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## Report On

FCC Testing of the Sharp SHL24 Dual-band CDMA (BC0, BC6), Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900), Dual-band UMTS (FDDI, FDDV), Quad-band LTE (B1, B3, B11, B18), Multi mode cellular phone with Bluetooth, WLAN, SRD(NFC, FeliCa) and GPS  
In accordance with FCC CFR 47 Part 15C (WLAN and Bluetooth Low Energy)

COMMERCIAL-IN-CONFIDENCE  
FCC ID: APYHRO00201

Document 75924750 Report 11 Issue 1

February 2014



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COMMERCIAL-IN-CONFIDENCE

**REPORT ON**

FCC Testing of the Sharp SHL24 Dual-band CDMA (BC0, BC6),  
Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900), Dual-  
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In accordance with FCC CFR 47 Part 15C (WLAN and Bluetooth Low  
Energy)

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**APPROVED BY**

**Simon Bennett**  
Authorised Signatory

**DATED**

03 February 2014

**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);

N Rousell

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G Lawler



T Guy

A Galpin

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## **SECTION 1**

### **REPORT SUMMARY**

FCC Testing of the  
Sharp SHL24 Dual-band CDMA (BC0, BC6), Quad-band GSM  
(GSM850/GSM900/DCS1800/PCS1900), Dual-band UMTS (FDDI, FDDV), Quad-band LTE  
(B1, B3, B11, B18), Multi mode cellular phone with Bluetooth, WLAN, SRD(NFC, FeliCa) 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 SHL24 Dual-band CDMA (BC0, BC6), Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900), Dual-band UMTS (FDDI, FDDV), Quad-band LTE (B1, B3, B11, B18), Multi mode cellular phone with Bluetooth, WLAN, SRD(NFC, FeliCa) 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)	SHL24
Serial Number(s)	IMEI 004401115003556 IMEI 004401115003390
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2012)
Incoming Release Date	Application Form 09 December 2013
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	9952 25 November 2013
Start of Test	23 December 2013
Finish of Test	12 January 2014
Name of Engineer(s)	N Rousell G Lawler T Guy A Galpin
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	



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Section	Spec Clause	Test Description	Result	Comments/Base Standard
Bluetooth Low Energy				
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	



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**1.3 APPLICATION FORM**

EQUIPMENT DESCRIPTION	
Model Name/Number	SHL2 4
Part Number	
FCC ID (if applicable)	APYHRO00201
Industry Canada ID (if applicable)	N/A
Technical Description (Please provide a brief description of the intended use of the equipment)	Quad-band LTE(B1/B3/B11/B18), Dual-band WCDMA ( FDDI/V), Quad-band GSM(850/900/1800/1900), Dual-band CDMA(BC0/BC6) Cellular Phone with Bluetooth, WLAN, NFC and GPS

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:	
0 dBi for assembly identified as Bluetooth/WLAN	
dBi for assembly identified as	

TRANSMITTER TECHNICAL CHARACTERISTICS		
TRANSMITTER OPERATING FREQUENCY RANGE(S)		
	FCC and/or Industry Canada	EU
<b>Bluetooth</b>	2402 to 2480 MHz	2402 to 2480 MHz
<b>WLAN</b>	2412 to 2462 MHz	2412 to 2472 MHz
FCC and/or Industry Canada (only)		
Highest Internally Generated Frequency 2150.4 MHz		



SPREAD SPECTRUM PARAMETERS		
<input checked="" type="checkbox"/> <b>Bluetooth</b>	Version: 4.0	
FHSS: Channel <input checked="" type="checkbox"/> 79 Other	EDR <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Medium Access Protocol (Customer Declaration)</b>		
"We have implemented Bluetooth protocol which satisfies the medium access protocol requirement of EN 300 328".		
<input checked="" type="checkbox"/> <b>WLAN</b>		
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)	1	1
Receiver (Rx)	1	1
GI (Guard Interval)	<input checked="" type="checkbox"/> 800 ns <input type="checkbox"/> 400 ns	
Band Width	<input checked="" type="checkbox"/> 20 MHz <input type="checkbox"/> 40 MHz	
<b>Medium Access Protocol (Customer Declaration)</b>		
"We have implemented IEEE 802.11 (b/g/n) protocol which satisfies the medium access protocol requirement of EN 300 328".		
<input type="checkbox"/> <b>Other Technology</b>		
<input type="checkbox"/> 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		
<b>Medium Access Protocol (Customer Declaration)</b>		
"We have implemented a protocol which satisfies the medium access protocol requirement of EN 300 328".		



TRANSMITTER POWER CHARACTERISTICS				
Bluetooth				
Maximum Rated Transmitter Output				
Effective radiated power (for equipment with antenna connector)				W
Effective radiated power (for equipment with integral antenna)	2.5m			W
Minimum Rated Transmitter Output				
Effective radiated power (for equipment with antenna connector)				W
Effective radiated power (for equipment with integral antenna)	0.25m			W
Is transmitter intended for :				
Continuous duty		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
Intermittent duty		<input type="checkbox"/>	Yes	<input type="checkbox"/> No
If intermittent state DUTY CYCLE				
Transmitter ON	seconds	Transmitter OFF		minutes
Is continuous operation possible for testing purposes?				
		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
Is transmitter output power variable:				
		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
State during the test:				
Transmitter duty cycle	Tx on	Seconds	Tx Off	Seconds
Duty cycle (Tx on / (Tx on +Tx off))				
		%		
<input type="checkbox"/> Continuously variable		<input type="checkbox"/> Stepped		
				dB per step
WLAN				
Maximum Rated Transmitter Output				
Effective radiated power (for equipment with antenna connector)				W
Effective radiated power (for equipment with integral antenna)	0.1			W
Minimum Rated Transmitter Output				
Effective radiated power (for equipment with antenna connector)				W
Effective radiated power (for equipment with integral antenna)				W
Is transmitter intended for :				
Continuous duty		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
Intermittent duty		<input type="checkbox"/>	Yes	<input type="checkbox"/> No
If intermittent state DUTY CYCLE				
Transmitter ON	seconds	Transmitter OFF		minutes
Is continuous operation possible for testing purposes?				
		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
Is transmitter output power variable:				
		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No
State during the test:				
Transmitter duty cycle	Tx on	Seconds	Tx Off	Seconds
Duty cycle (Tx on / (Tx on +Tx off))				
		%		
<input type="checkbox"/> Continuously variable		<input type="checkbox"/> Stepped		
				dB per step



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<b>TRANSMITTER POWER SOURCE (3)</b>				
<input checked="" type="checkbox"/> Common power source for transmitter and receiver				
<input type="checkbox"/> AC mains				
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 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.

<b>AUTOMATIC EQUIPMENT SWITCH OFF</b>	
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	3.35 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 <span style="float: right;">V cut-off voltage</span>
<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: Hiroyuki Murakami  
 Position held: Supervisor | Date: 9<sup>th</sup> December, 2013



Product Service

## **1.4 PRODUCT INFORMATION**

### **1.4.1 Technical Description**

The Equipment Under Test (EUT) was a Sharp SHL24 Dual-band CDMA (BC0, BC6), Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900), Dual-band UMTS (FDDI, FDDV), Quad-band LTE (B1, B3, B11, B18), Multi mode cellular phone with Bluetooth, WLAN, SRD(NFC, FeliCa) 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 Measurement Facility Registration Number  
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 SHL24 Dual-band CDMA (BC0, BC6), Quad-band GSM  
(GSM850/GSM900/DCS1800/PCS1900), Dual-band UMTS (FDDI, FDDV), Quad-band LTE  
(B1, B3, B11, B18), Multi mode cellular phone with Bluetooth, WLAN, SRD(NFC, FeliCa) and  
GPS

In accordance with FCC CFR 47 Part 15C (WLAN and Bluetooth Low Energy)



Product Service

## 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

SHL24 S/N: IMEI 004401115003556 - Modification State 0

### 2.1.3 Date of Test

12 January 2014

### 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 was set up on a test table 800mm above a horizontal ground plane. A vertical ground plane is also required and was placed 400mm from the EUT.

The EUT is powered through a Line Impedance Stabilisation Network (LISN) which was bonded to the ground plane. The EUT was 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 was noted for formal measurements.

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

### 2.1.6 Environmental Conditions

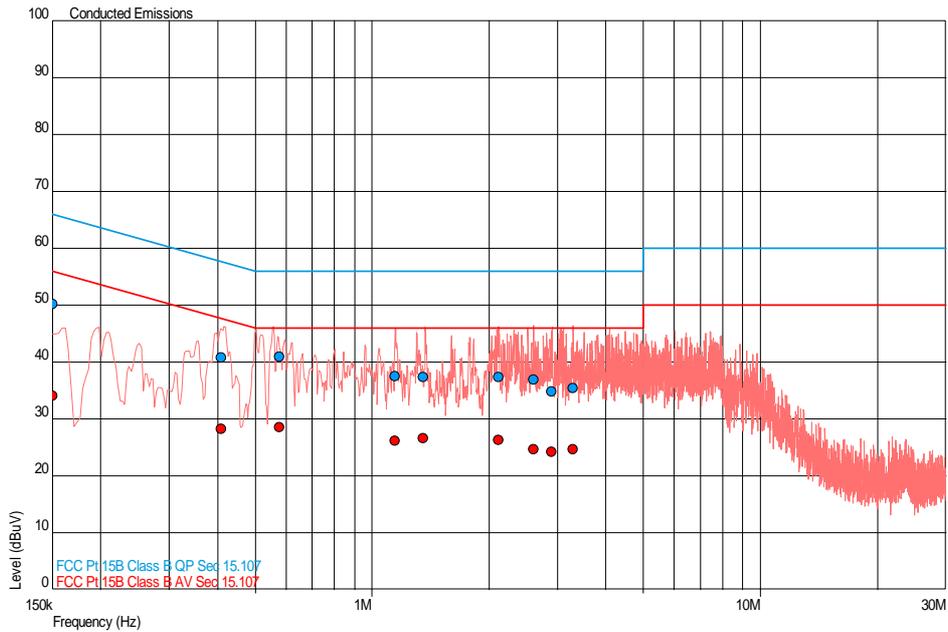
Ambient Temperature	22.6°C
Relative Humidity	24.0%



2.1.7 Test Results

802.11(b)

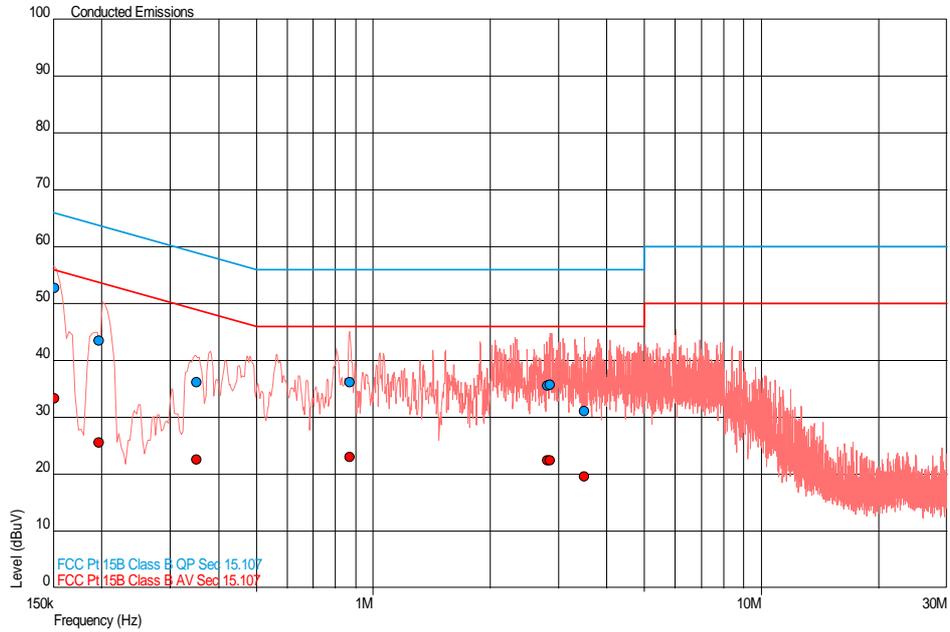
Live Line



Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.150	50.2	66.0	-15.8	34.1	56.0	-21.9
0.409	40.9	57.7	-16.8	28.3	47.7	-19.3
0.578	41.0	56.0	-15.0	28.6	46.0	-17.4
1.144	37.6	56.0	-18.4	26.2	46.0	-19.8
1.352	37.3	56.0	-18.7	26.6	46.0	-19.4
2.117	37.4	56.0	-18.6	26.3	46.0	-19.7
2.605	36.9	56.0	-19.1	24.7	46.0	-21.3
2.901	34.9	56.0	-21.1	24.3	46.0	-21.7
3.295	35.4	56.0	-20.6	24.7	46.0	-21.3



Neutral Line



Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBμV)
0.151	52.7	65.9	-13.2	33.4	55.9	-22.6
0.197	43.5	63.7	-20.2	25.6	53.7	-28.2
0.351	36.2	58.9	-22.7	22.7	48.9	-26.3
0.870	36.2	56.0	-19.8	23.0	46.0	-23.0
2.810	35.5	56.0	-20.5	22.5	46.0	-23.5
2.860	35.7	56.0	-20.3	22.5	46.0	-23.5
3.504	31.1	56.0	-24.9	19.6	46.0	-26.4



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## **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**

SHL24 S/N: IMEI 004401115003390 - Modification State 0

### **2.2.3 Date of Test**

23 December 2013, 6 January 2014 & 7 January 2014

### **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 connected to a Peak Power Meter via a cable and attenuator. The path loss between the EUT and sensor was measured and entered as an offset. Measurements were made on the bottom, middle and top channels on all supported data rates.

### **2.2.6 Environmental Conditions**

Ambient Temperature	23.6 - 24.7°C
Relative Humidity	35.1 - 37.9%



Product Service

**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	17.96	17.91	17.64	62.517	61.802	58.076
2	17.03	16.78	15.20	50.444	47.671	33.112
5.5	16.89	16.74	15.29	48.862	47.200	33.807
11	17.04	17.14	15.73	50.600	51.740	37.420

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.



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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	20.87	21.31	19.45	122.084	135.315	88.154
9	20.63	21.25	19.33	115.517	133.282	85.697
12	21.07	21.61	19.46	127.859	127.859	144.816
18	20.98	21.44	19.78	125.375	139.249	95.144
24	20.91	21.31	19.57	123.211	135.192	90.668
36	21.07	21.42	19.60	127.930	138.525	91.242
48	20.63	21.41	19.35	115.523	138.506	86.054
54	21.01	21.68	21.33	126.183	147.231	135.831

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.



