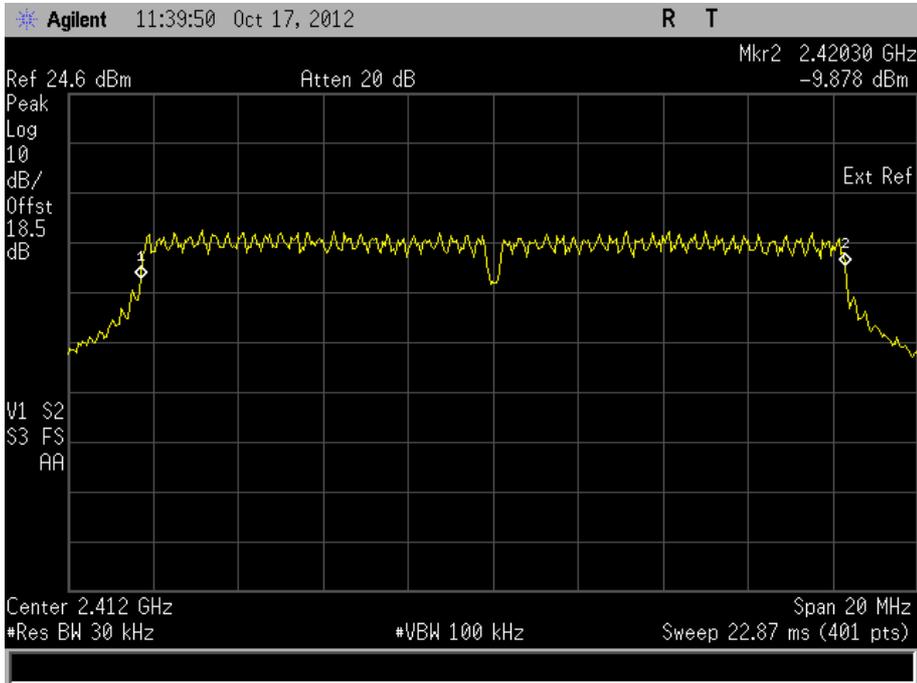
Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412 MHz	6	16.600
	9	16.600
	12	16.600
	18	16.600
	24	16.600
	36	16.600
	48	16.600
	54	16.600
2437 MHz	6	16.600
	9	16.600
	12	16.600
	18	16.600
	24	16.600
	36	16.600
	48	16.600
	54	16.600
2462 MHz	6	16.600
	9	16.600
	12	16.600
	18	16.600
	24	16.550
	36	16.600
	48	16.600
	54	16.600