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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	21.26	21.30	20.72	133.660	134.896	118.032
13	20.88	21.24	19.47	122.537	133.139	88.495
19.5	20.59	21.33	19.61	114.611	135.749	91.486
26	21.34	21.49	19.54	136.001	141.035	90.028
39	21.01	21.36	19.86	126.123	136.766	96.831
52	21.03	21.33	19.66	126.743	135.721	92.544
58.5	20.92	21.50	19.88	123.574	141.216	97.311
65	20.89	21.33	19.76	122.639	135.986	94.624

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	2440 MHz	2480 MHz	2402 MHz	2440 MHz	2480 MHz
37octet/prbs9	0.46	0.49	-0.09	1.113	1.118	0.979

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**

SHL24 S/N: IMEI 004401115003556 - Modification State 0

### **2.3.3 Date of Test**

9 January 2014 & 10 January 2014

### **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 through 360° and a height search of the measuring antenna. A substitution was then performed using a suitable calibrated 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. A peak power analyser was also used to obtain a correction factor for the wideband signal.

A calculation was then performed to obtain the final figure.

### **2.3.6 Environmental Conditions**

Ambient Temperature	18.7 - 21.2°C
Relative Humidity	41.0 - 47.0%



Product Service

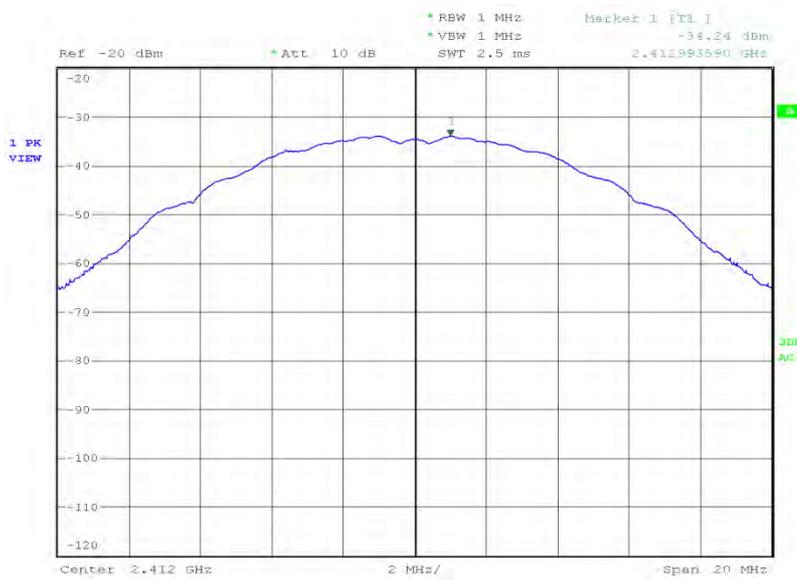
**2.3.7 Test Results**

802.11(b)

4.0 V DC Supply

2412 MHz

EIRP (dBm)	EIRP (mW)
26.06	403.6



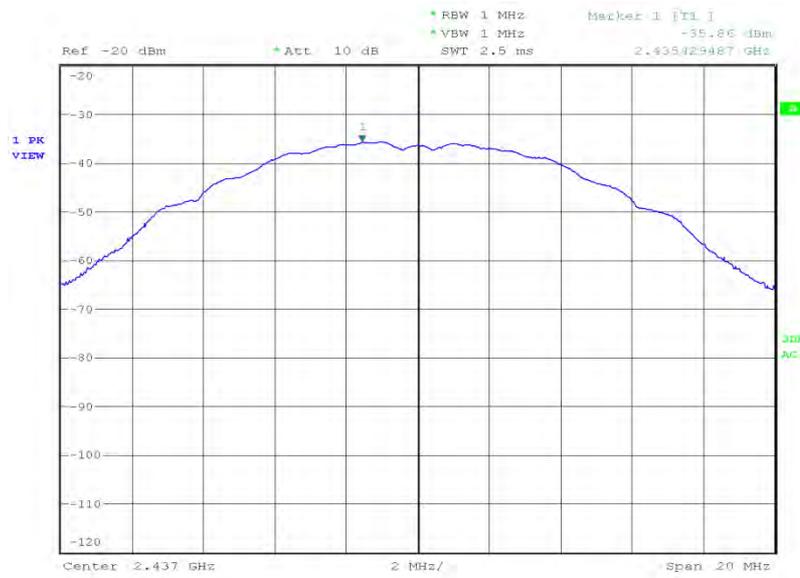
Date: 8.JAN.2014 22:51:05



Product Service

2437 MHz

EIRP (dBm)	EIRP (mW)
24.89	308.3



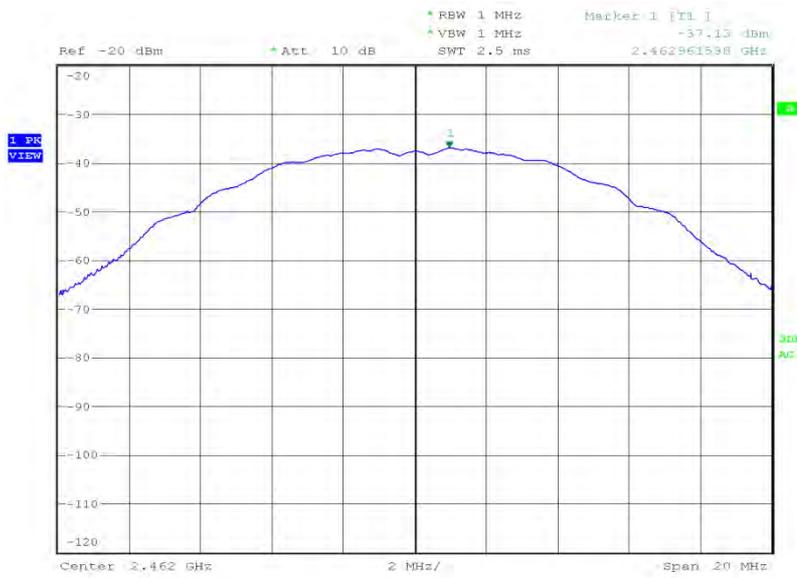
Date: 8.JAN.2014 22:34:17



Product Service

2462 MHz

EIRP (dBm)	EIRP (mW)
23.45	221.3



Date: 8.JAN.2014 23:48:03

Limit

EIRP (dBm)	EIRP (mW)
36.0	4000



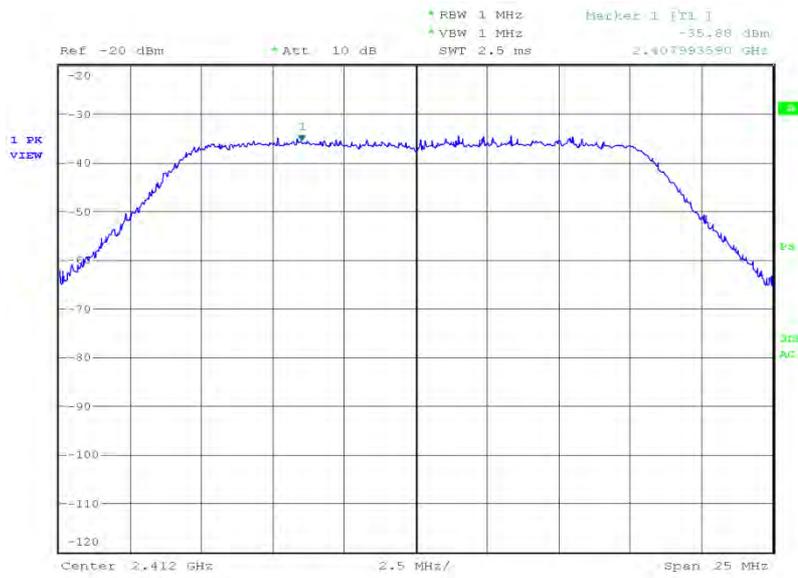
Product Service

802.11(g)

4.0 V DC Supply

2412 MHz

EIRP (dBm)	EIRP (mW)
29.71	935.4



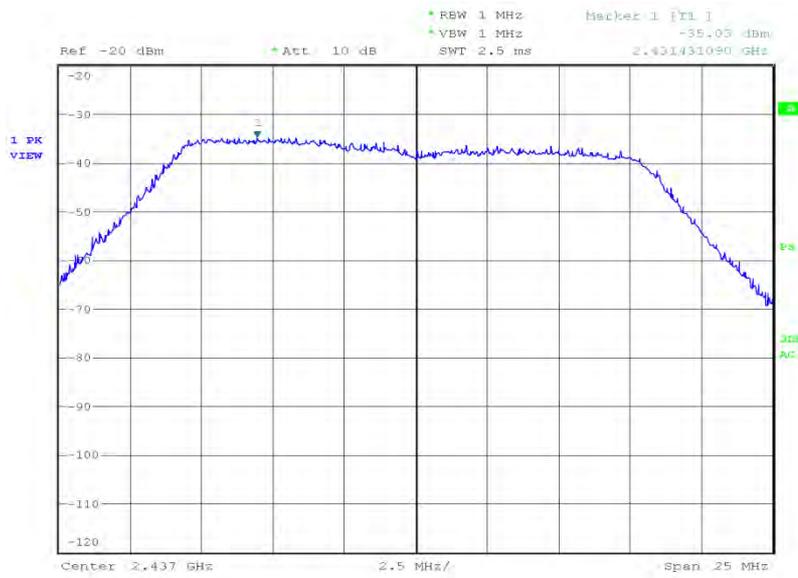
Date: 9.JAN.2014 01:07:56



Product Service

2437 MHz

EIRP (dBm)	EIRP (mW)
30.90	1230.2



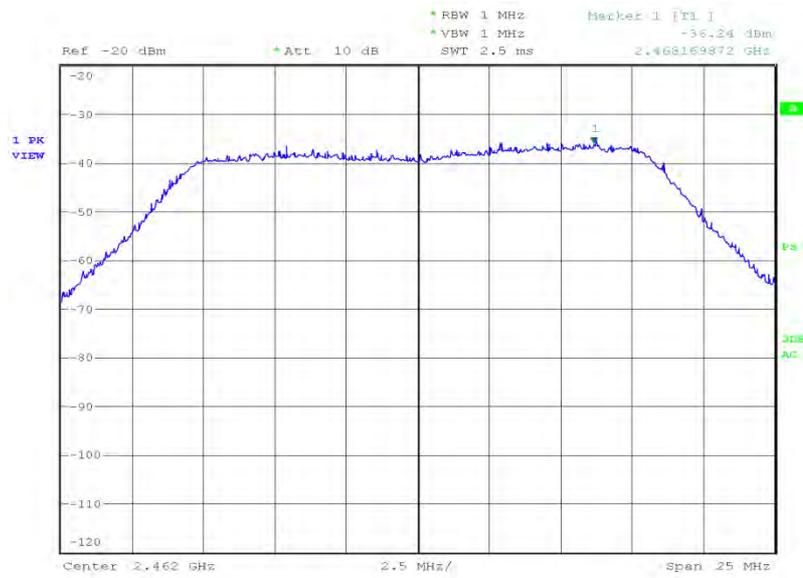
Date: 9.JAN.2014 00:53:47



Product Service

2462 MHz

EIRP (dBm)	EIRP (mW)
29.85	966.0



Date: 9.JAN.2014 02:21:50

Limit

EIRP (dBm)	EIRP (mW)
36.0	4000



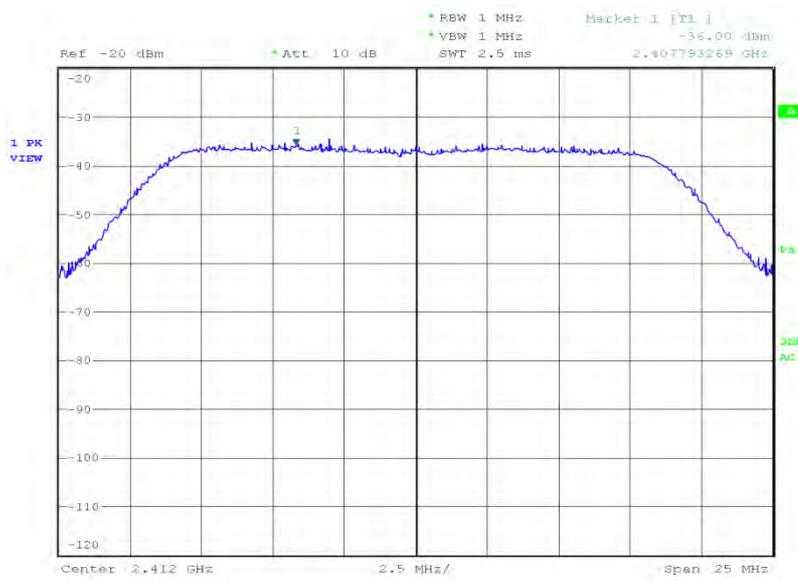
Product Service

802.11(n)

4.0 V DC Supply

2412 MHz

EIRP (dBm)	EIRP (mW)
29.95	988.6



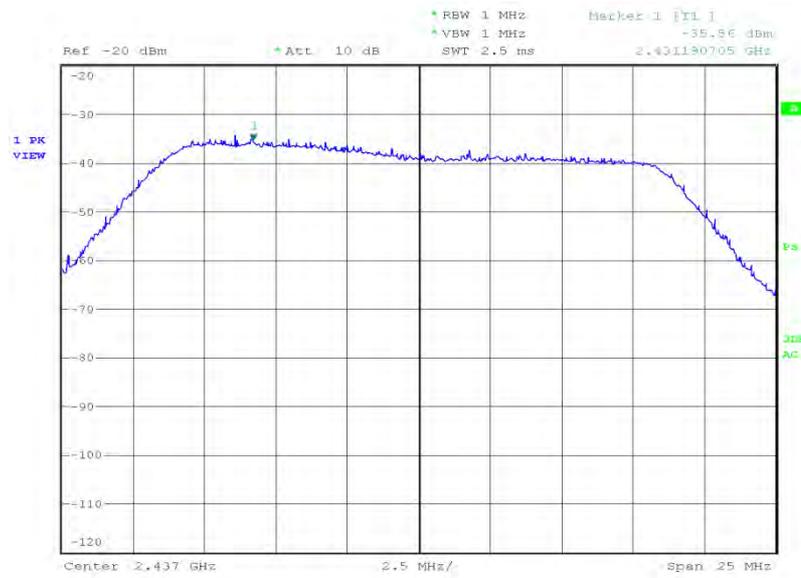
Date: 9.JAN.2014 03:00:24



Product Service

2437 MHz

EIRP (dBm)	EIRP (mW)
30.83	1210.6



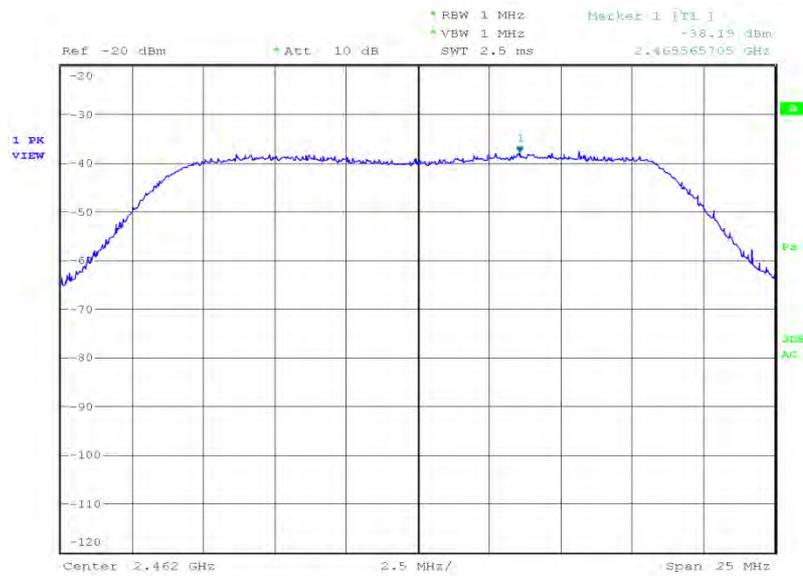
Date: 9.JAN.2014 20:57:01



Product Service

2462 MHz

EIRP (dBm)	EIRP (mW)
28.92	779.8



Date: 9.JAN.2014 04:16:07

Limit

EIRP (dBm)	EIRP (mW)
36.0	4000



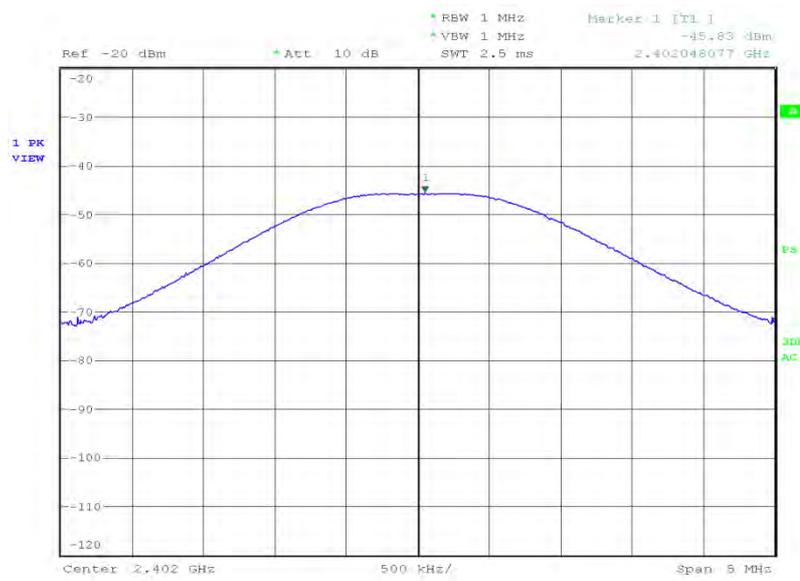
Product Service

Bluetooth Low Energy

4.0 V DC Supply

2402 MHz

EIRP (dBm)	EIRP (mW)
-3.30	0.467



Date: 10.JAN.2014 02:48:22



Product Service

2440 MHz

EIRP (dBm)	EIRP (mW)
-2.82	0.522



Date: 10.JAN.2014 02:54:09



Product Service

2480 MHz

EIRP (dBm)	EIRP (mW)
-4.91	0.322



Date: 10.JAN.2014 02:37:38

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**

SHL24 S/N: IMEI 004401115003556 - Modification State 0

### **2.4.3 Date of Test**

8 January 2014, 9 January 2014, 10 January 2014, 11 January 2014 & 12 January 2014

### **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 6.9.2. The results were analysed to ensure compliance with restricted bands. The EUT was set to the lowest and highest operating frequencies.