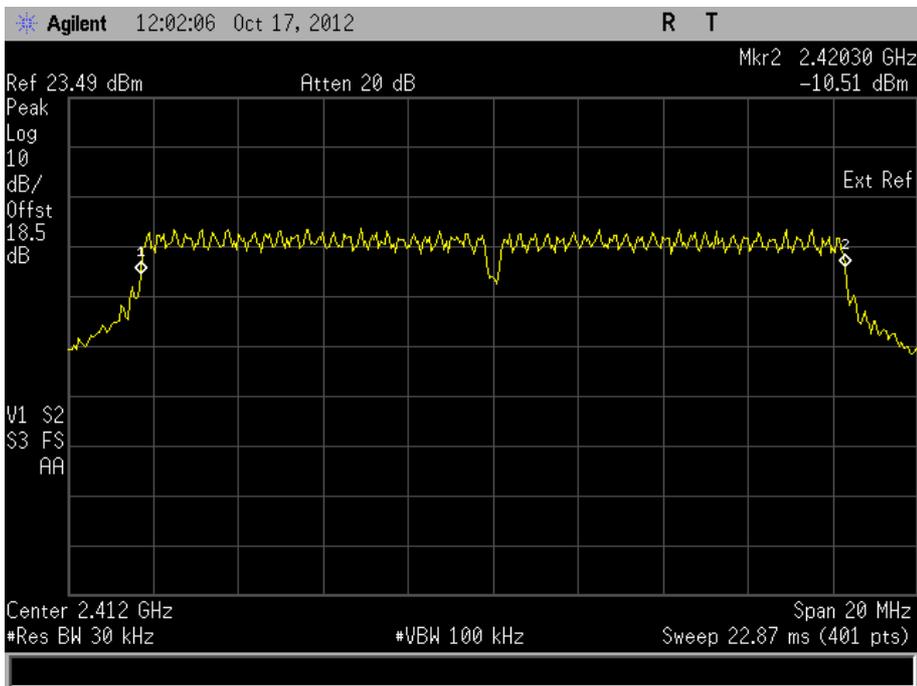
Product Service

2412 MHz

6 Mbps



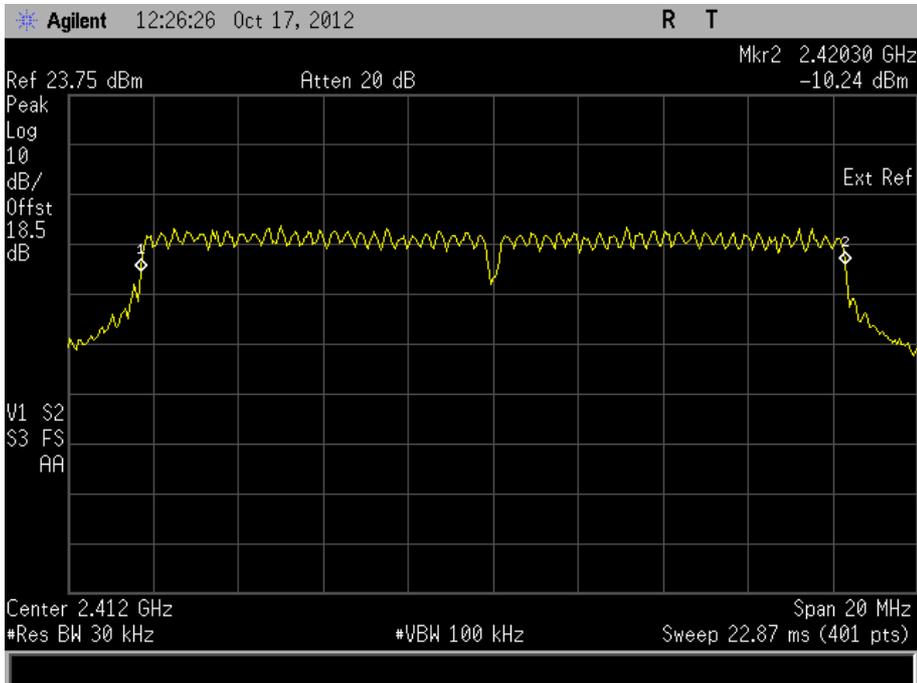
9 Mbps



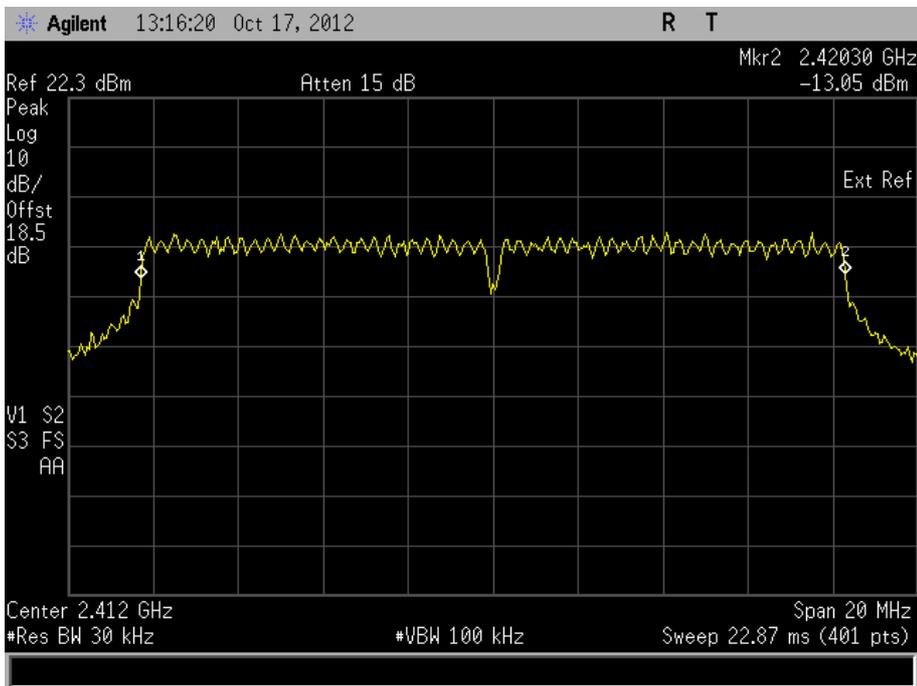


Product Service

12 Mbps



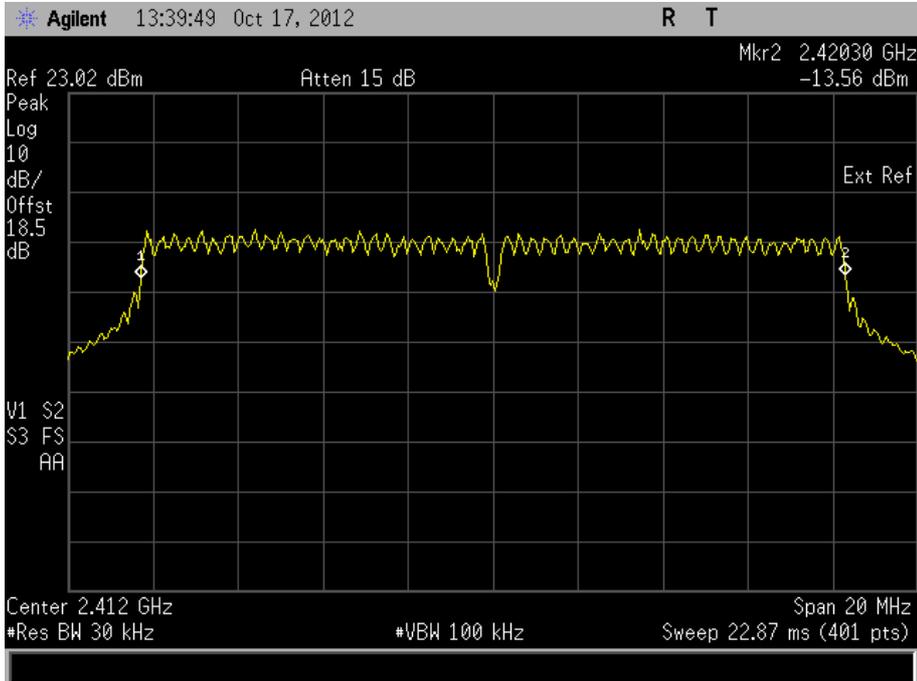
18 Mbps



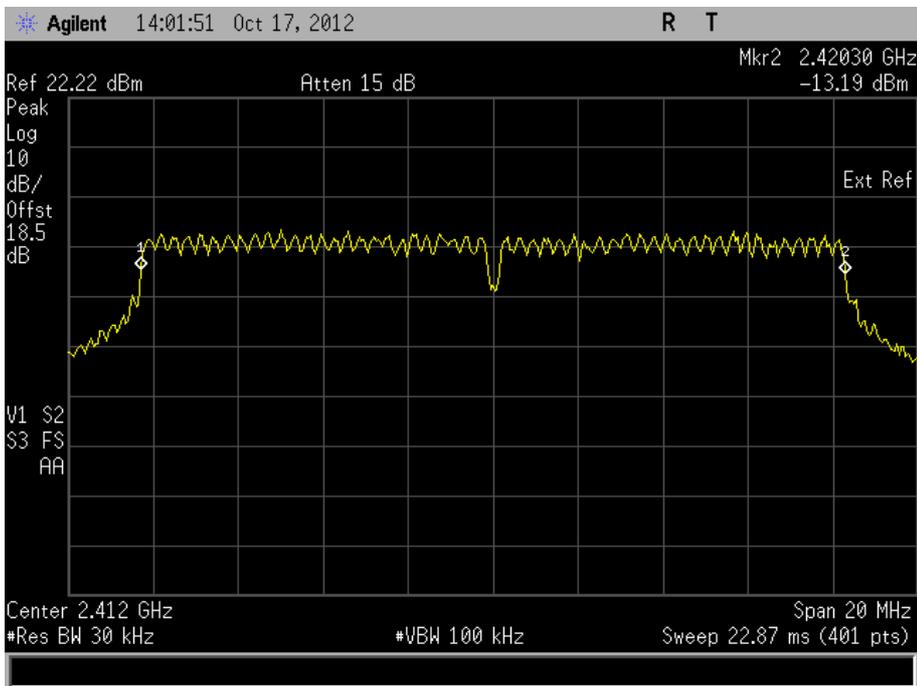


Product Service

24 Mbps



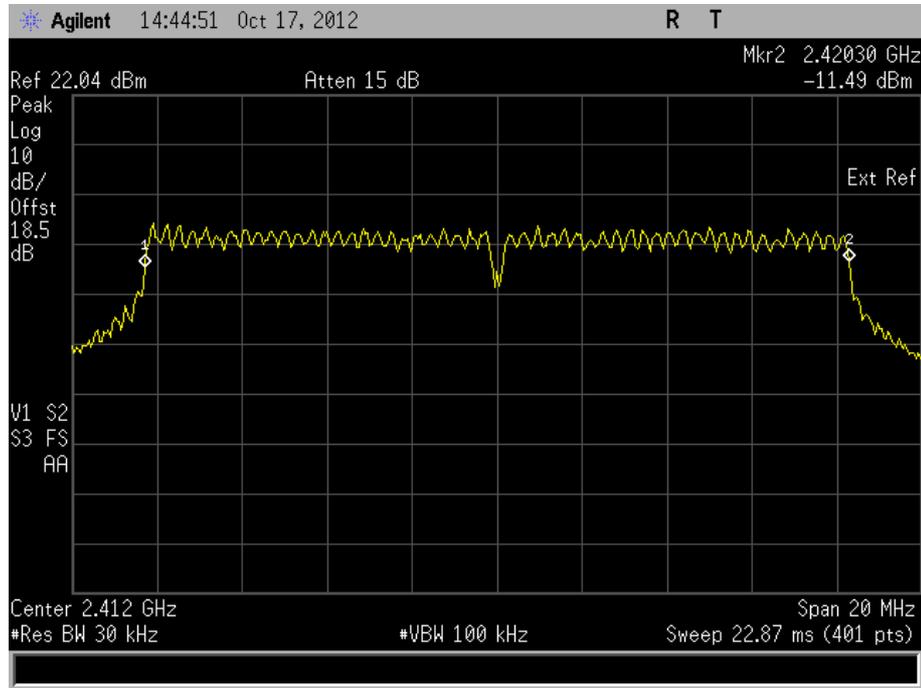
36 Mbps



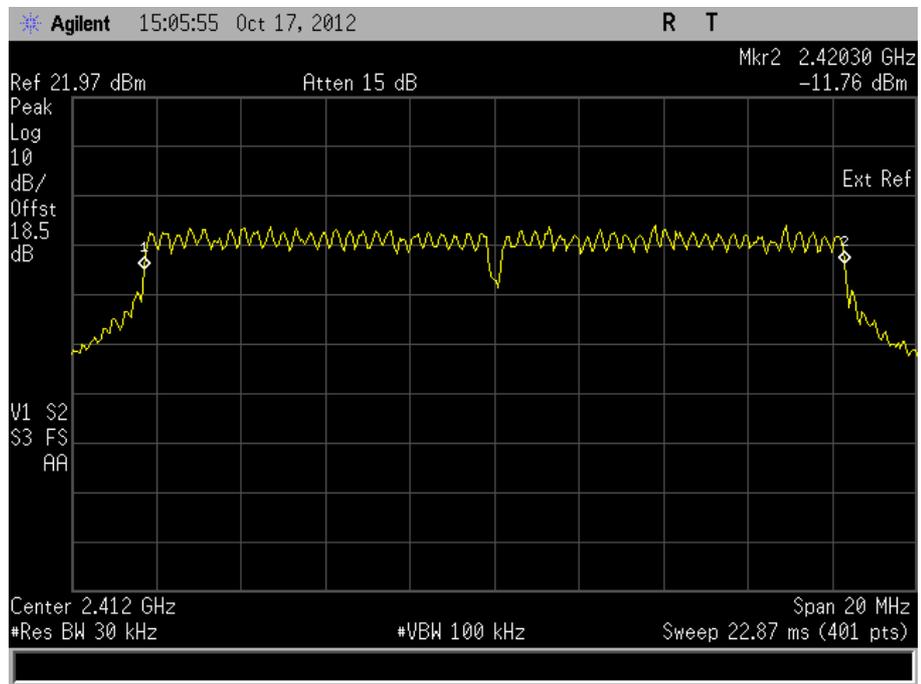


Product Service

48 Mbps



54 Mbps

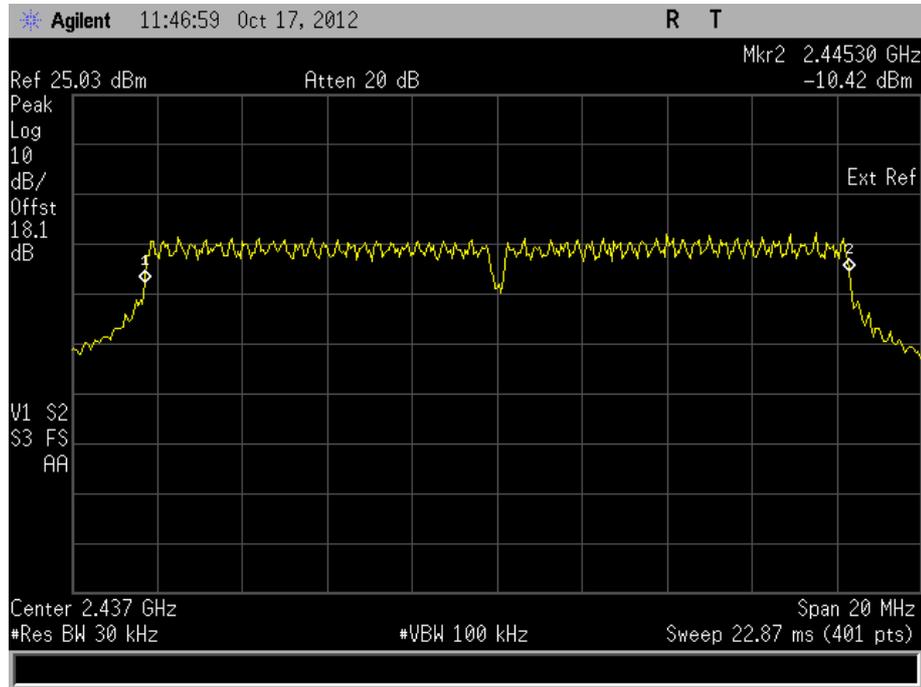




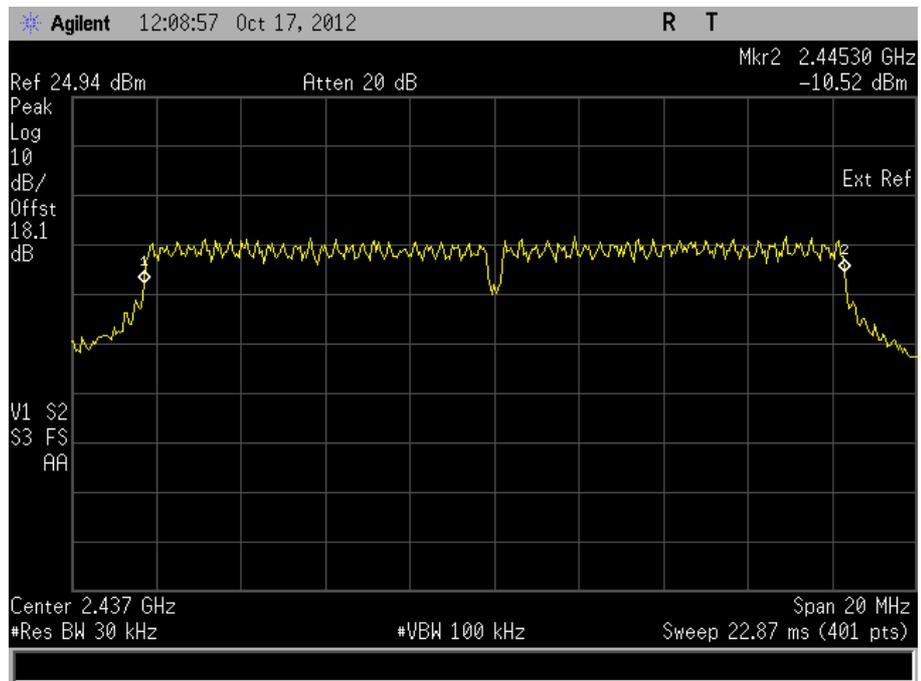
Product Service

2437 MHz

6 Mbps



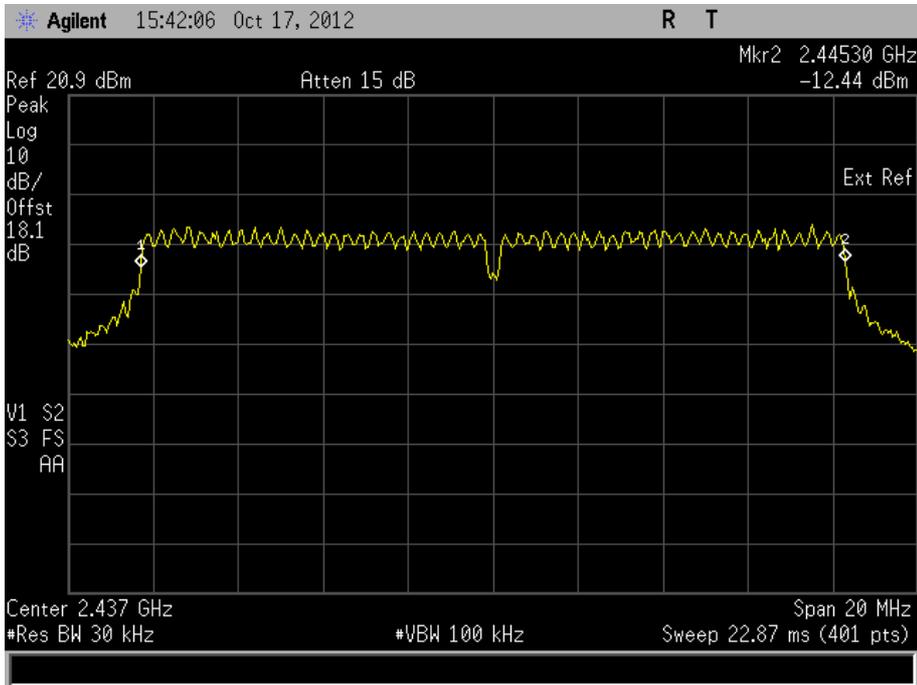
9 Mbps



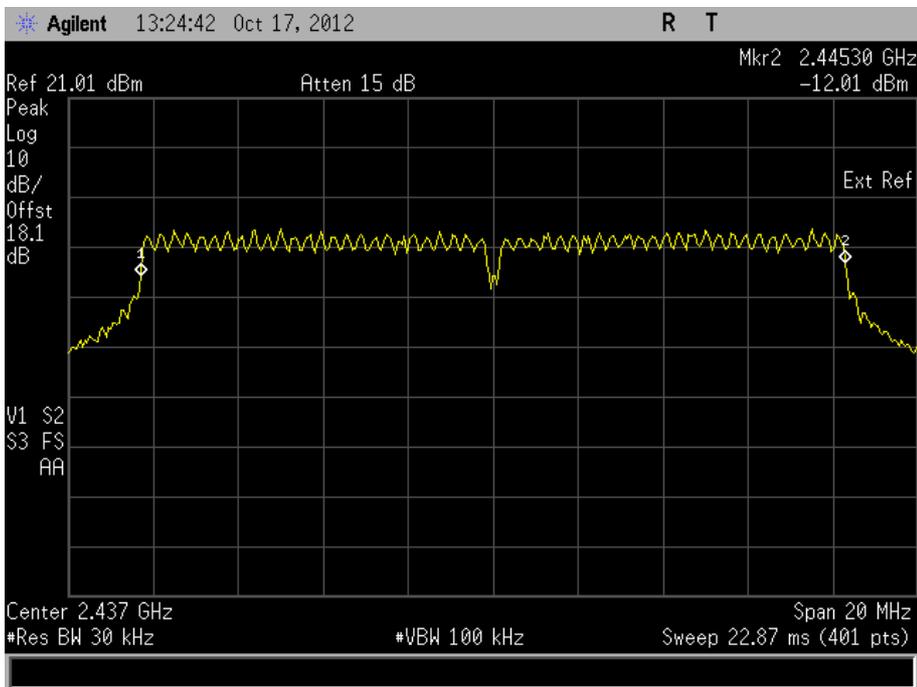


Product Service

12 Mbps



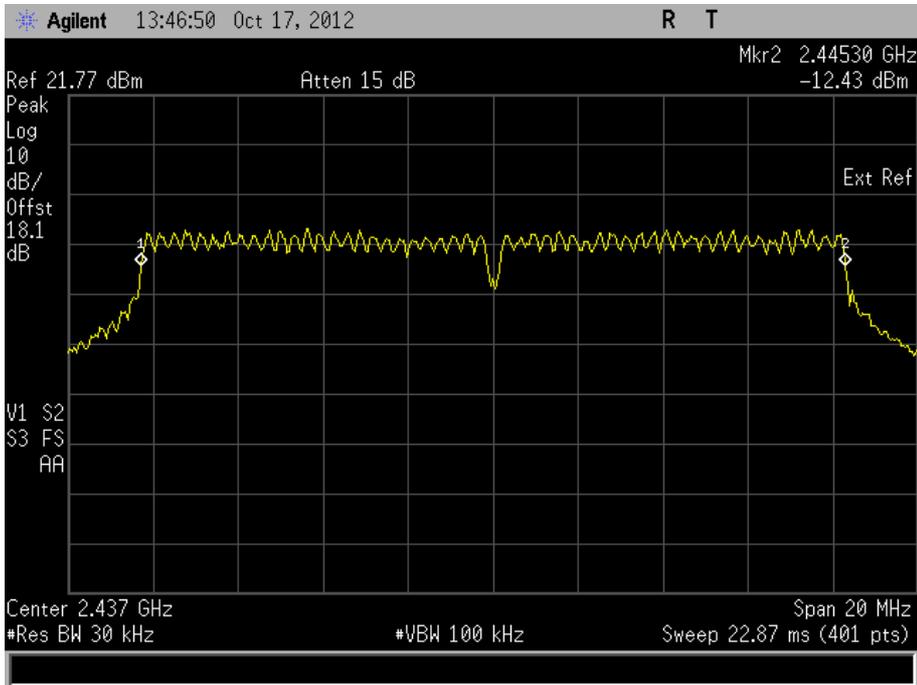
18 Mbps



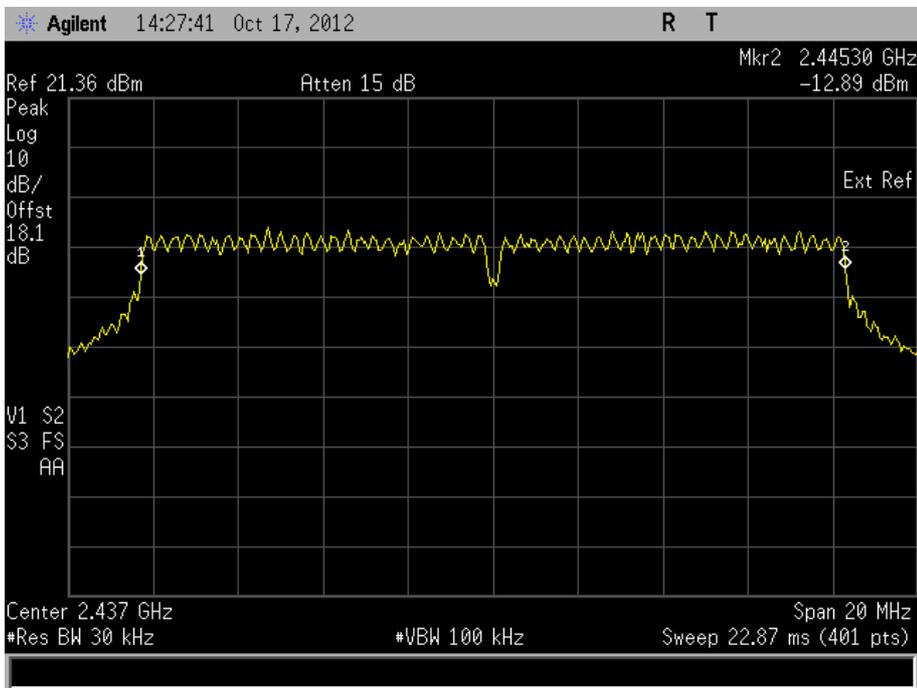


Product Service

24 Mbps



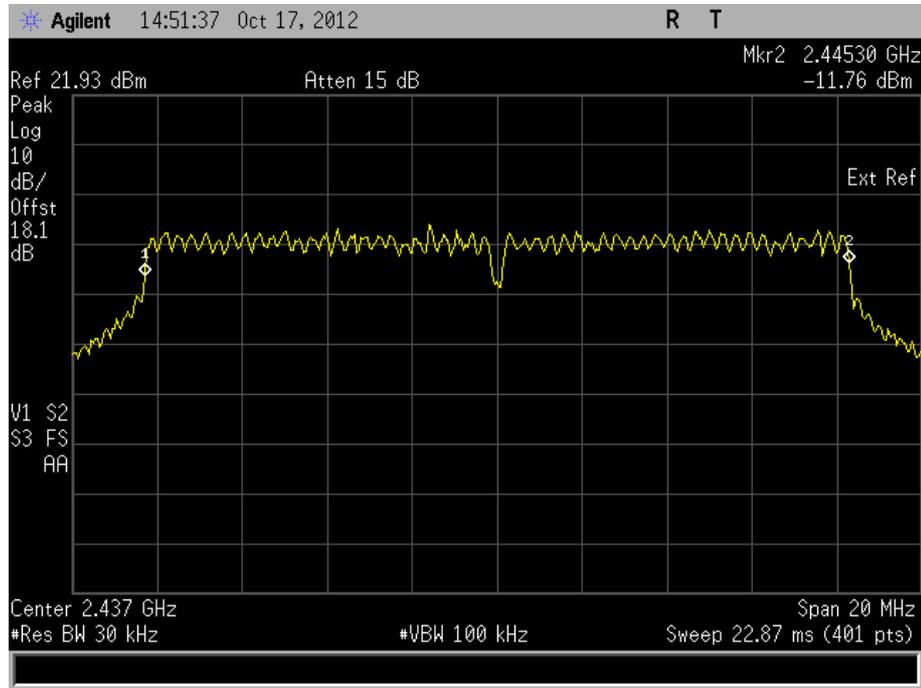
36 Mbps



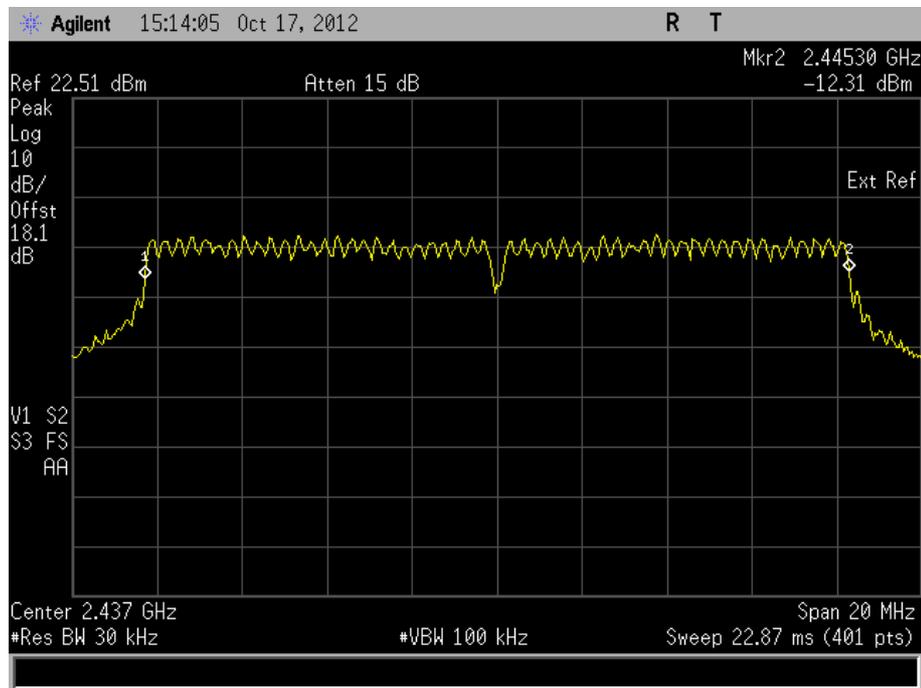


Product Service

48 Mbps



54 Mbps

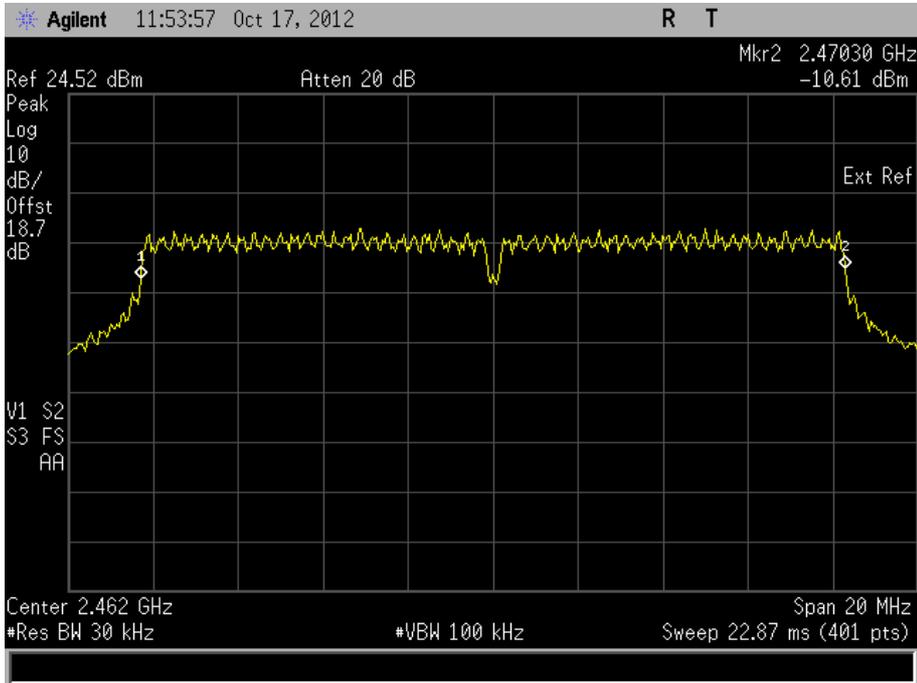




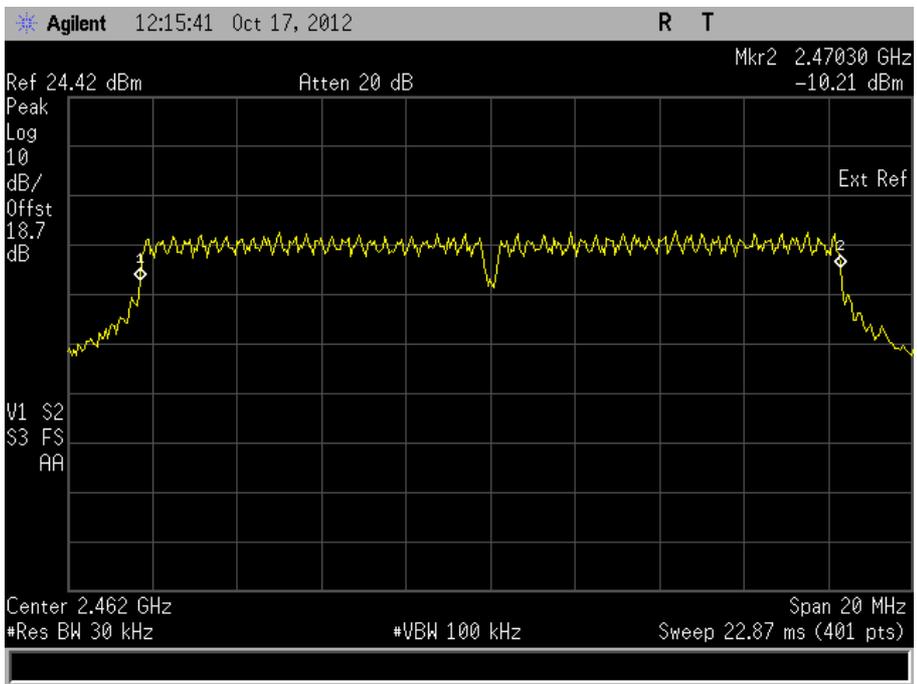
Product Service

2462 MHz

6 Mbps



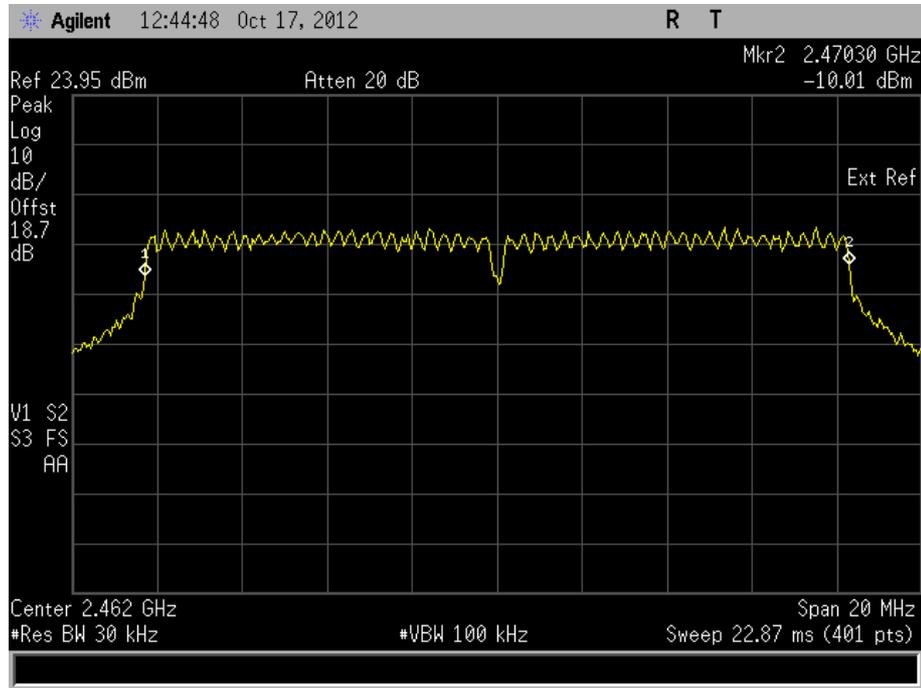
9 Mbps



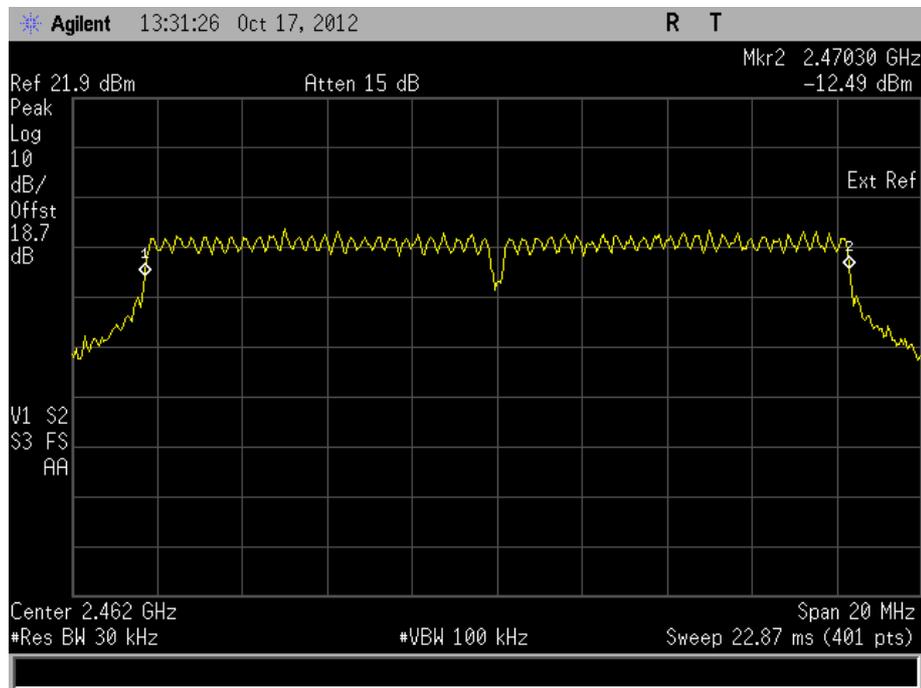


Product Service

12 Mbps



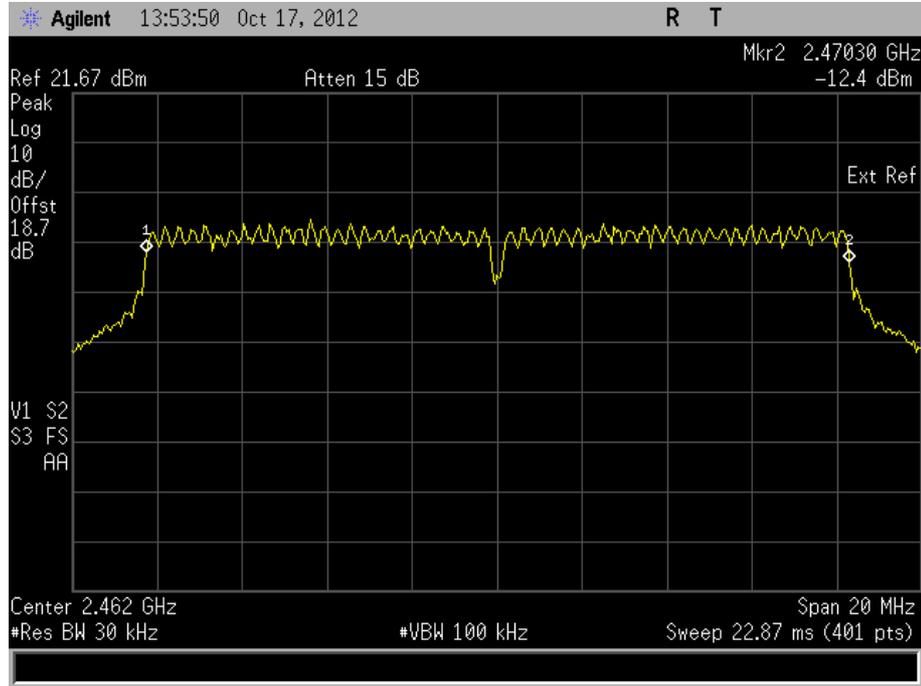
18 Mbps



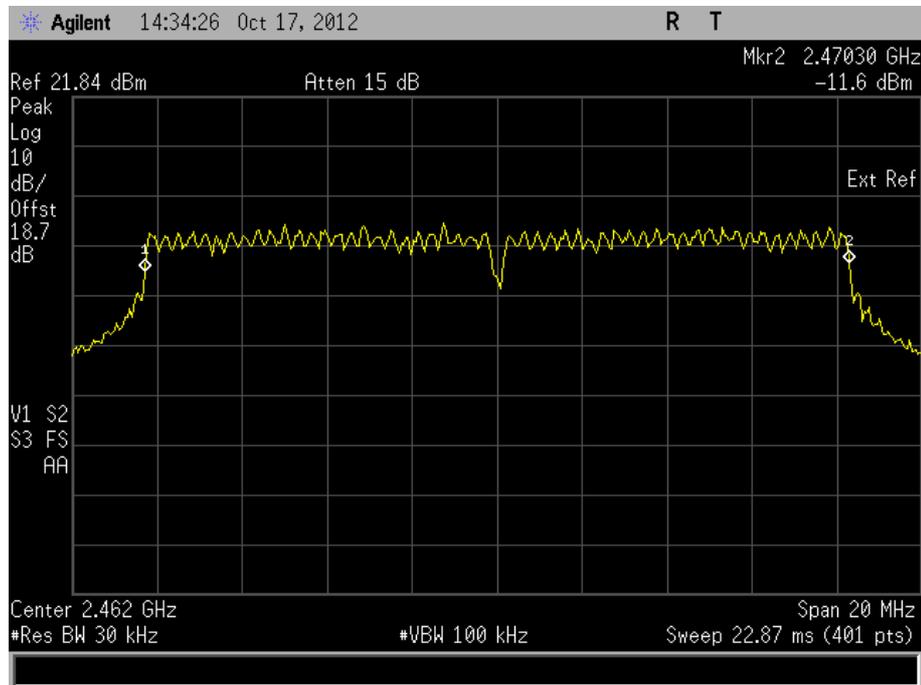


Product Service

24 Mbps



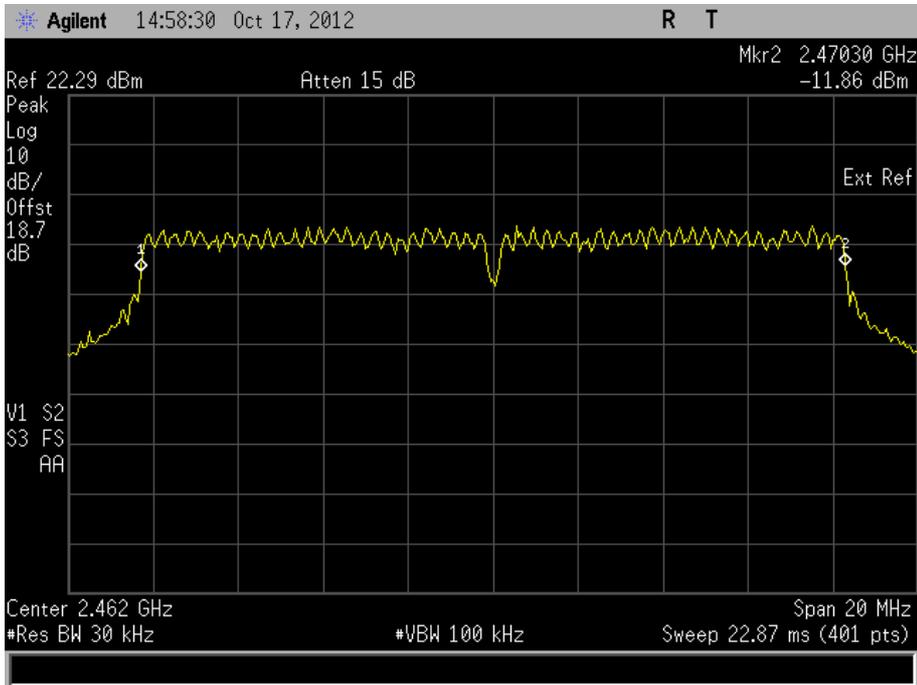
36 Mbps



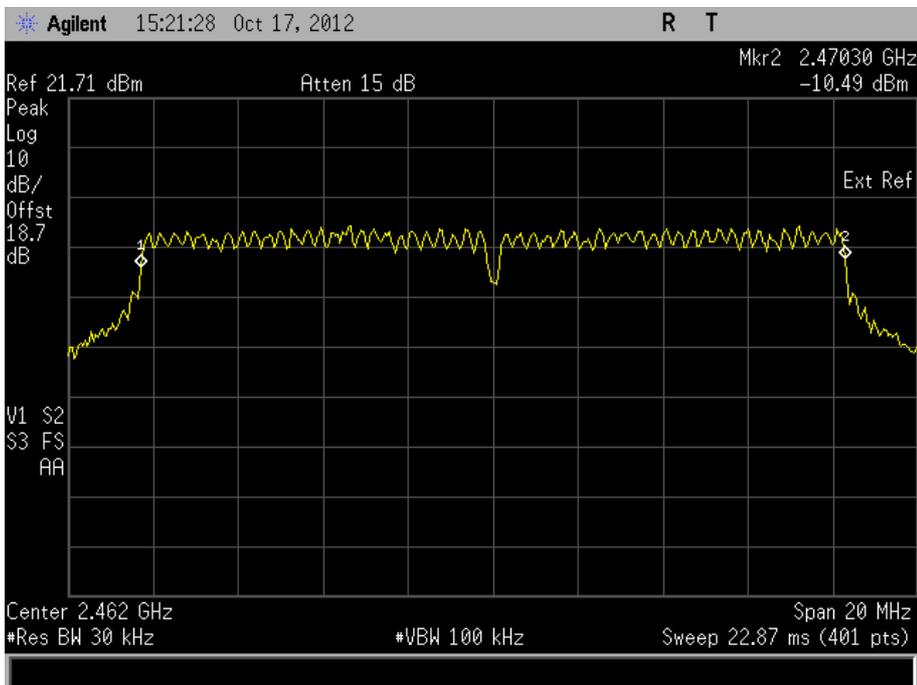


Product Service

48 Mbps



54 Mbps