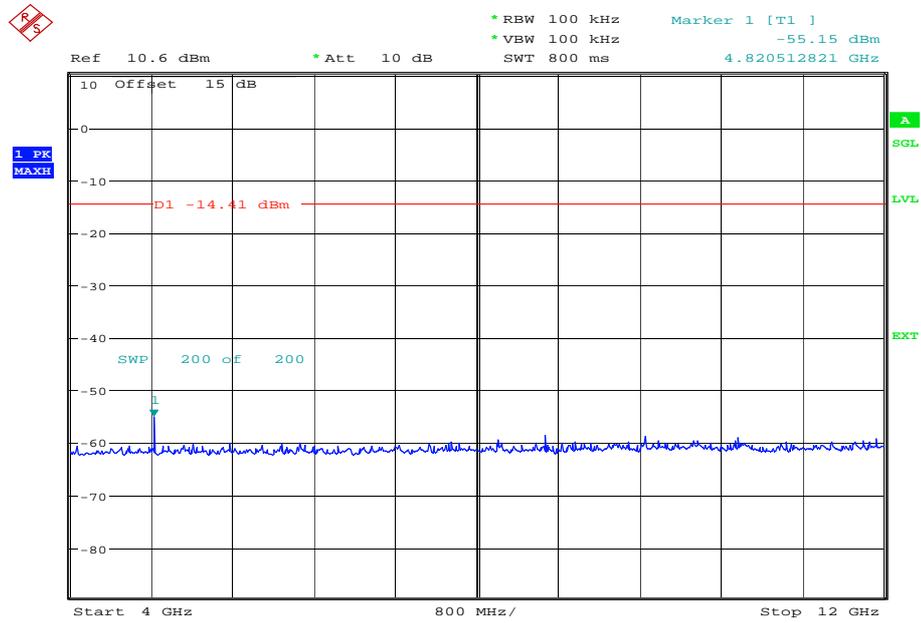
### **2.4.6 Environmental Conditions**

Ambient Temperature	18.7 - 36.3°C
Relative Humidity	25.0 - 476.0%



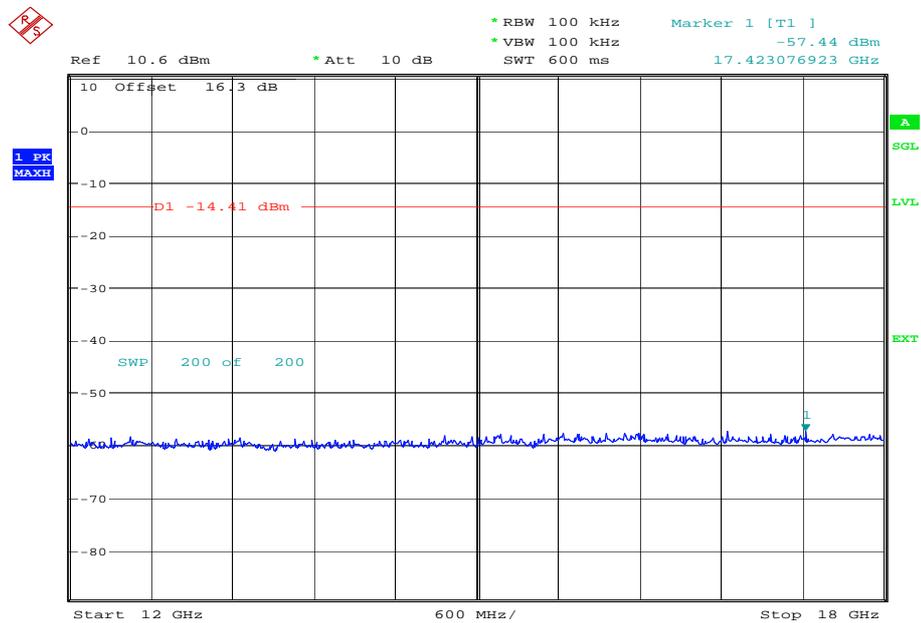


4 GHz to 12 GHz



Date: 9.JAN.2014 16:22:13

12 GHz to 18 GHz

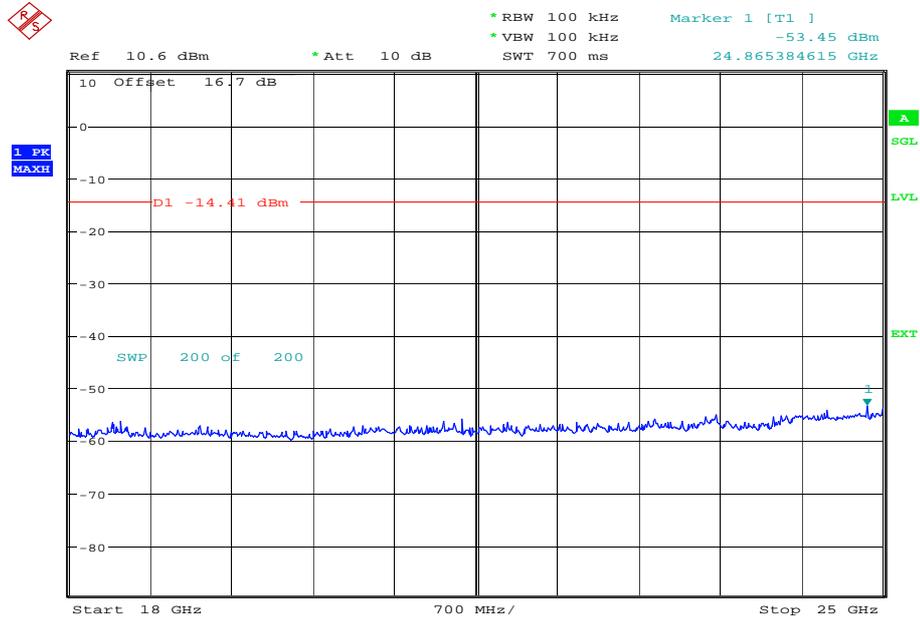


Date: 9.JAN.2014 14:33:31



Product Service

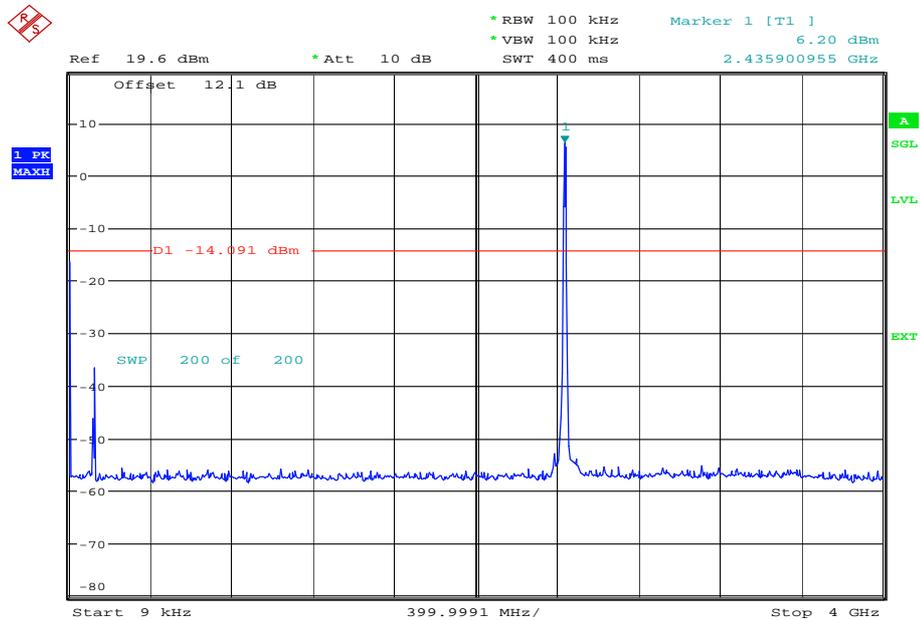
18 GHz to 25 GHz



Date: 9.JAN.2014 16:41:33

2437 MHz

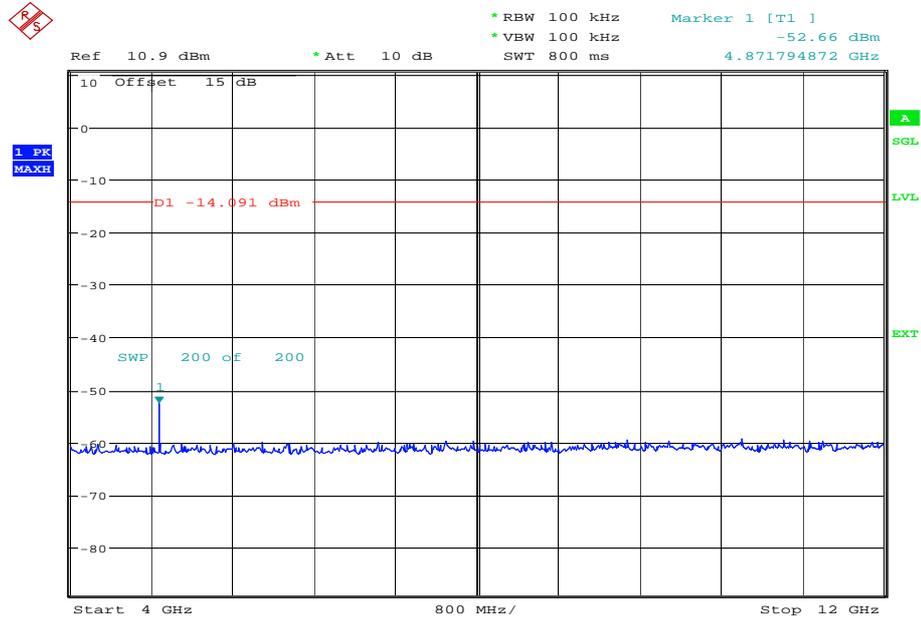
9 kHz to 4 GHz



Date: 8.JAN.2014 16:22:32

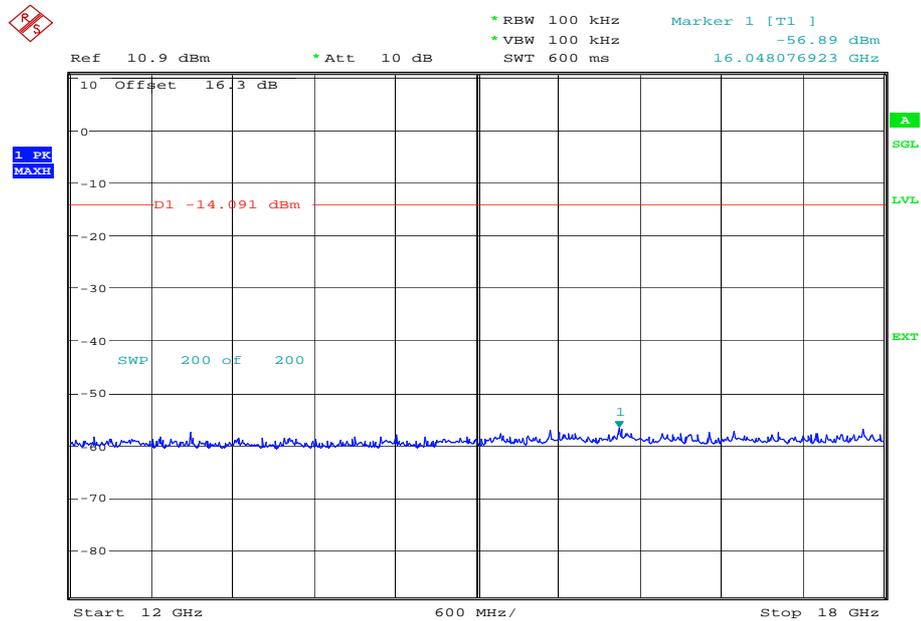


### 4 GHz to 12 GHz



Date: 9.JAN.2014 14:38:50

### 12 GHz to 18 GHz

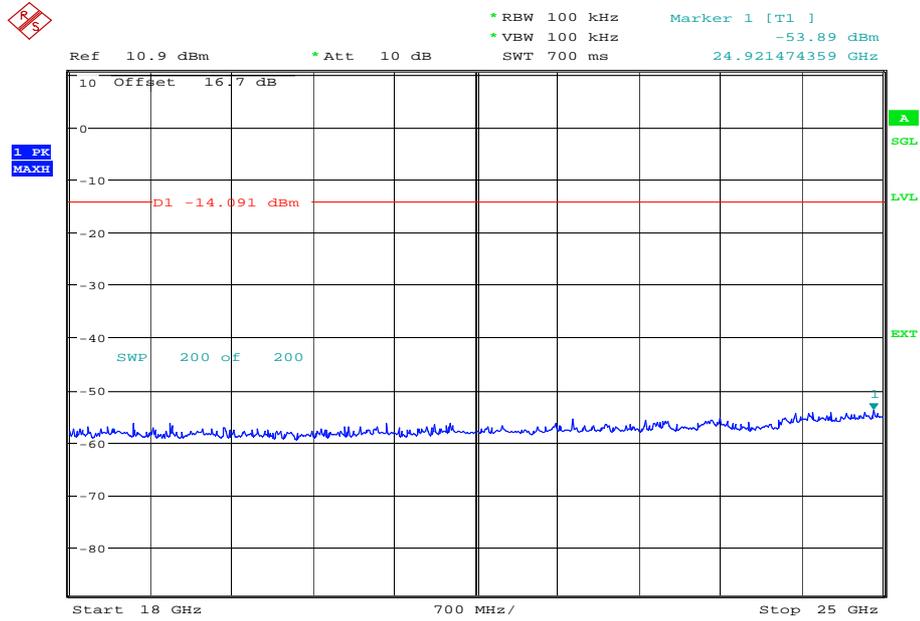


Date: 9.JAN.2014 14:41:18



Product Service

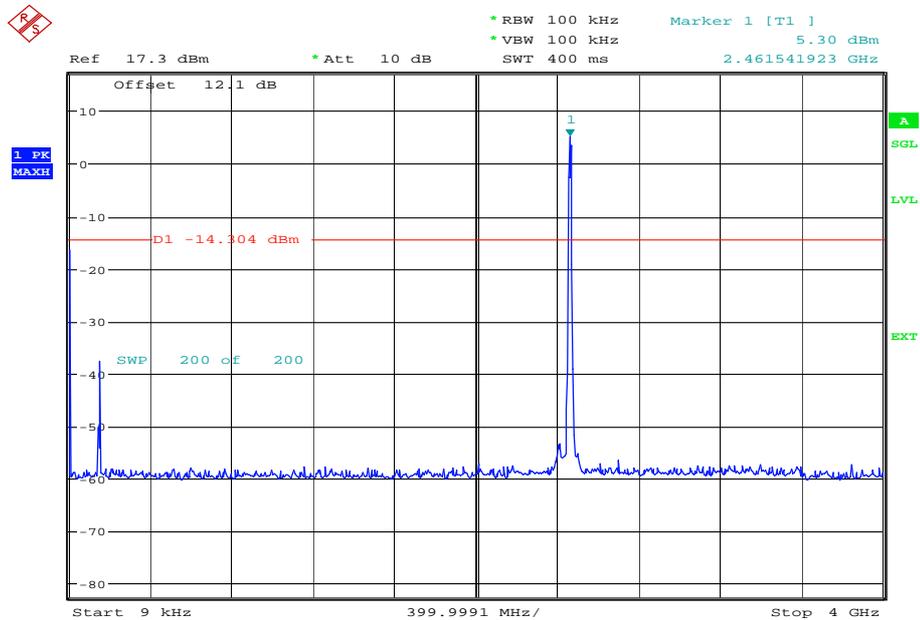
18 GHz to 25 GHz



Date: 8.JAN.2014 18:38:58

2462 MHz

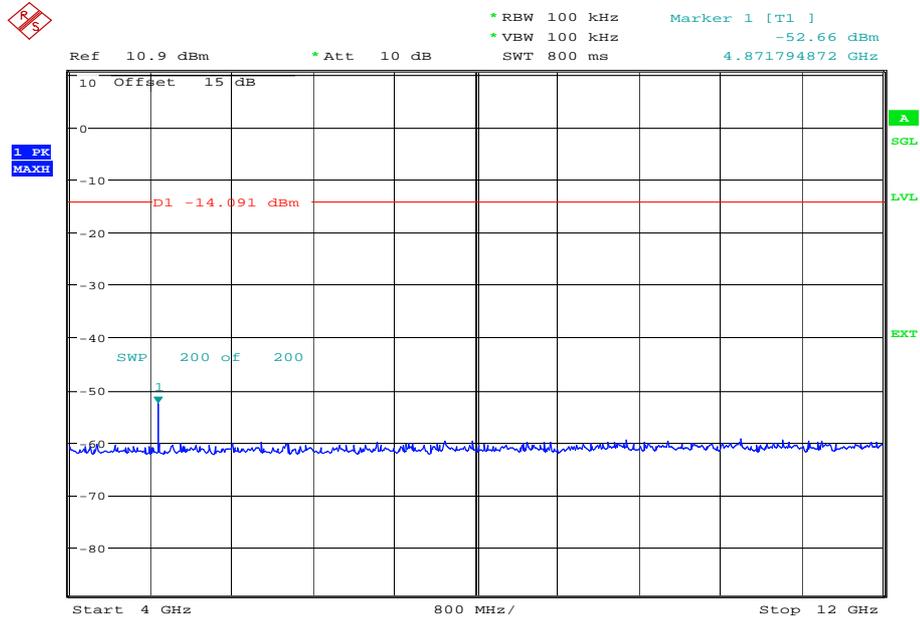
9 kHz to 4 GHz



Date: 8.JAN.2014 16:26:20

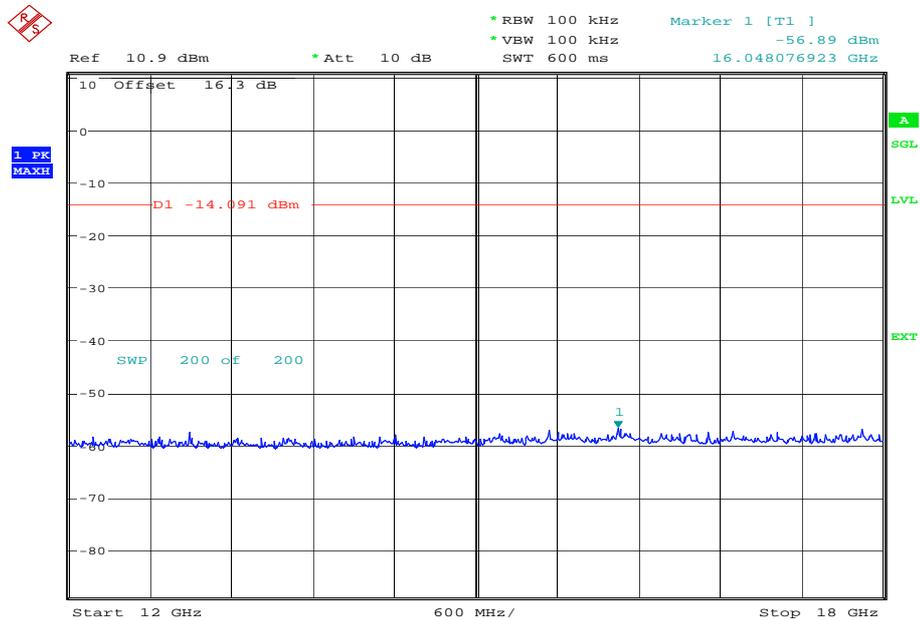


4 GHz to 12 GHz



Date: 9.JAN.2014 14:38:50

12 GHz to 18 GHz

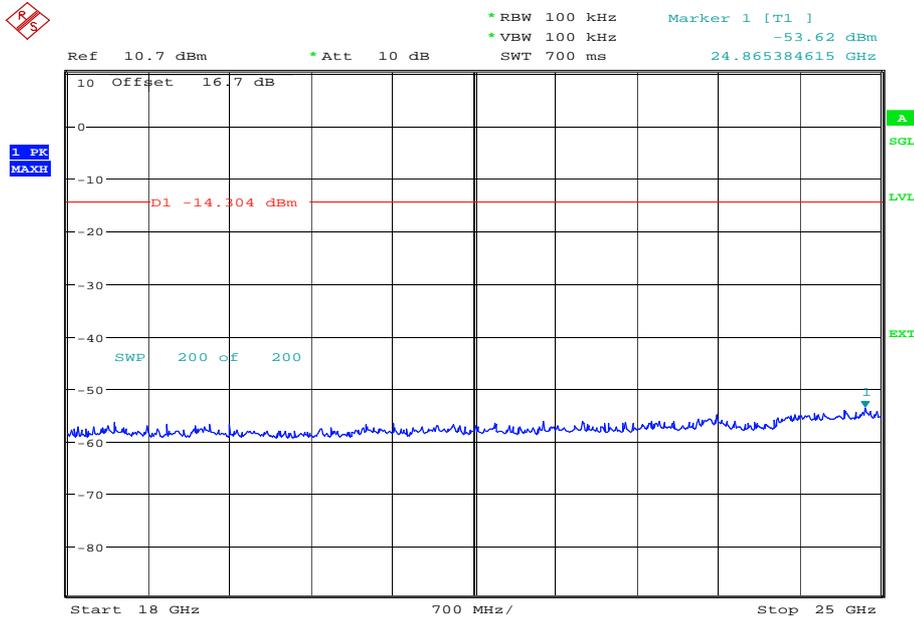


Date: 9.JAN.2014 14:41:18



Product Service

18 GHz to 25 GHz



Date: 8.JAN.2014 18:42:36

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.

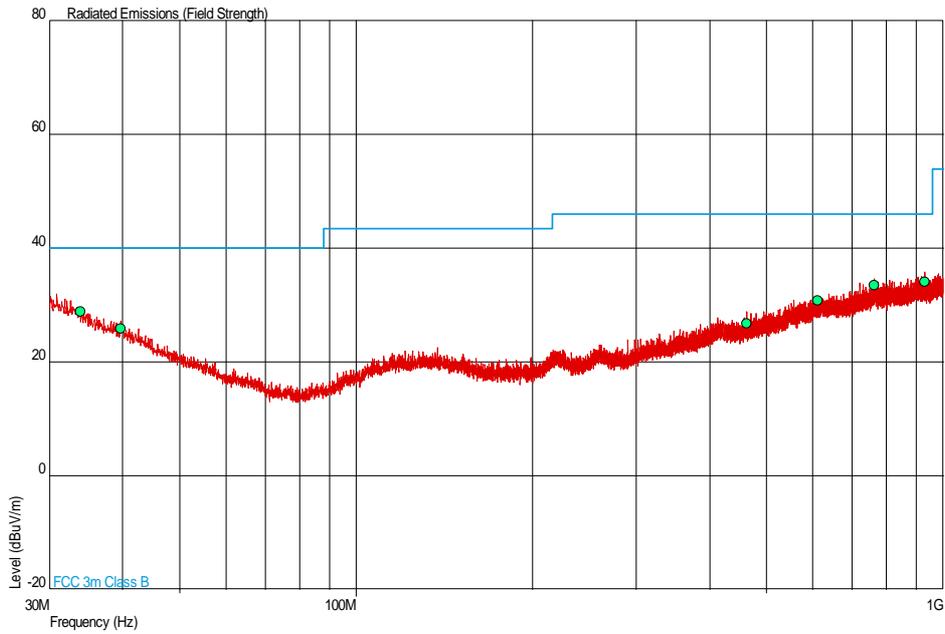


Product Service

Spurious Radiated Emissions

2412 MHz

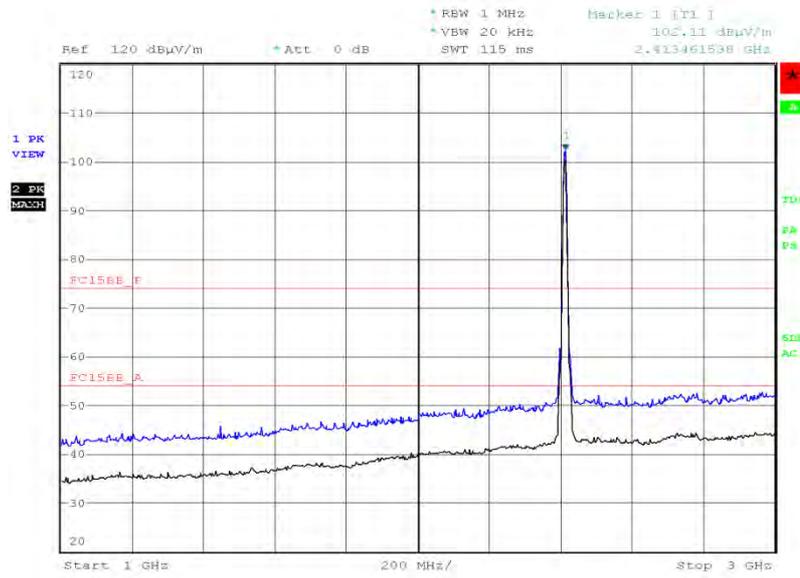
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
33.864	28.9	27.9	40.0	100	-11.1	72.1	282	1.12	Horizontal
39.751	25.9	19.7	40.0	100	-14.1	80.3	324	1.57	Vertical
462.363	26.8	21.9	46.0	200	-19.2	178.1	51	2.13	Vertical
612.143	30.8	34.7	46.0	200	-15.2	165.3	212	1.00	Vertical
764.205	33.5	47.3	46.0	200	-12.5	152.7	323	1.08	Vertical
930.955	34.0	50.1	46.0	200	-12.0	149.9	80	2.90	Vertical