These results have been performed on a different sample to the sample used for radiated measurements. The sample used for radiated measurements was reduced in output power to achieve compliance with the specification.

The sample used for this test was not reduced in output power but the test was not repeated because the result of this test would not be affected.



Product Service

Limit Clause

The minimum 6 dB Bandwidth shall be at least 500 kHz.

802.11(n)

4.0 V DC Supply

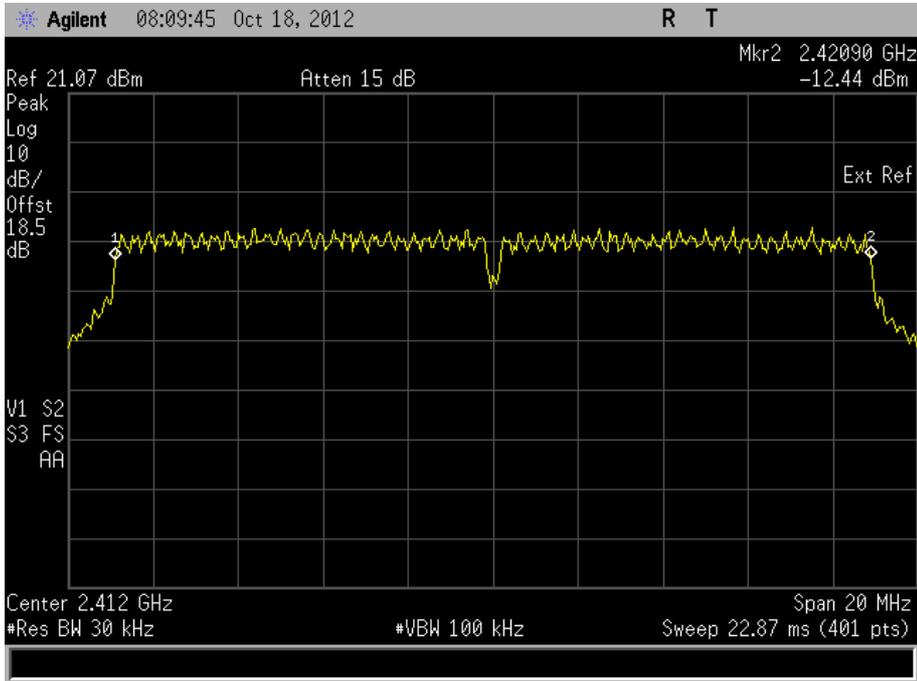
Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412 MHz	6.5	17.800
	13	17.800
	19.5	17.800
	26	17.800
	39	17.800
	52	17.800
	58.5	17.800
	65	17.800
2437 MHz	6.5	17.850
	13	17.800
	19.5	17.850
	26	17.850
	39	17.800
	52	17.800
	58.5	17.850
	65	17.850
2462 MHz	6.5	17.800
	13	17.800
	19.5	17.800
	26	17.800
	39	17.800
	52	17.750
	58.5	17.850
	65	17.850



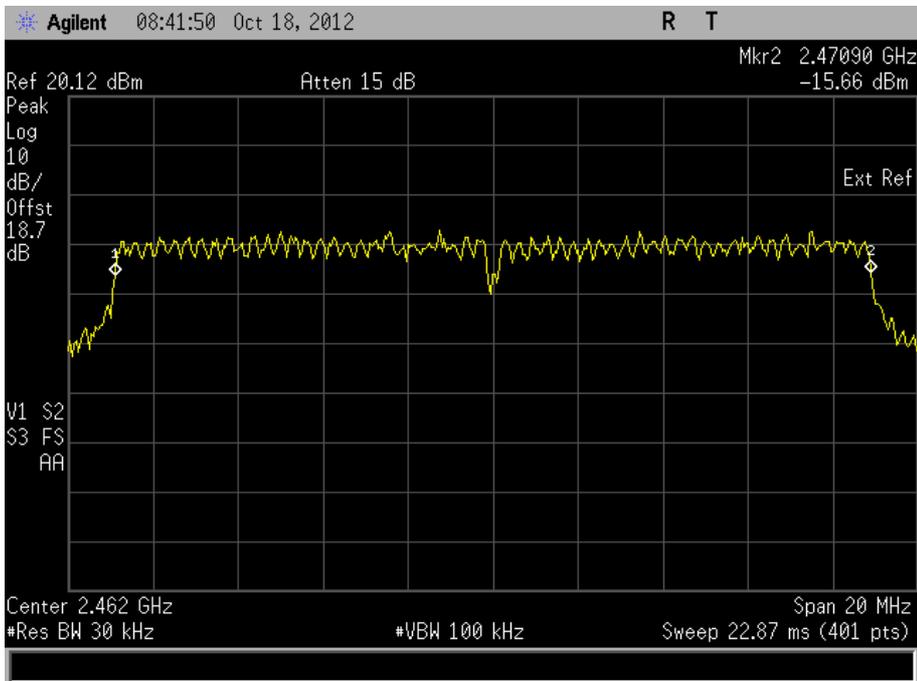
Product Service

2412 MHz

6.5 Mbps



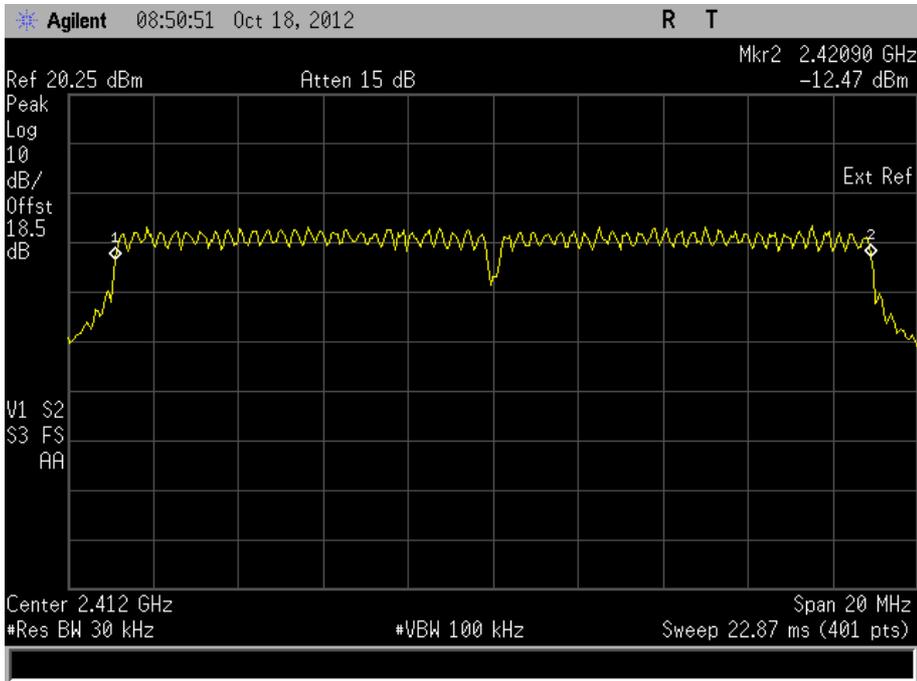
13 Mbps



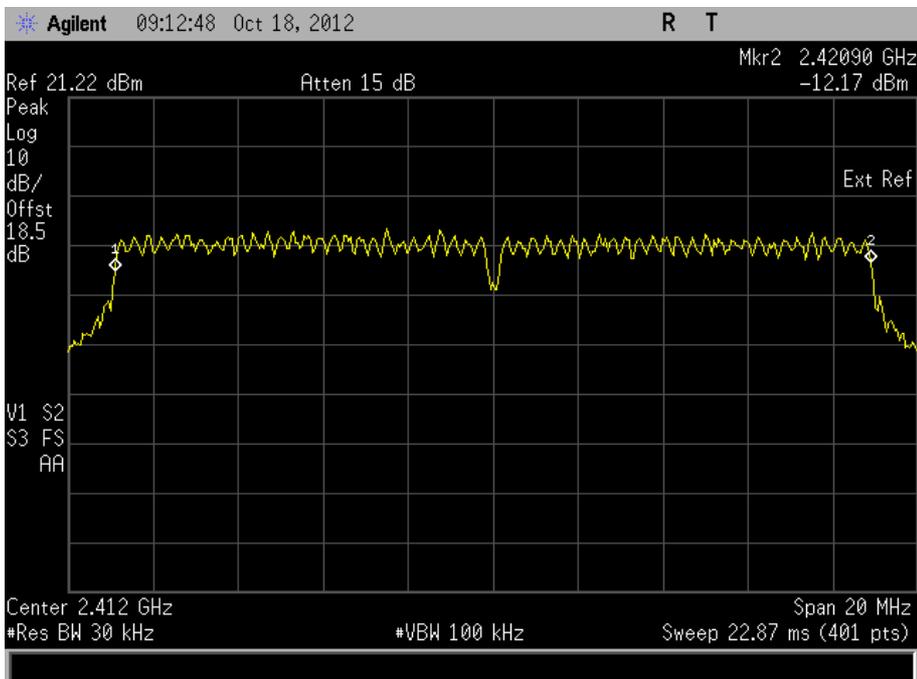


Product Service

19.5 Mbps



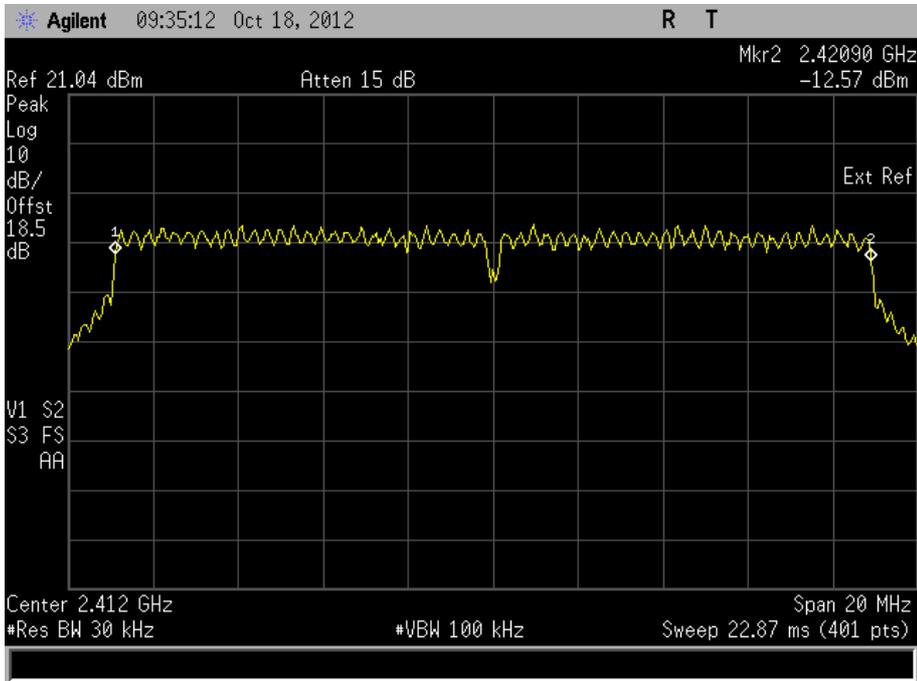
26 Mbps



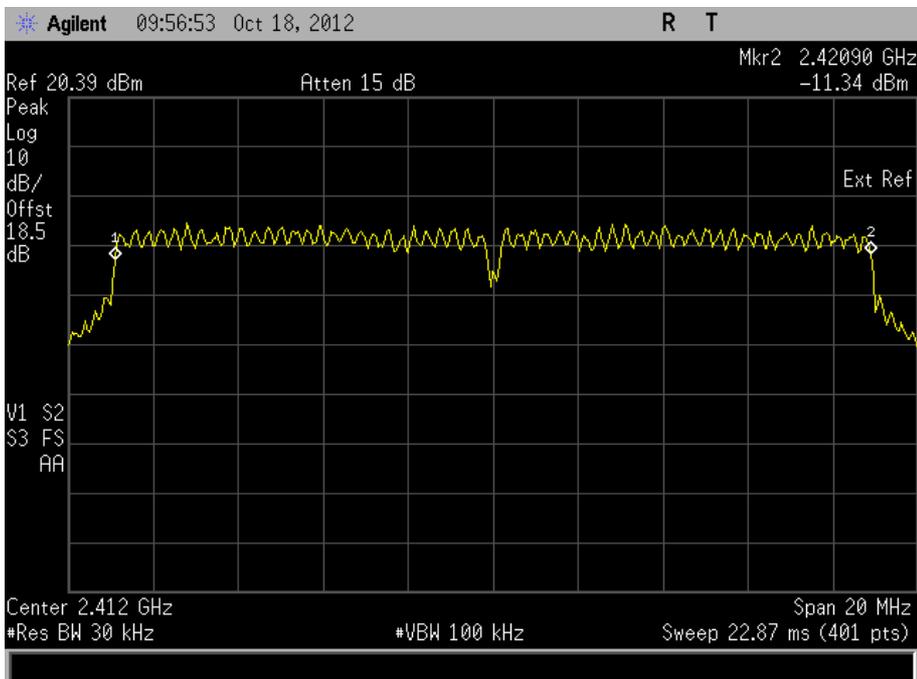


Product Service

39 Mbps



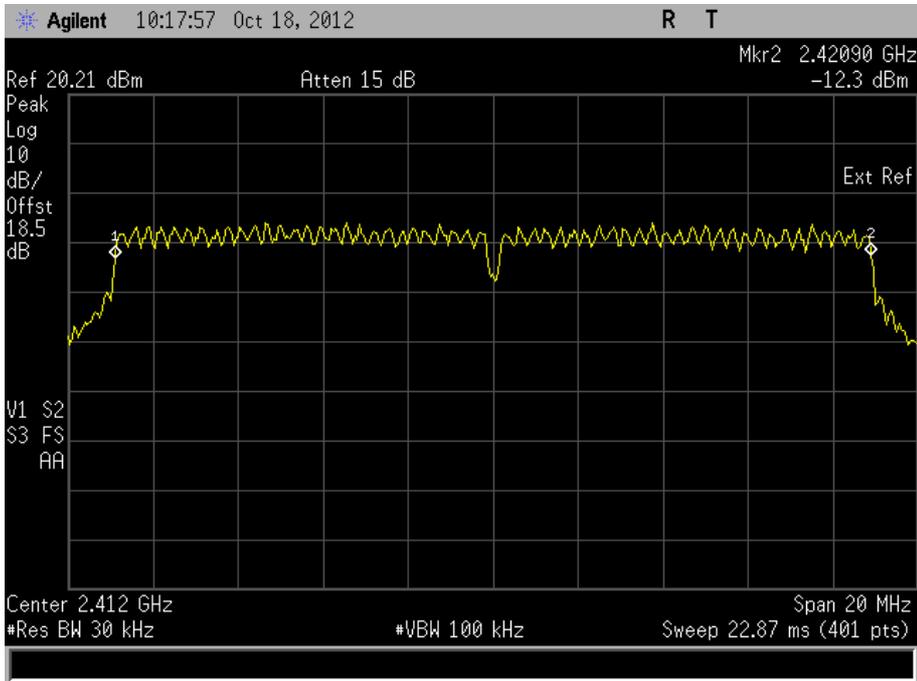
52 Mbps



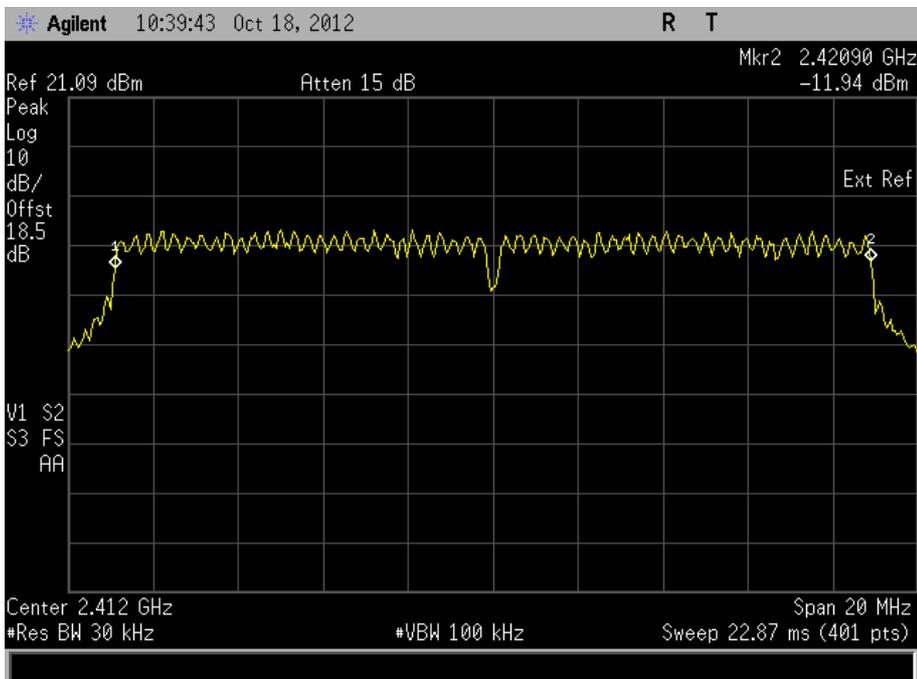


Product Service

58.5 Mbps



65 Mbps

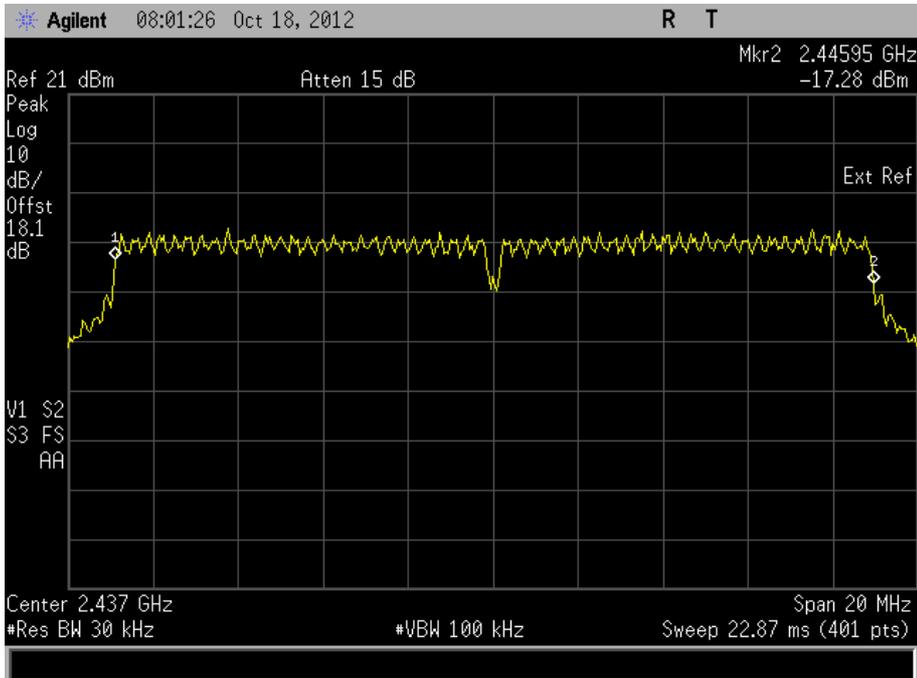




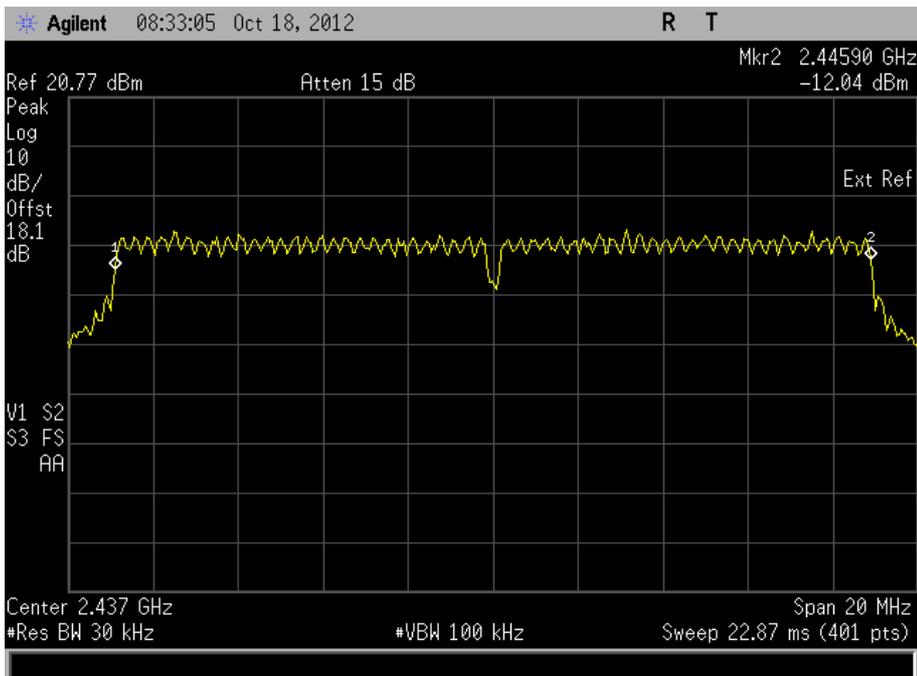
Product Service

2437 MHz

6.5 Mbps



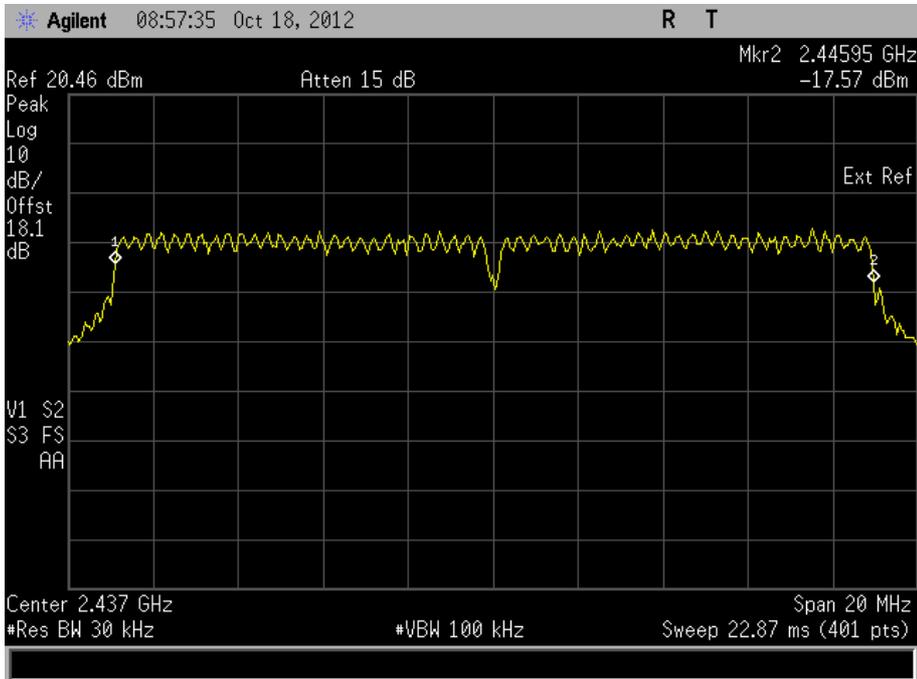
13 Mbps



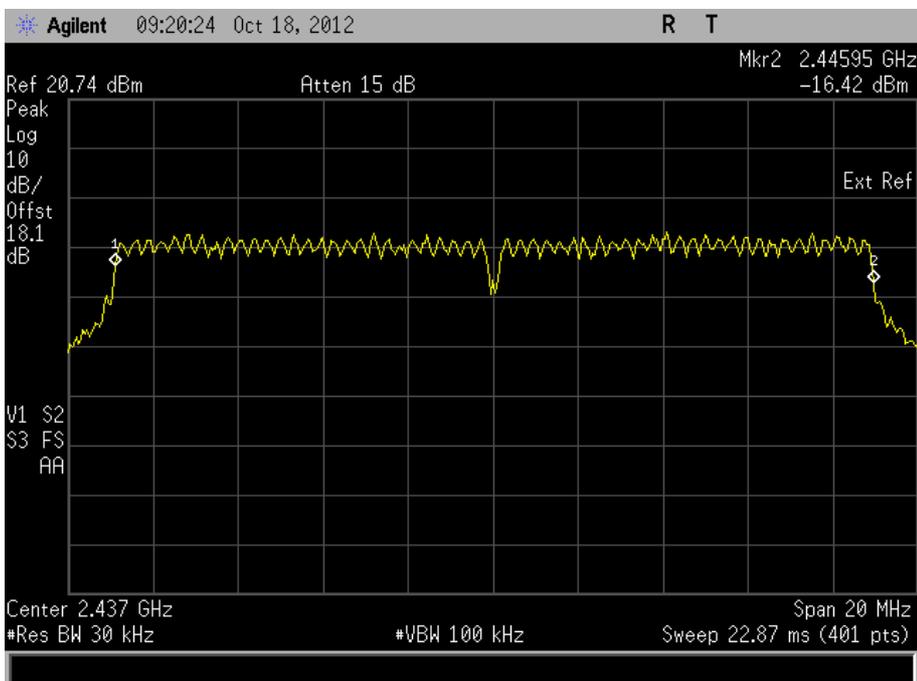


Product Service

19.5 Mbps



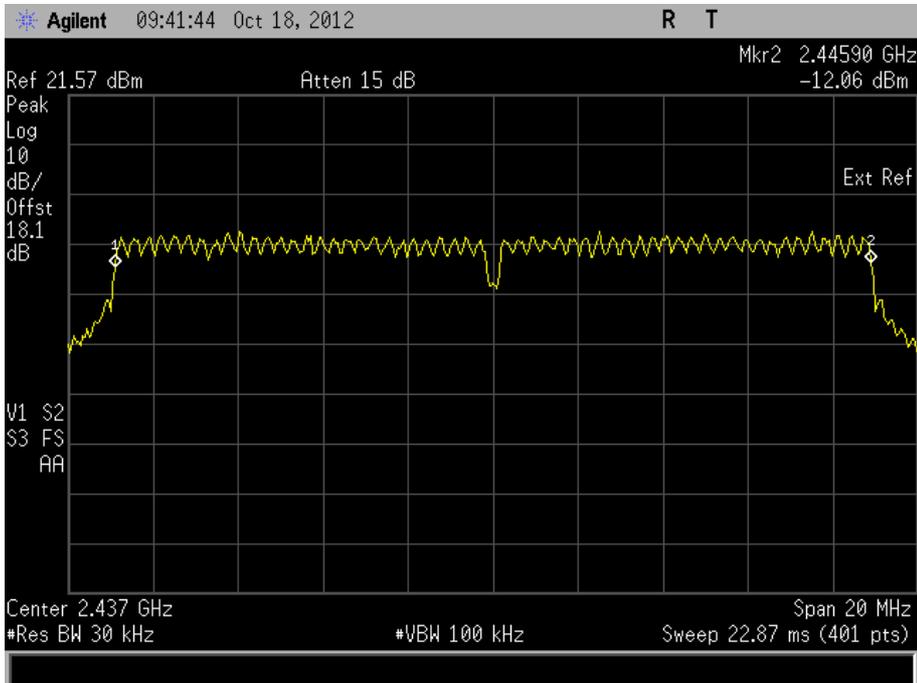
26 Mbps



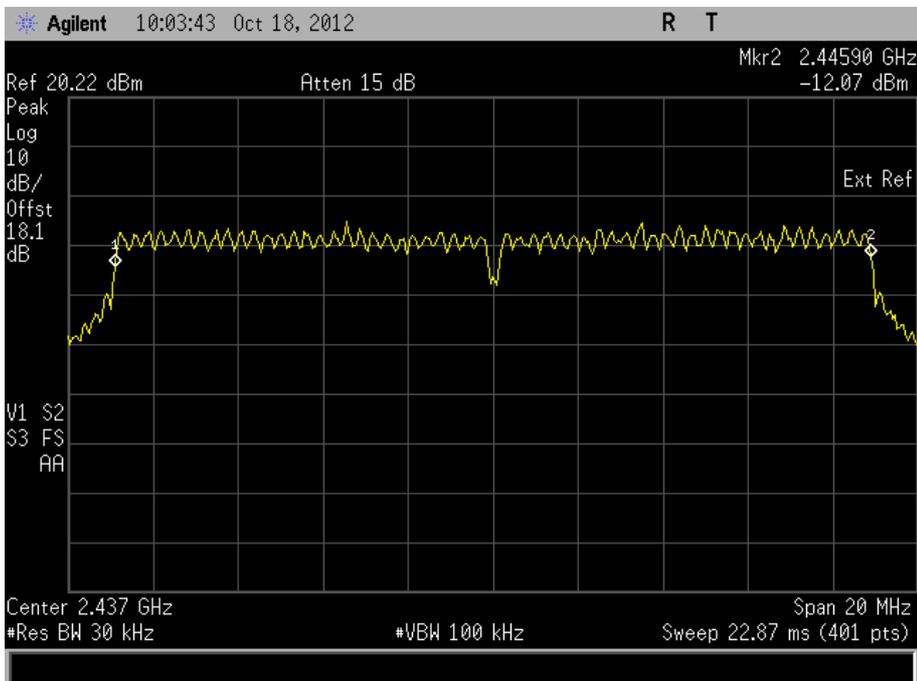


Product Service

39 Mbps



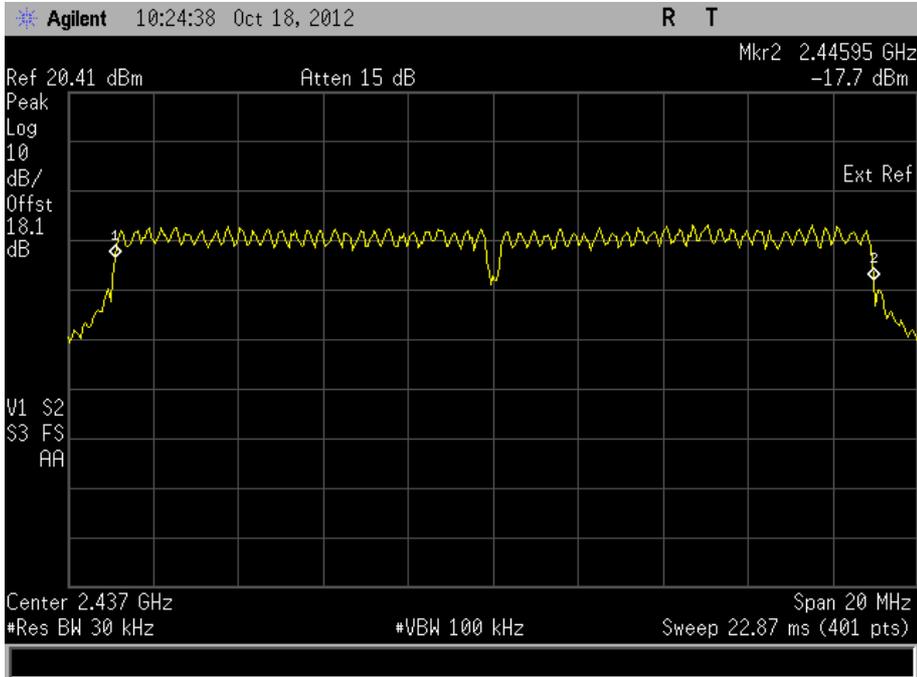
52 Mbps



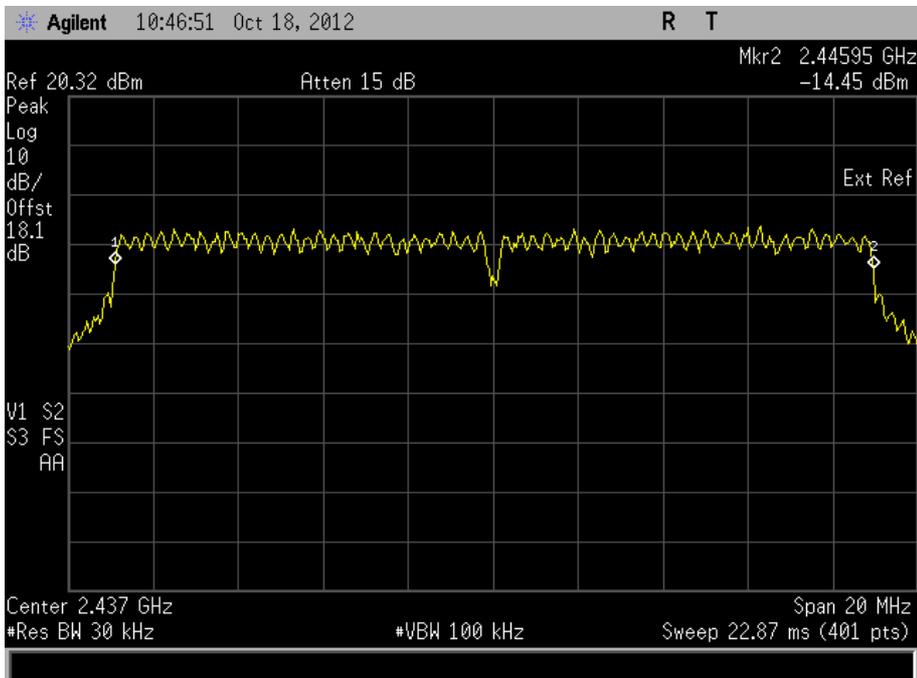


Product Service

58.5 Mbps



65 Mbps

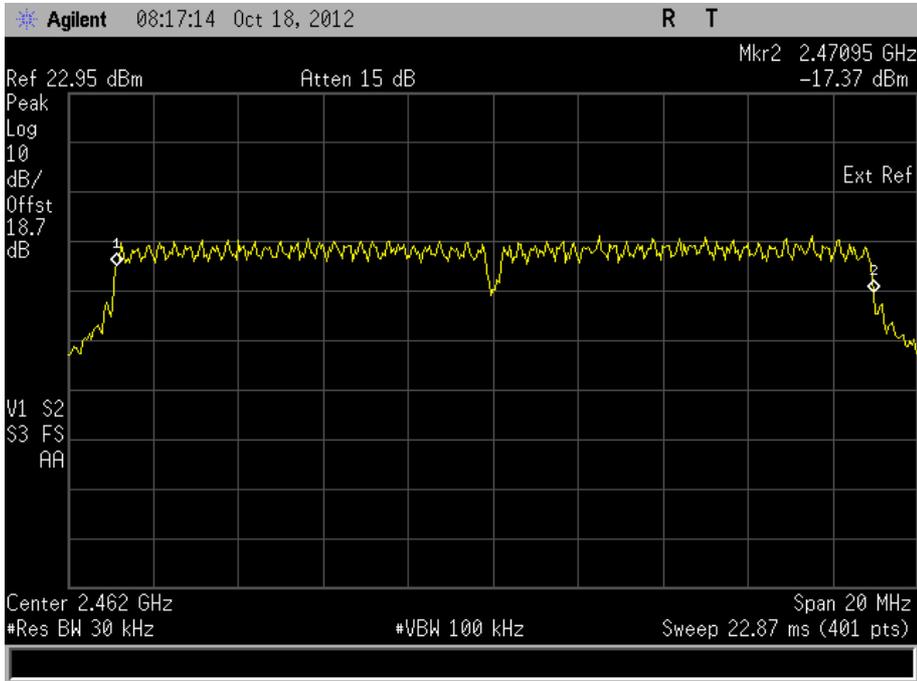




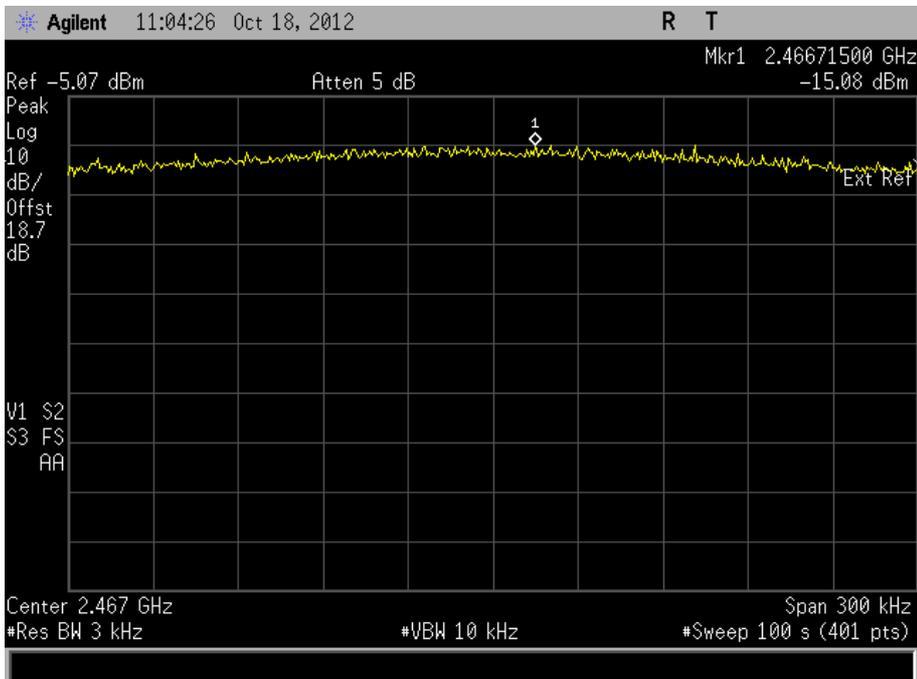
Product Service

2462 MHz

6.5 Mbps



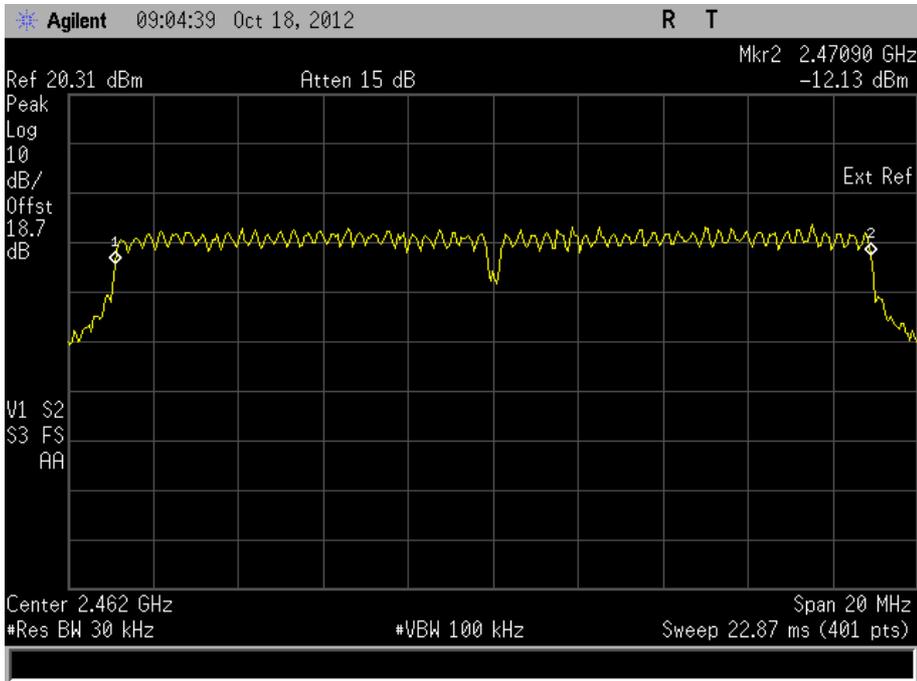
13 Mbps



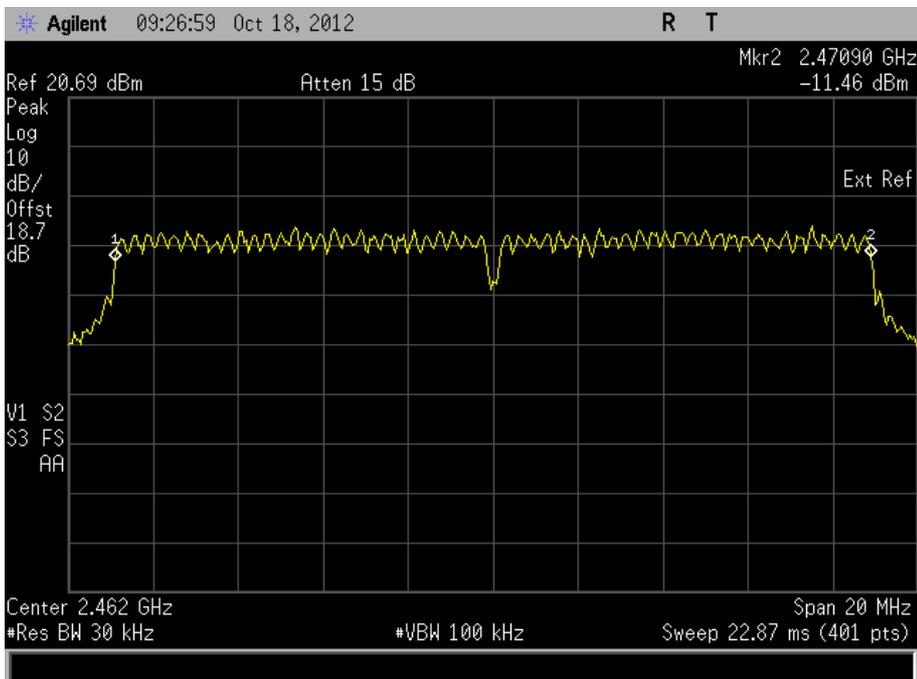


Product Service

19.5 Mbps



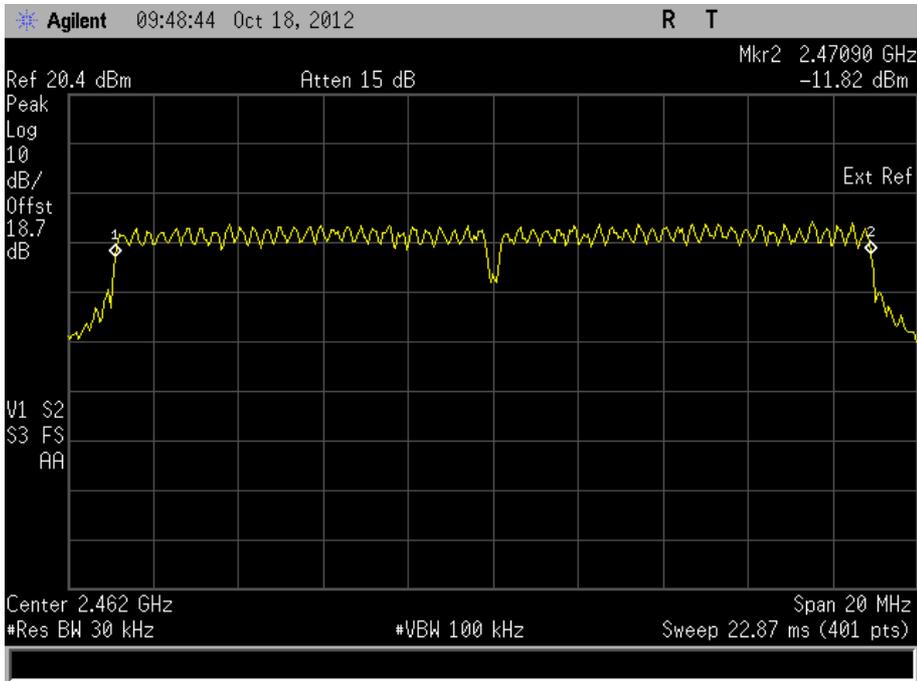
26 Mbps



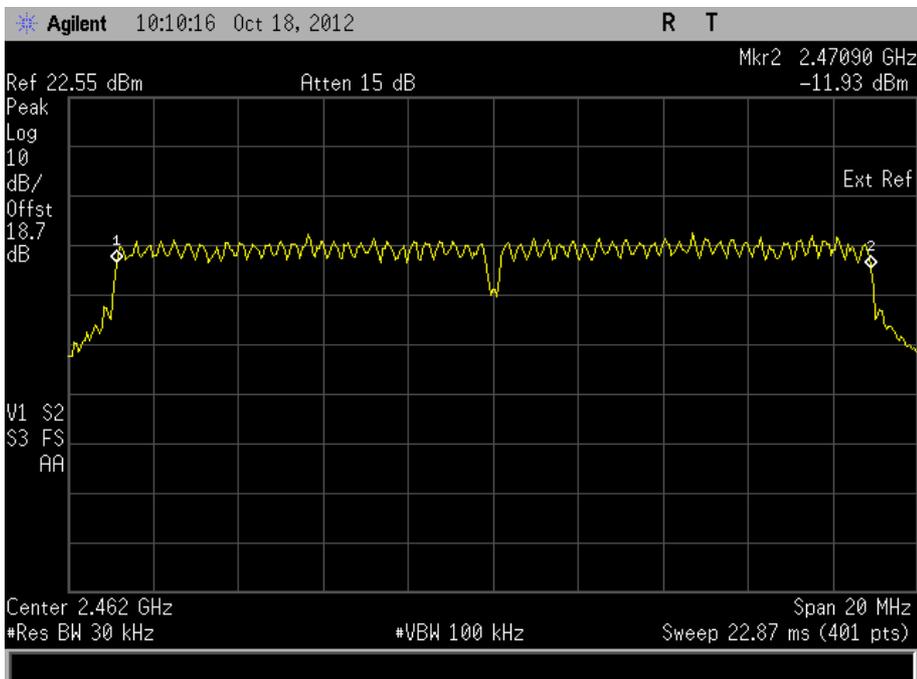


Product Service

39 Mbps



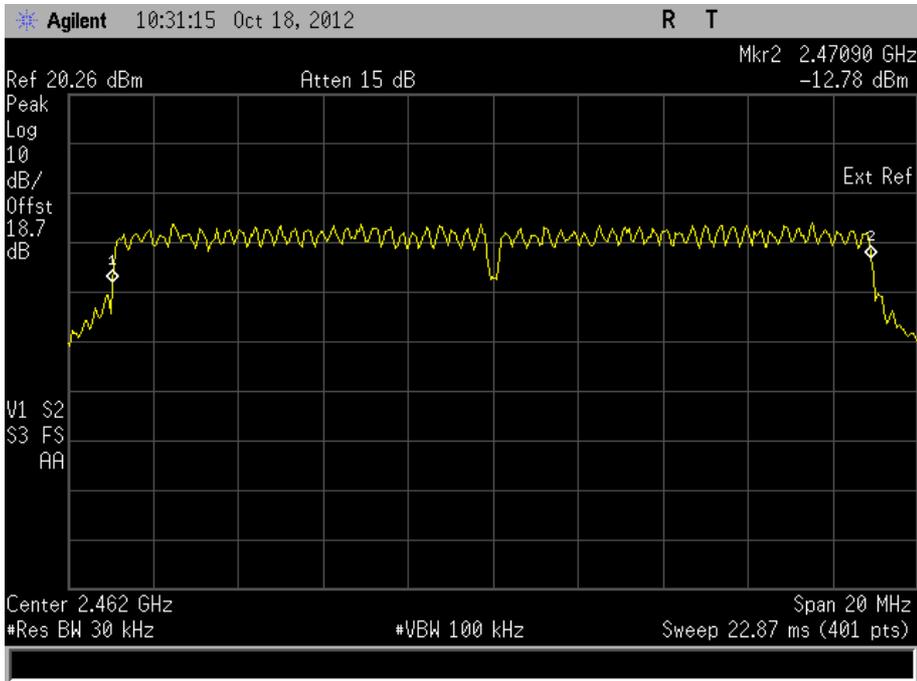
52 Mbps



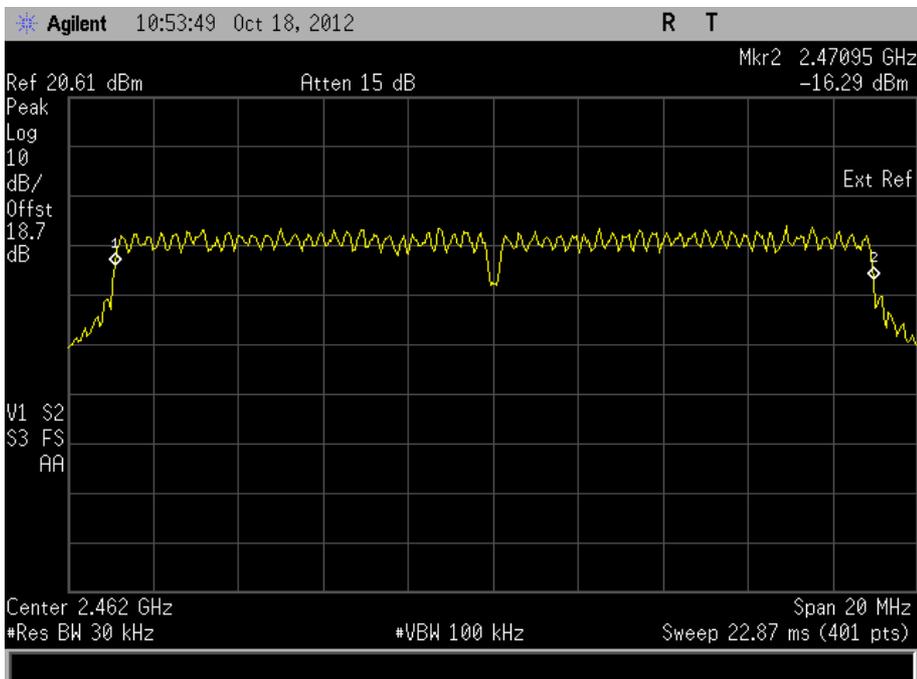


Product Service

58.5 Mbps



65 Mbps



Limit Clause

The minimum 6 dB Bandwidth shall be at least 500 kHz.



Product Service

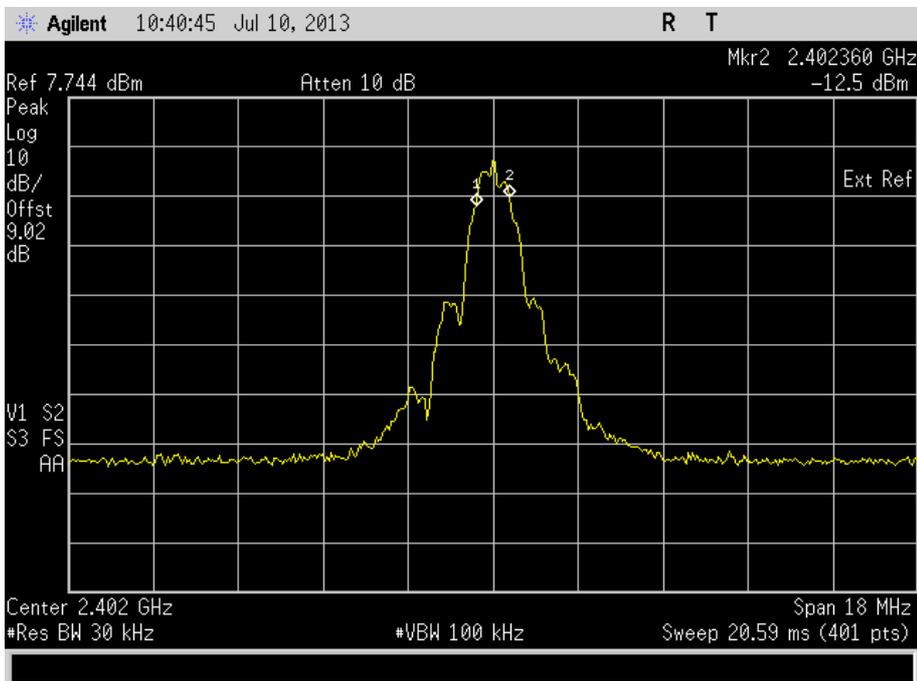
Bluetooth Low Energy

4.0 V DC Supply

Frequency (MHz)	Packet Type	6dB Bandwidth (kHz)