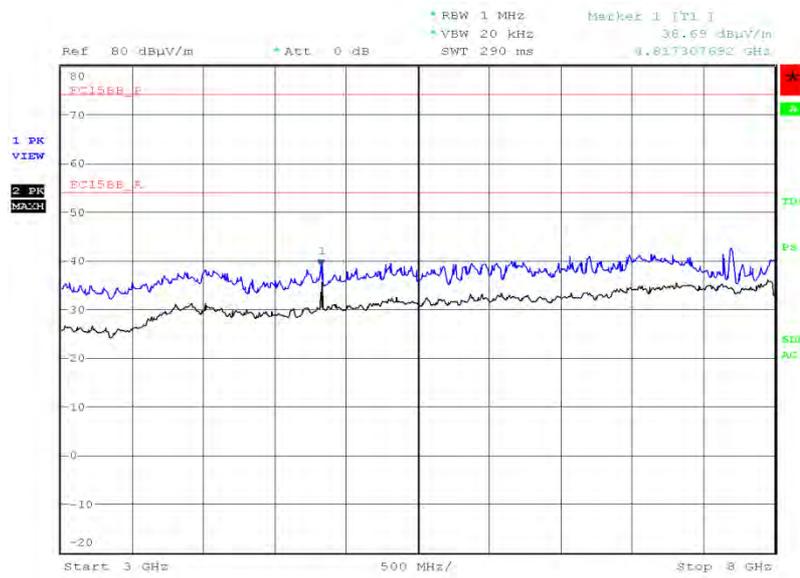


1 GHz to 3 GHz



Date: 9.JAN.2014 22:07:07

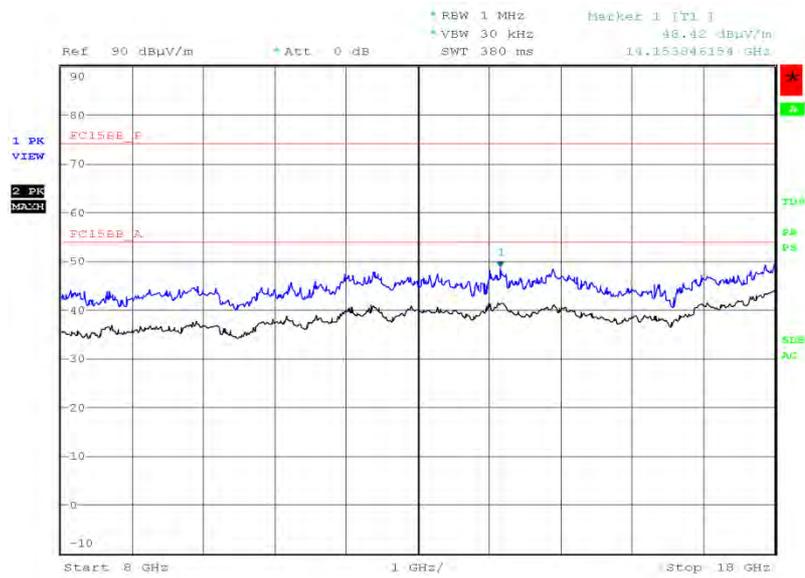
3 GHz to 8 GHz



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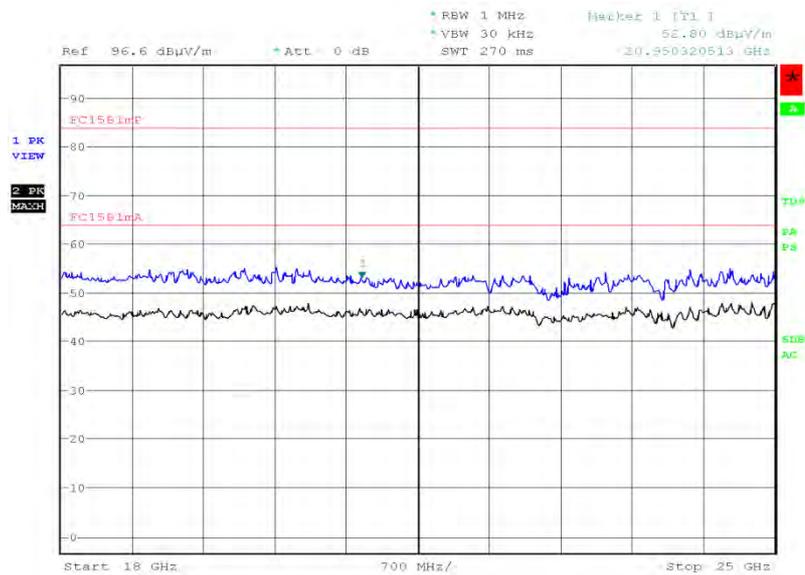


8 GHz to 18 GHz



Date: 10.JAN.2014 23:39:51

18 GHz to 25 GHz

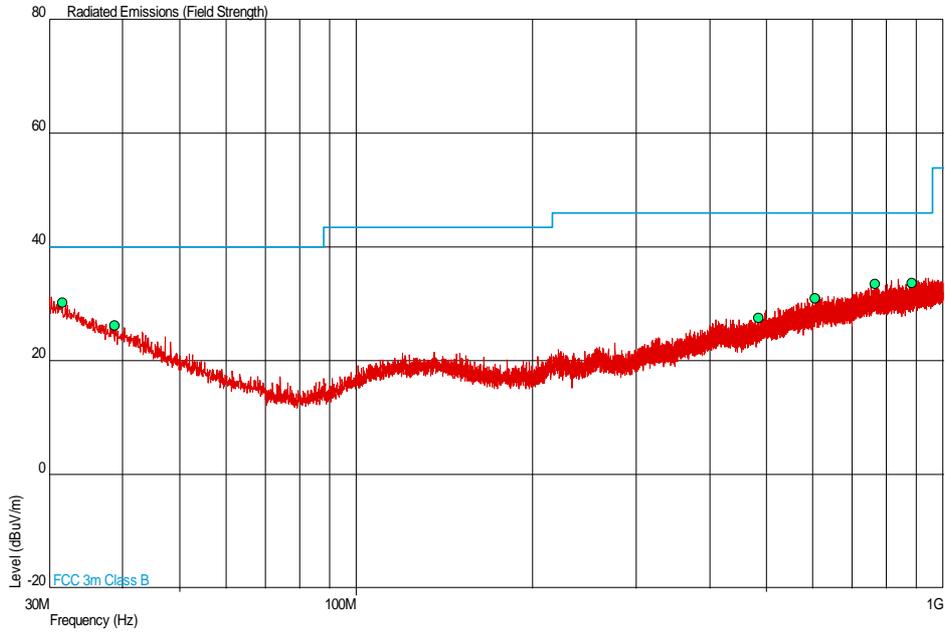


Date: 11.JAN.2014 03:09:08



2437 MHz

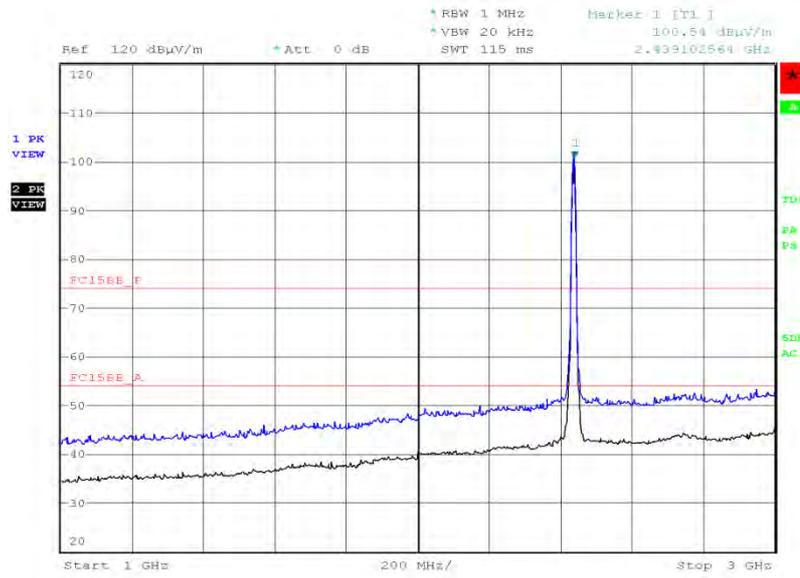
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
31.598	30.3	32.7	40.0	100	-9.7	67.3	183	1.00	Vertical
38.789	26.2	20.4	40.0	100	-13.8	79.6	105	1.00	Vertical
484.864	27.6	24.0	46.0	200	-18.4	176.0	218	1.00	Horizontal
605.938	31.0	35.5	46.0	200	-15.0	164.5	225	1.00	Horizontal
765.223	33.5	47.3	46.0	200	-12.5	152.7	0	1.15	Horizontal
886.027	33.7	48.4	46.0	200	-12.3	151.6	214	1.00	Horizontal

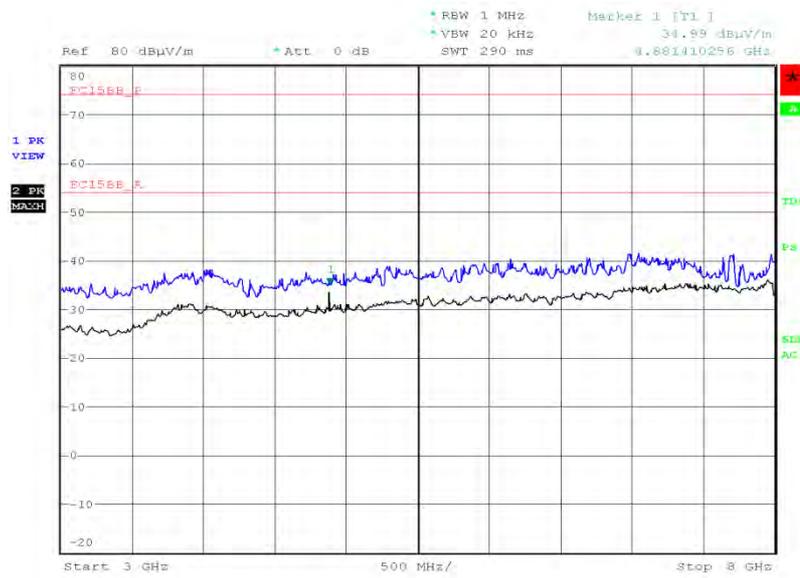


1 GHz to 3 GHz



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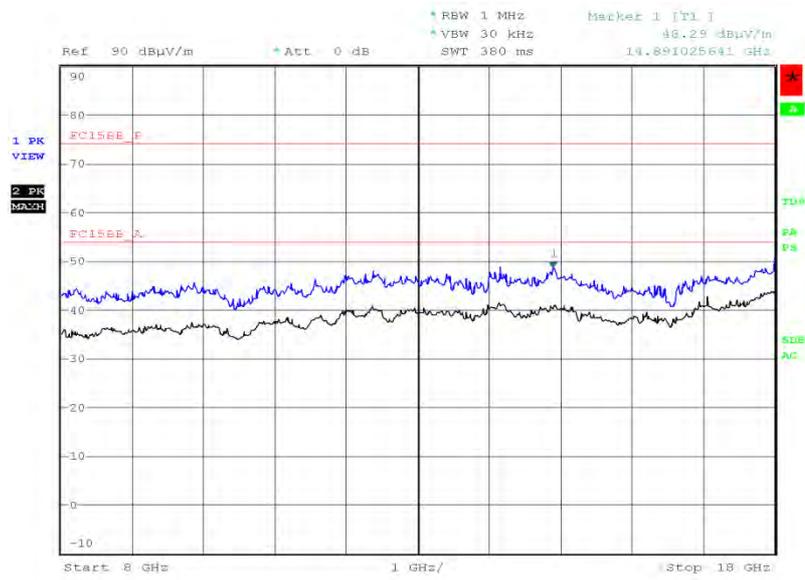
3 GHz to 8 GHz



Date: 11.JAN.2014 05:09:23

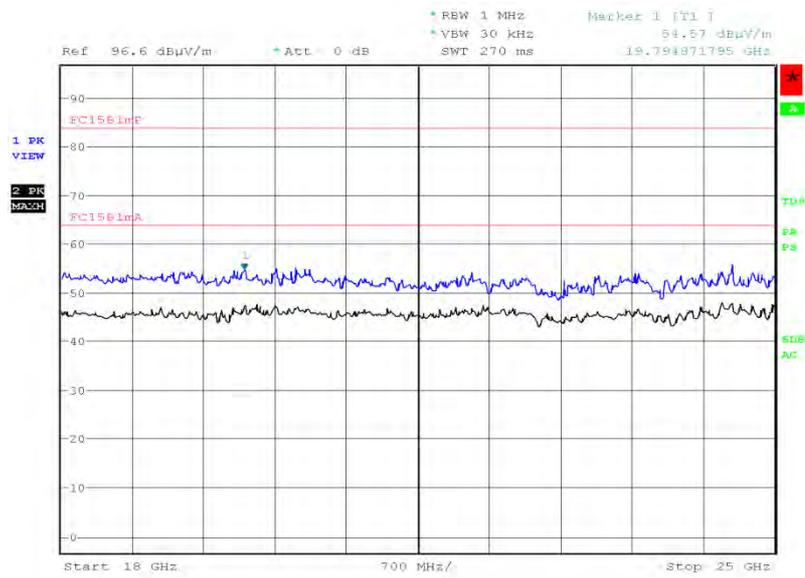


8 GHz to 18 GHz



Date: 10.JAN.2014 23:46:52

18 GHz to 25 GHz

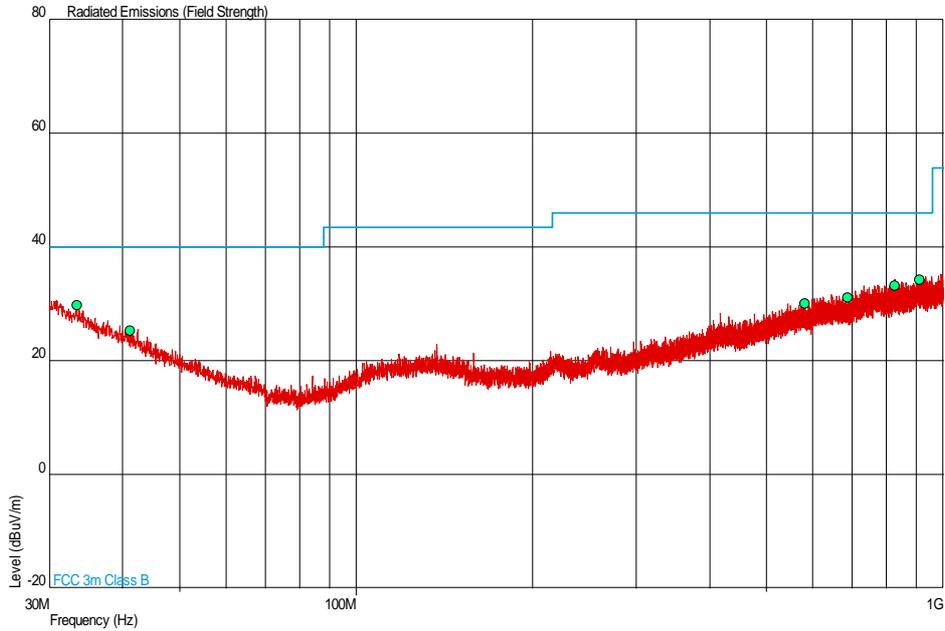


Date: 11.JAN.2014 03:14:58



2462 MHz

30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
33.428	29.7	30.5	40.0	100	-10.3	69.5	298	1.00	Horizontal
41.263	25.2	18.2	40.0	100	-14.8	81.8	161	1.00	Horizontal
582.036	30.1	32.0	46.0	200	-15.9	168.0	231	2.63	Horizontal
686.527	31.2	36.3	46.0	200	-14.8	163.7	59	1.00	Horizontal
827.649	33.2	45.7	46.0	200	-12.8	154.3	154	1.00	Vertical
911.575	34.2	51.3	46.0	200	-11.8	148.7	93	2.28	Vertical

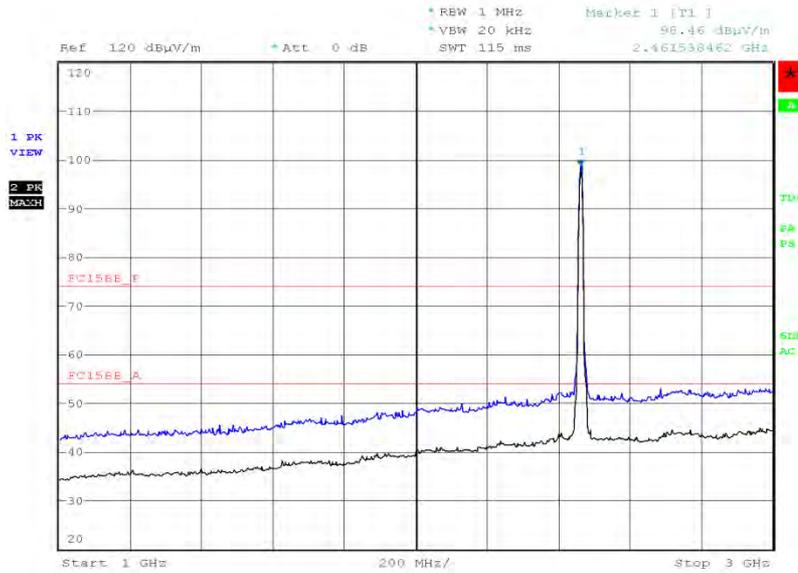


Product Service

1 GHz to 25 GHz

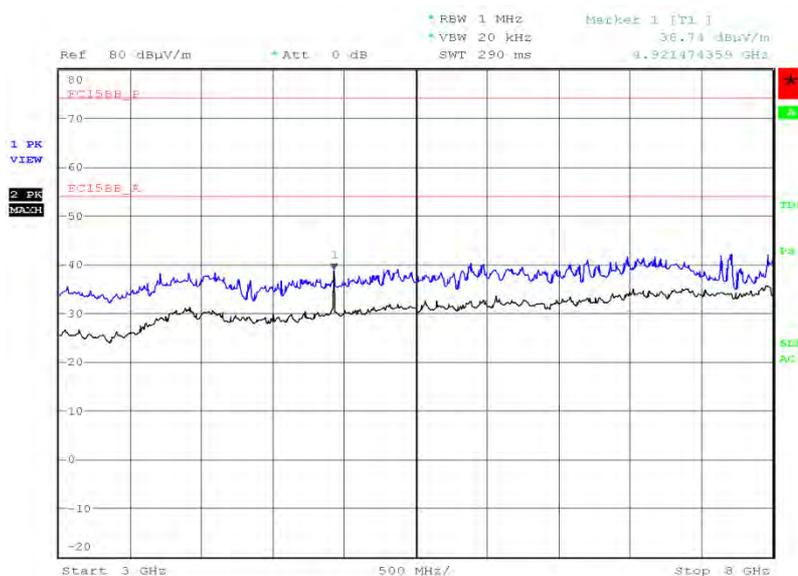
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
4.924	Horizontal	150	166	43.57	37.91

1 GHz to 3 GHz



Date: 9.JAN.2014 22:22:35

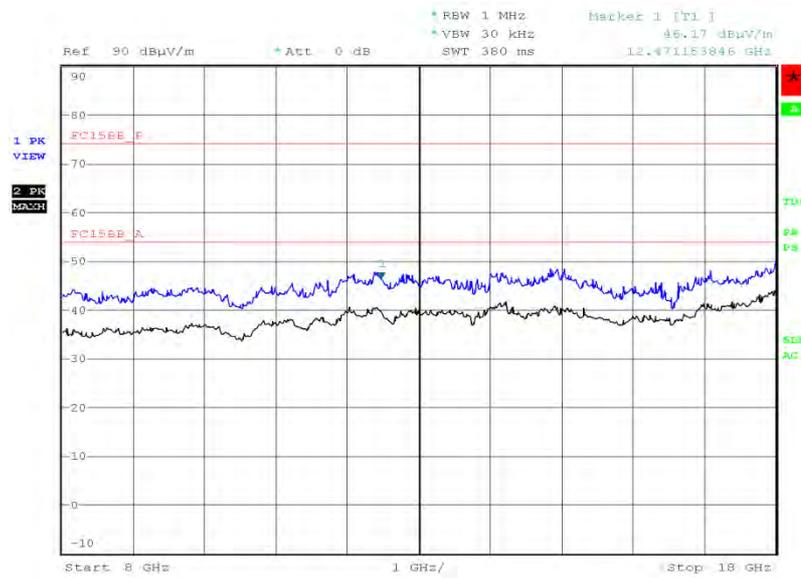
3 GHz to 8 GHz



Date: 11.JAN.2014 05:12:59

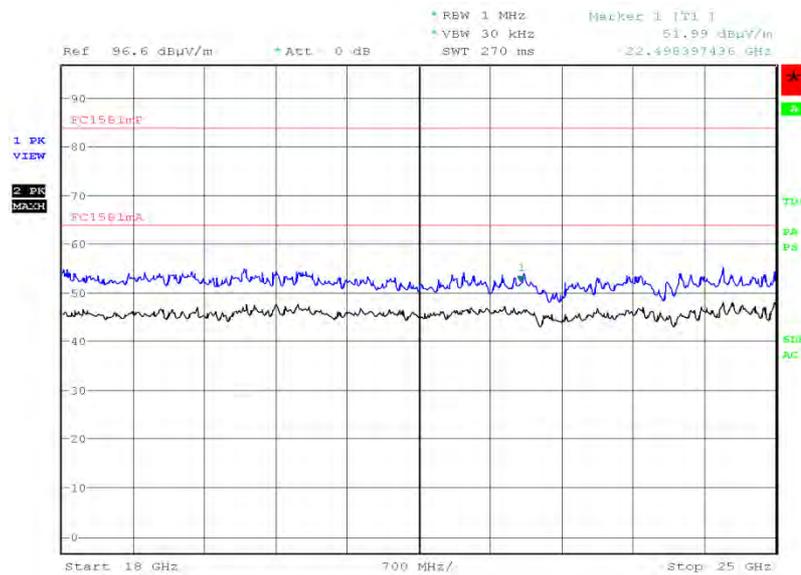


8 GHz to 18 GHz



Date: 10.JAN.2014 23:53:37

18 GHz to 25 GHz



Date: 11.JAN.2014 03:19:36

Limit

Peak (dB $\mu$ V/m)	Average (dB $\mu$ V/m)
74.0	54.0

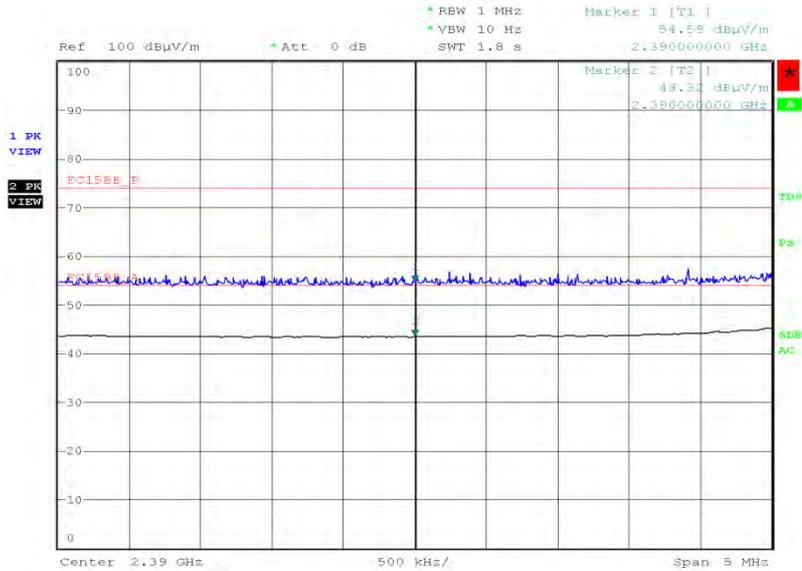


Product Service

Band Edge Emissions

2412 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	54.59	43.32



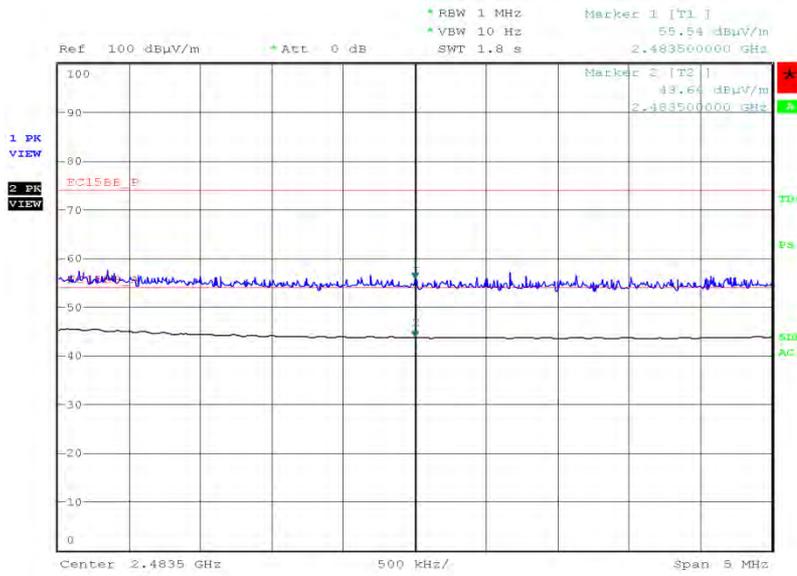
Date: 9.JAN.2014 22:01:39



Product Service

2462 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	55.54	43.64



Date: 9.JAN.2014 21:59:24

Limit

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



Product Service

802.11(g)