2402 MHz	37 oct/prbs9	720
2441 MHz	37 oct/prbs9	720
2480 MHz	37 oct/prbs9	720

2402 MHz

37 oct/prbs9

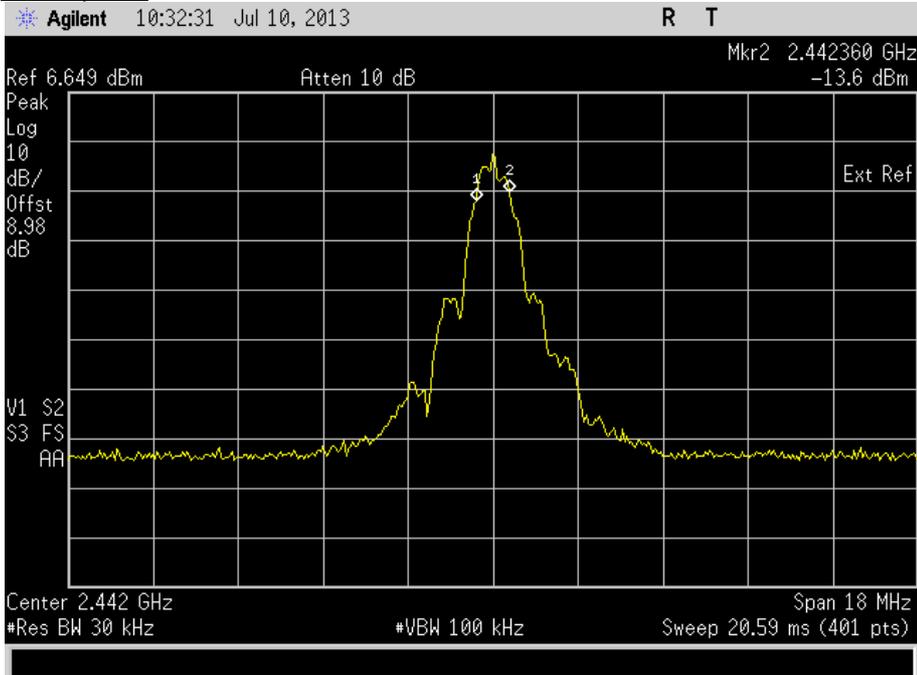




Product Service

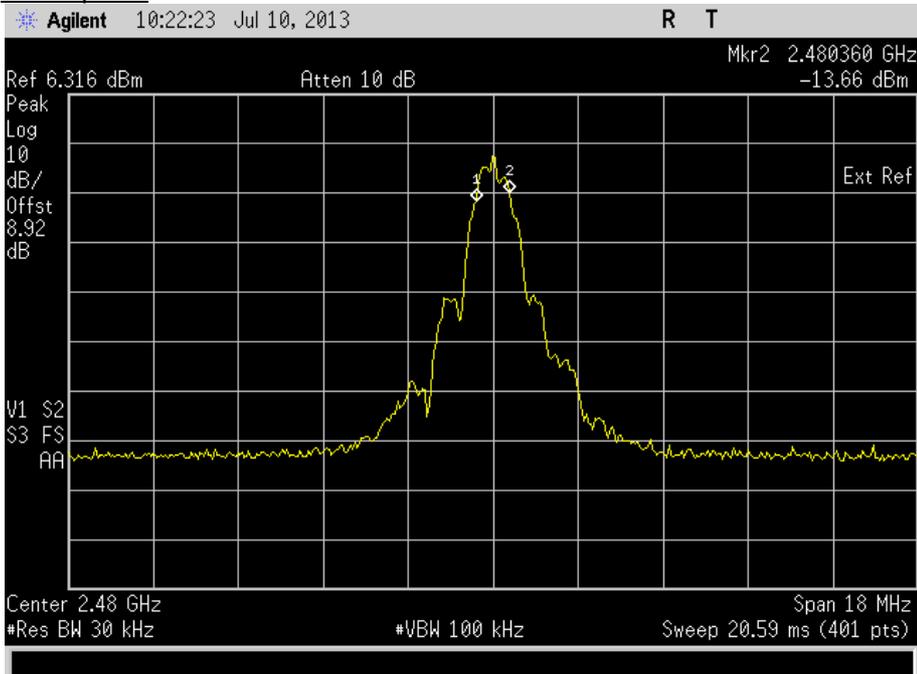
2441 MHz

37 oct/prbs9



2480 MHz

37 oct/prbs9



Limit Clause

The minimum 6 dB Bandwidth shall be at least 500 kHz.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1- AC Line Conducted Emissions					
LISN (1 Phase)	Chase	MN 2050	336	12	23-Mar-2013
Transient Limiter	Hewlett Packard	11947A	1032	12	28-Jun-2013
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	11-Oct-2013
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
Section 2.2 - Maximum Peak Conducted Output Power					
Multimeter	Fluke	79 Series III	411	12	25-Jul-2013
Broadband Resistive Power Divider	Weinschel	1506A	601	12	2-Dec-2012
Power Supply Unit	Farnell	D302T	609	-	O/P Mon
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jul-2013
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	23-Jul-2013
Multimeter	Iso-tech	IDM101	2424	12	10-Sep-2013
Power Supply	Iso-tech	IPS 2010	2439	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	13-Jun-2013
Power Divider (N) 1W	Weinschel	1506A	3344	12	28-Jun-2014
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	19-Nov-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	31-Aug-2013
P-Series Power Meter	Agilent	N1911A	3981	12	17-Sep-2013
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3982	12	17-Sep-2013
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	17-Sep-2013
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4105	12	25-Oct-2013