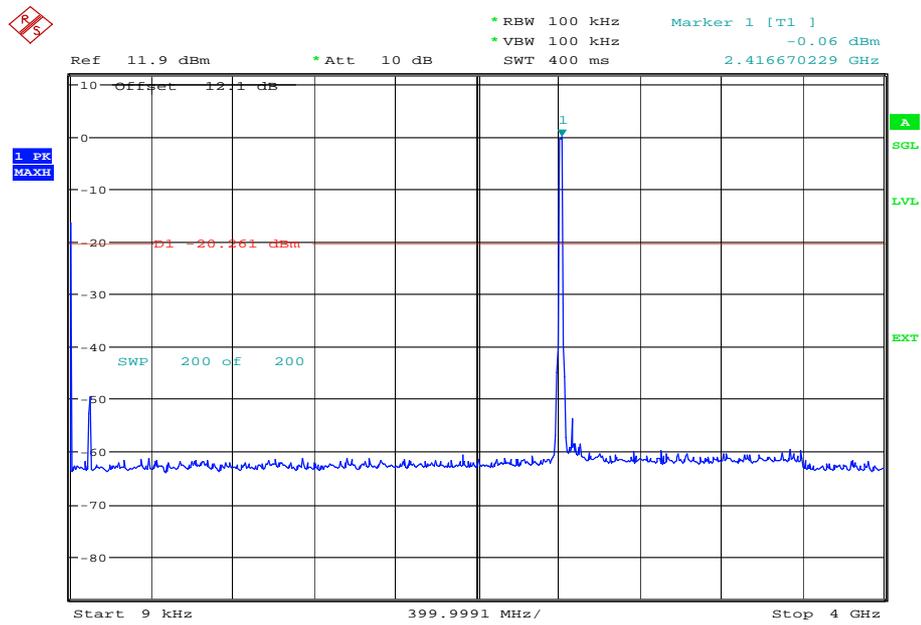
4.0 V DC Supply

Spurious Conducted Emissions

54 Mbps

2412 MHz

9 kHz to 4 GHz

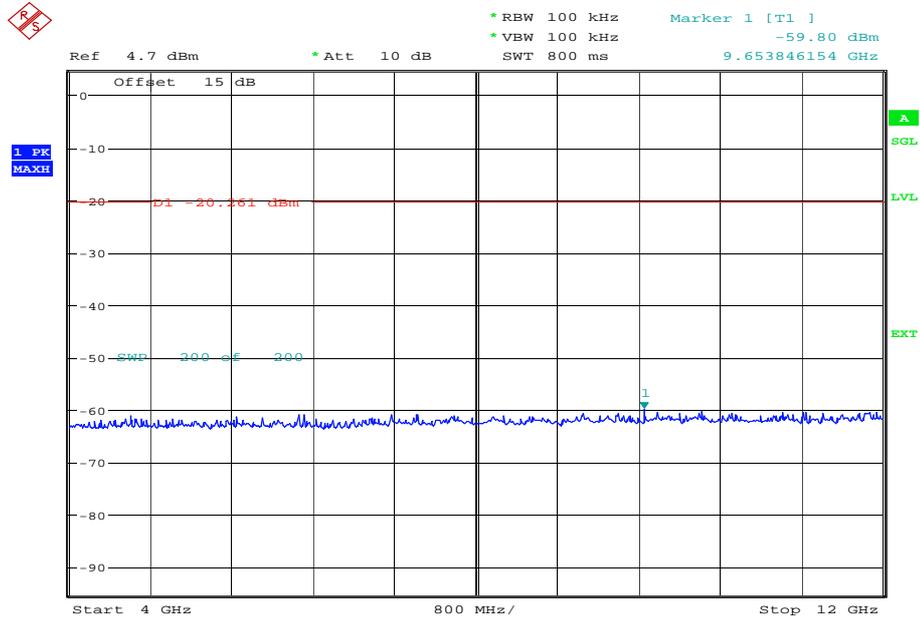


Date: 8.JAN.2014 16:30:18



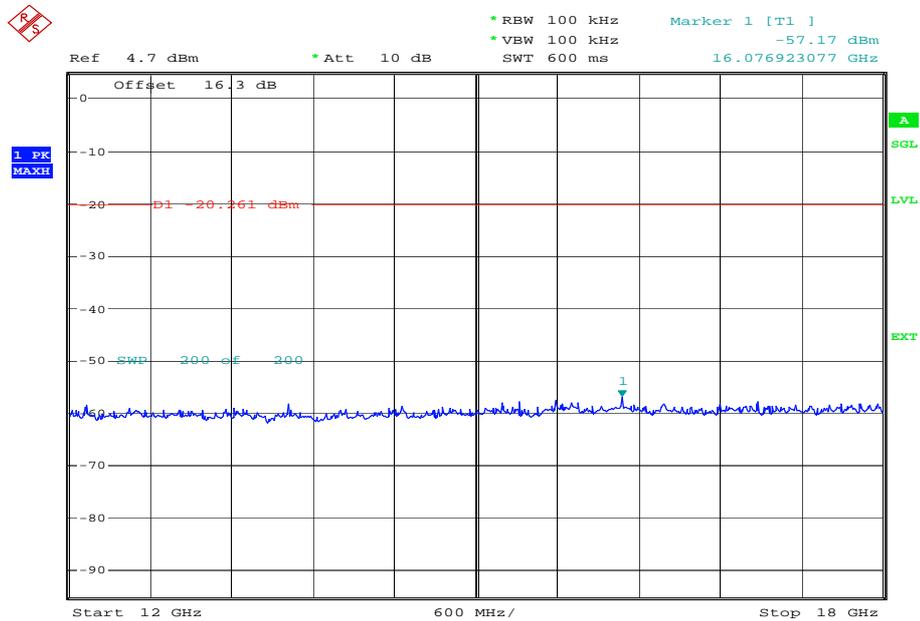
Product Service

4 GHz to 12 GHz



Date: 9.JAN.2014 16:26:34

12 GHz to 18 GHz

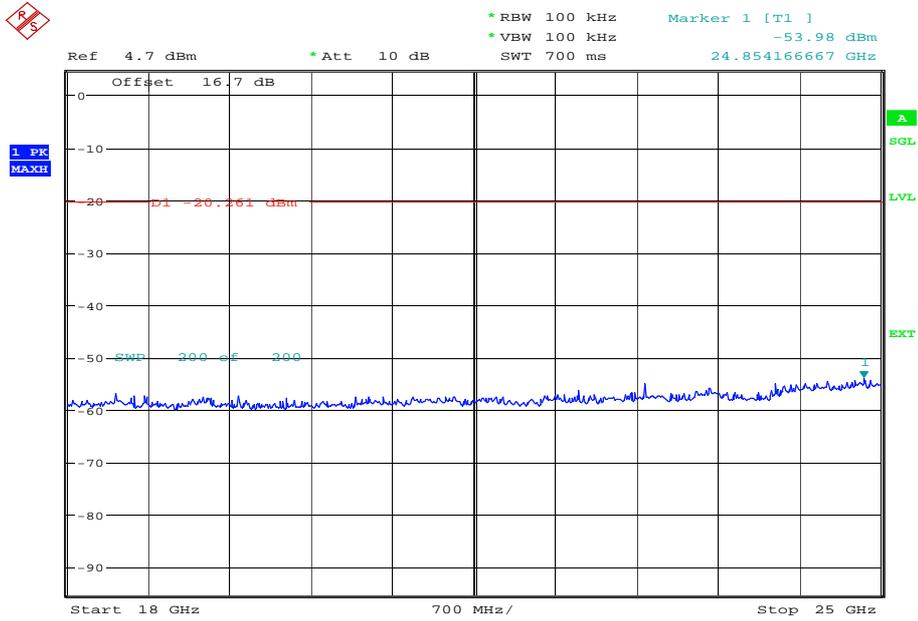


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Product Service

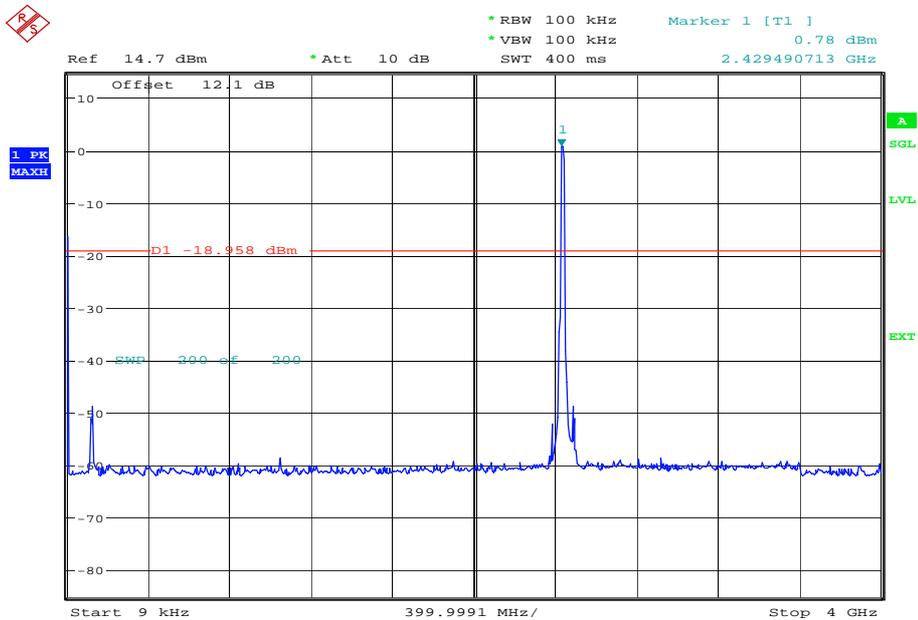
18 GHz to 25 GHz



Date: 8.JAN.2014 18:58:01

2437 MHz

9 kHz to 4 GHz

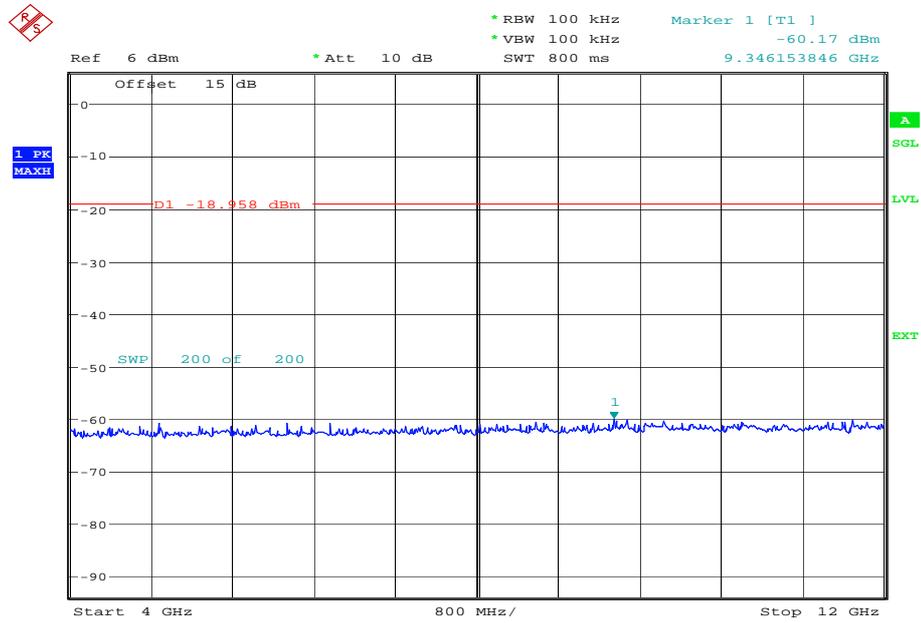


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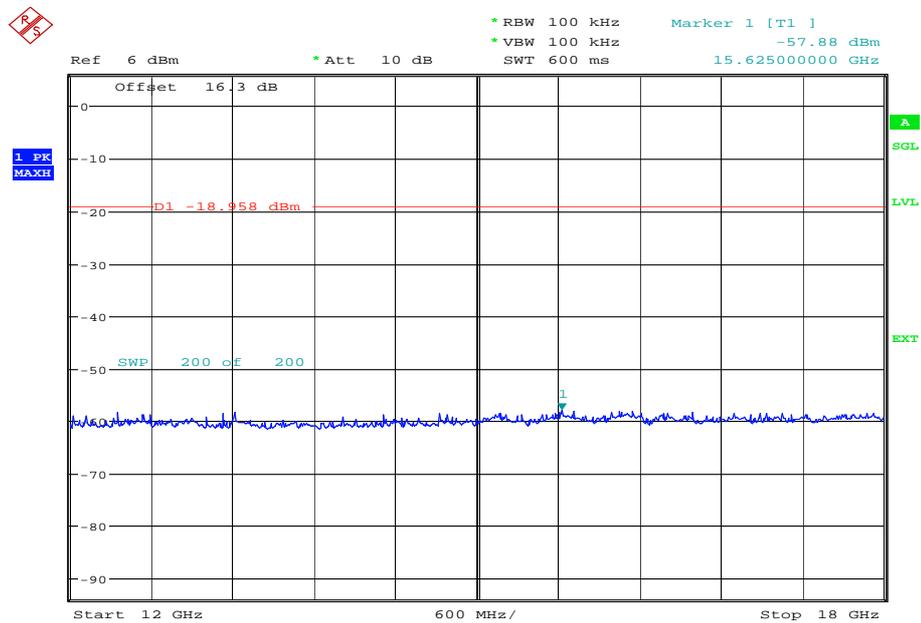
Product Service