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 - EIRP Peak Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Multimeter	Fluke	79 Series III	411	12	25-Jul-2013
Broadband Resistive Power Divider	Weinschel	1506A	601	12	2-Dec-2012
Power Supply Unit	Farnell	D302T	609	-	O/P Mon
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jul-2013
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	23-Jul-2013
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM101	2424	12	10-Sep-2013
Power Supply	Iso-tech	IPS 2010	2439	-	O/P Mon
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	24-May-2013
Hygrometer	Rotronic	I-1000	3220	12	13-Jun-2013
Power Divider (N) 1W	Weinschel	1506A	3344	12	28-Jun-2014
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	19-Nov-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	11-Oct-2013
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	31-Aug-2013
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
P-Series Power Meter	Agilent	N1911A	3981	12	17-Sep-2013
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3982	12	17-Sep-2013
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	17-Sep-2013
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4105	12	25-Oct-2013
Section 2.4 - Spurious and Band Edge Emissions					
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	13-Sep-2013
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	20-Feb-2013
Pre-Amplifier	Phase One	PS04-0086	1533	12	27-Sep-2013
Pre-Amplifier	Phase One	PSO4-0087	1534	12	28-Sep-2013
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Test Receiver	Rohde & Schwarz	ESIB40	1934	12	10-Dec-2012
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	11-Oct-2013
3 GHz High Pass Filter	K&L Microwave	11SH10-3000/X18000-O/O	3552	12	16-Apr-2013
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3694	12	25-Oct-2013
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3695	12	15-Oct-2013
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	-	TU



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Power Spectral Density					
Broadband Resistive Power Divider	Weinschel	1506A	601	12	2-Dec-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jul-2013
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Multimeter	Iso-tech	IDM101	2424	12	10-Sep-2013
Power Supply	Iso-tech	IPS 2010	2439	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	13-Jun-2013
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	19-Nov-2012
Section 2.6 - 6dB Bandwidth					
RF Coupler	TUV SUD Product Service	TÜV	415	-	TU
Broadband Resistive Power Divider	Weinschel	1506A	601	12	2-Dec-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jul-2013
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Multimeter	Iso-tech	IDM101	2424	12	10-Sep-2013
Power Supply	Iso-tech	IPS 2010	2439	-	O/P Mon
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	27-Jun-2013
Hygrometer	Rotronic	I-1000	3220	12	13-Jun-2013
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	19-Nov-2012

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
6dB Bandwidth	± 212.114 kHz
EIRP Peak Power	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Maximum Peak Conducted Output Power	± 0.70 dB
Spurious and Band Edge Emissions	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Power Spectral Density	± 3.0 dB
AC Line Conducted Emissions	± 3.2 dB



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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