### 4 GHz to 12 GHz



Date: 9.JAN.2014 14:17:23

### 12 GHz to 18 GHz

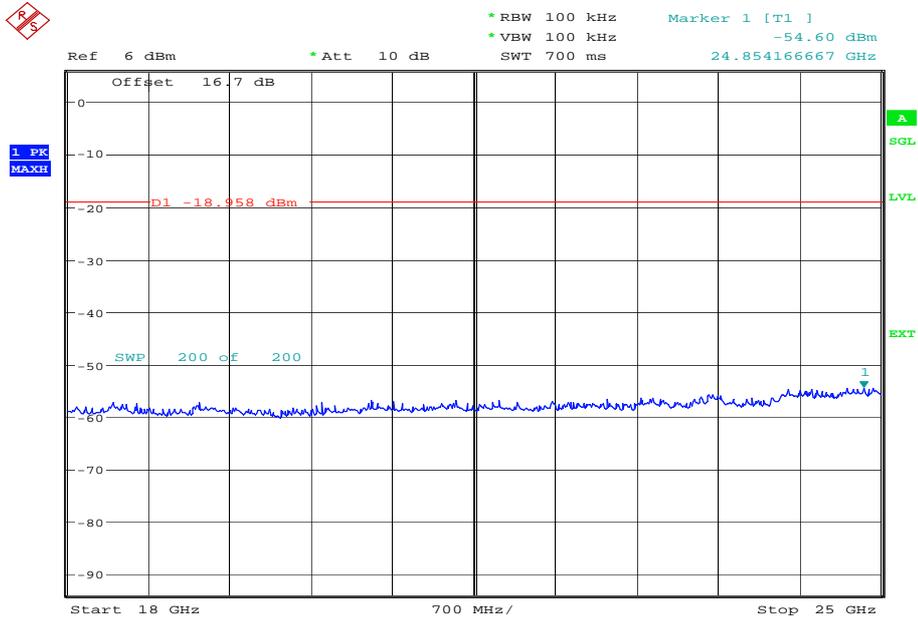


Date: 9.JAN.2014 14:20:03



Product Service

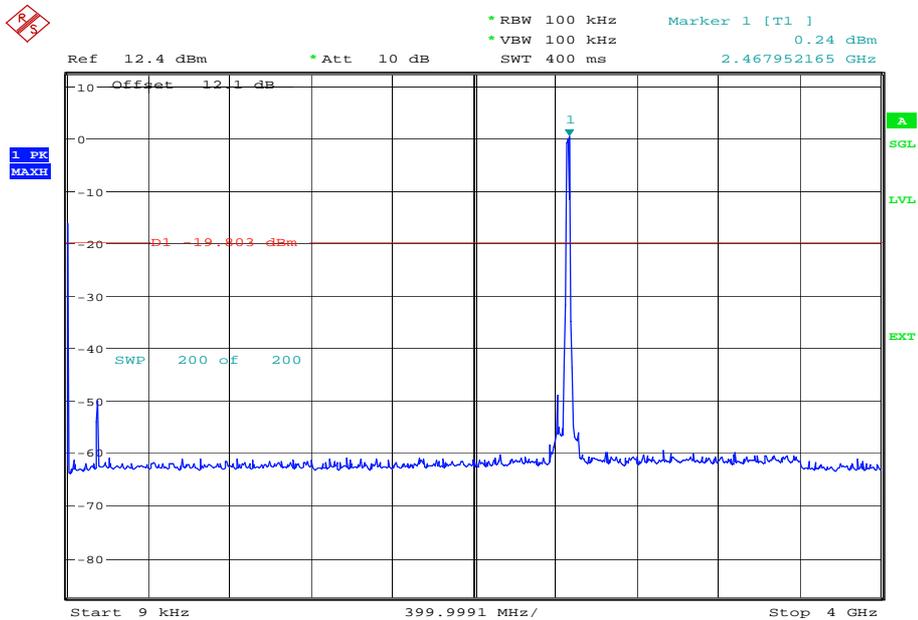
18 GHz to 25 GHz



Date: 8.JAN.2014 18:53:53

2462 MHz

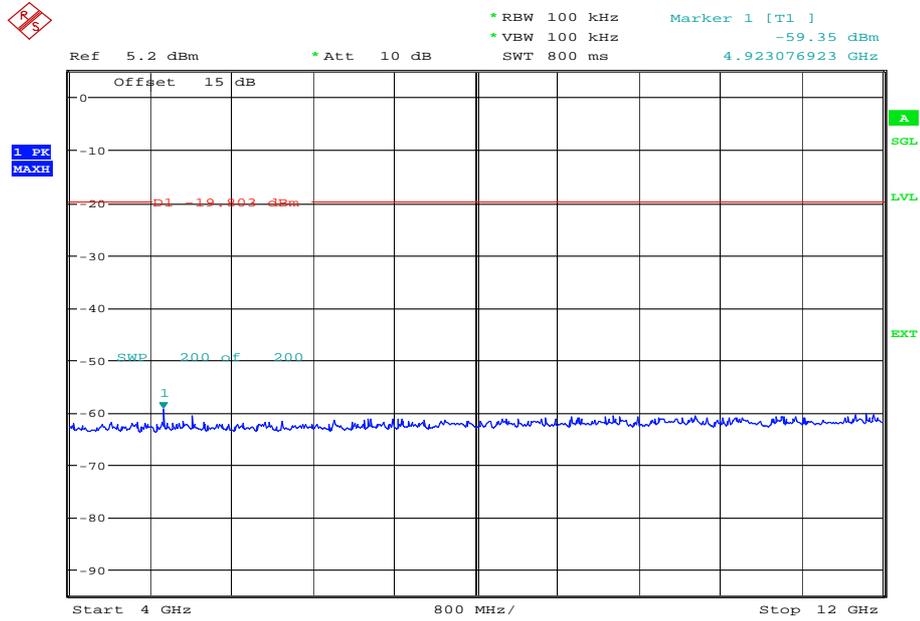
9 kHz to 4 GHz



Date: 8.JAN.2014 16:38:05

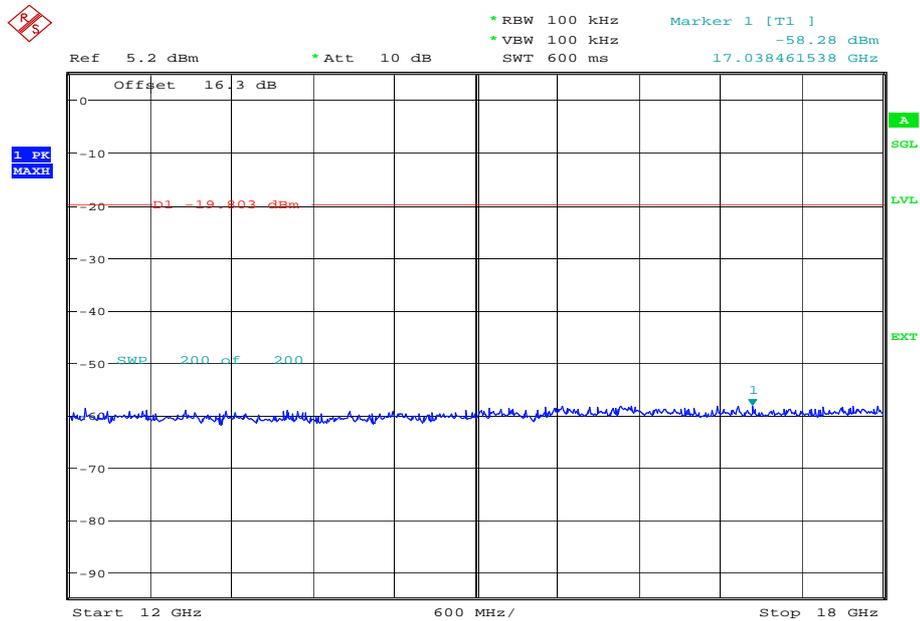


4 GHz to 12 GHz



Date: 9.JAN.2014 14:23:55

12 GHz to 18 GHz

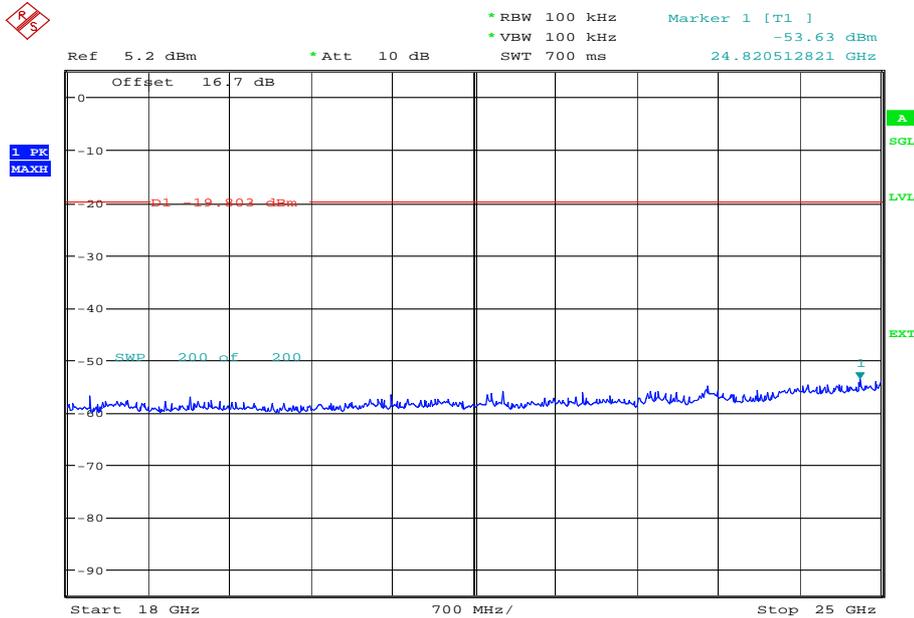


Date: 9.JAN.2014 14:26:32



Product Service

18 GHz to 25 GHz



Date: 9.JAN.2014 16:37:31

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.

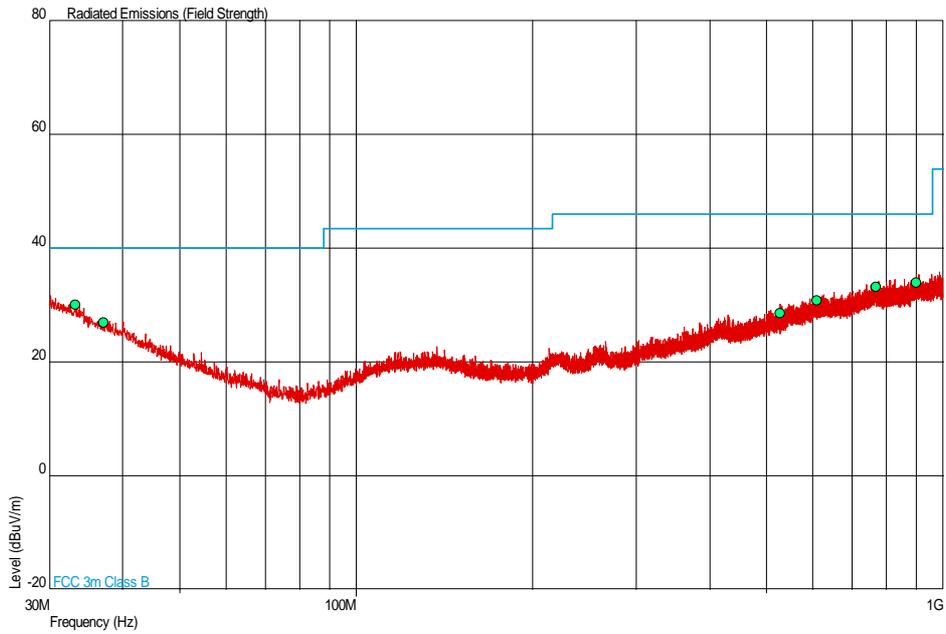
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Spurious Radiated Emissions

2412 MHz

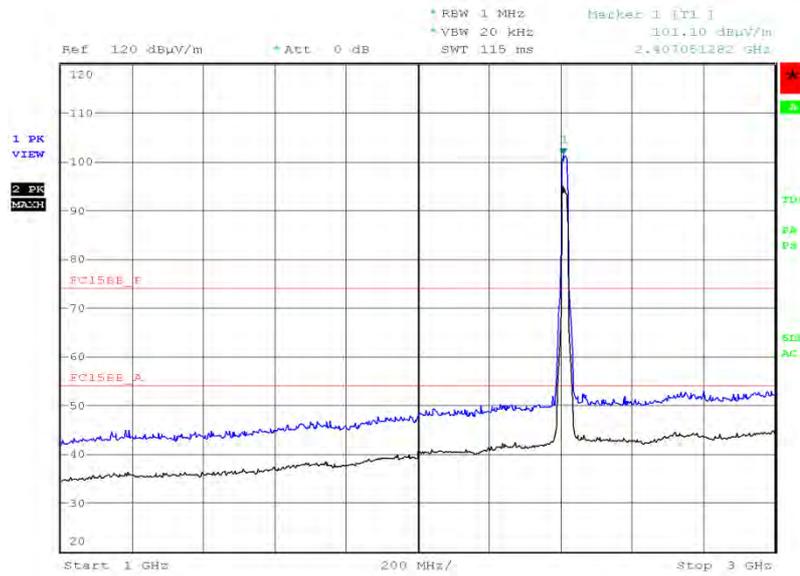
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
33.254	30.1	32.0	40.0	100	-9.9	68.0	259	2.84	Vertical
37.184	27.0	22.4	40.0	100	-13.0	77.6	175	1.00	Horizontal
528.078	28.6	26.9	46.0	200	-17.4	173.1	223	1.00	Vertical
609.681	30.9	35.1	46.0	200	-15.1	164.9	0	1.00	Vertical
767.259	33.3	46.2	46.0	200	-12.7	153.8	54	1.00	Vertical
900.531	34.0	50.1	46.0	200	-12.0	149.9	179	1.00	Vertical

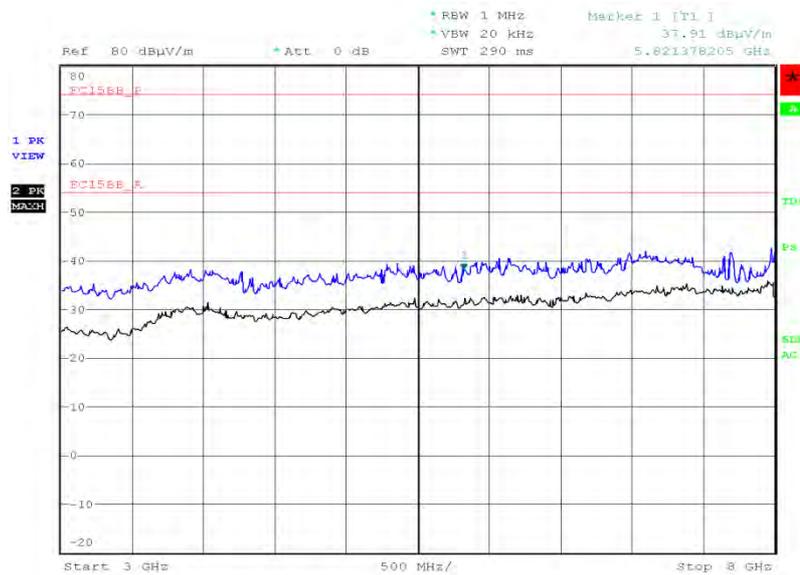


1 GHz to 3 GHz



Date: 9.JAN.2014 22:29:15

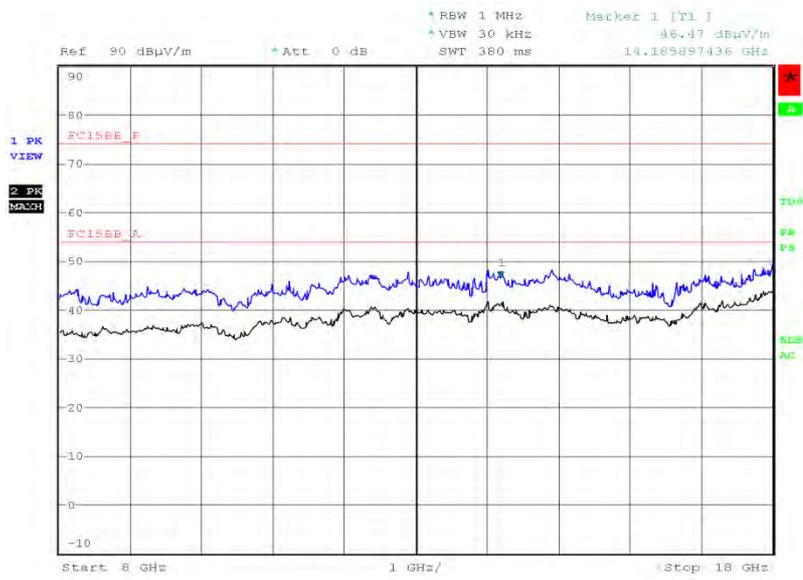
3 GHz to 8 GHz



Date: 11.JAN.2014 05:24:35

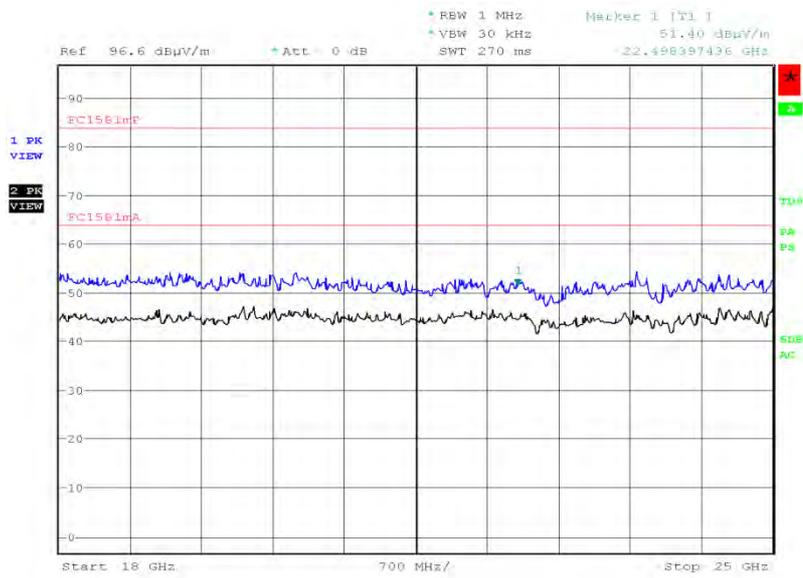


8 GHz to 18 GHz



Date: 10.JAN.2014 23:58:55

18 GHz to 25 GHz



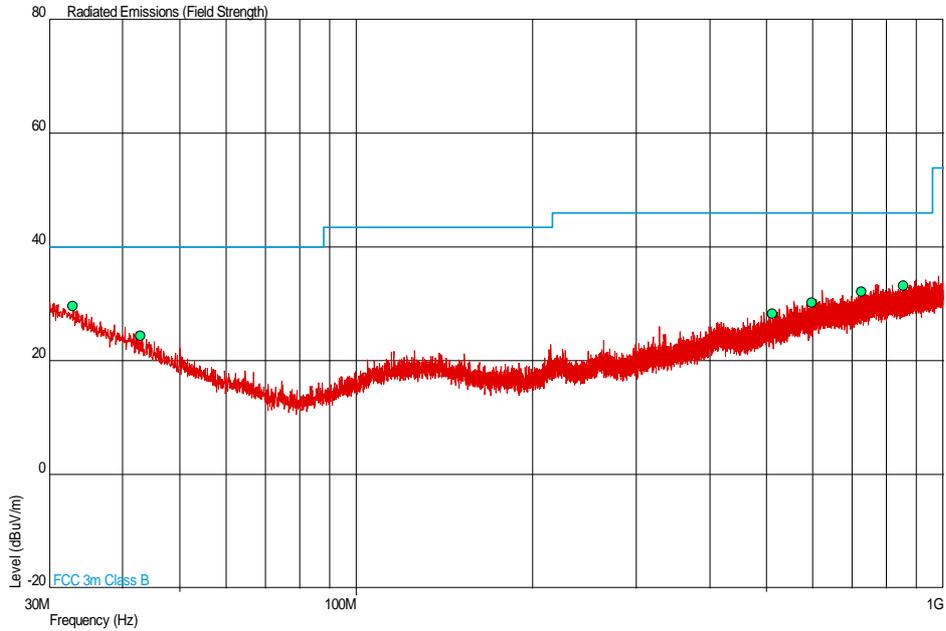
Date: 11.JAN.2014 03:24:27



Product Service

2437 MHz

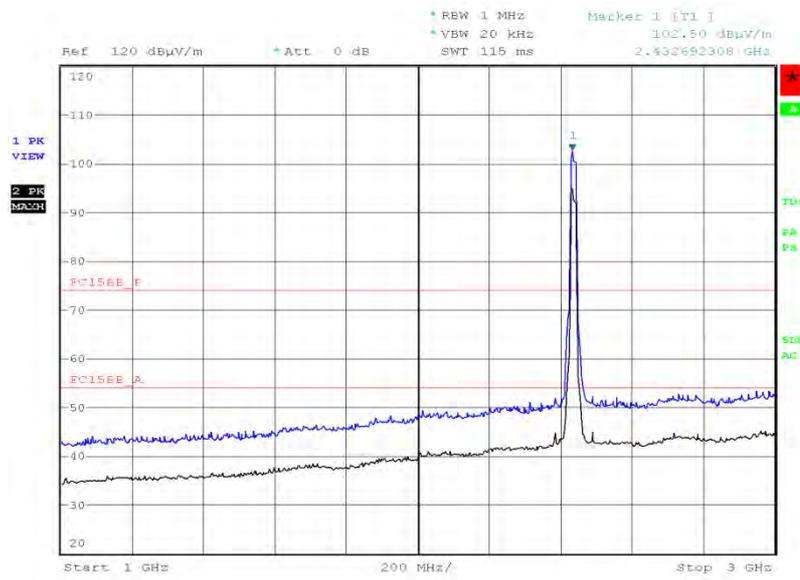
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
32.900	29.7	30.5	40.0	100	-10.3	69.5	348	1.00	Vertical
42.866	24.4	16.6	40.0	100	-15.6	83.4	228	1.00	Vertical
512.403	28.4	26.3	46.0	200	-17.6	173.7	137	1.00	Vertical
596.509	30.2	32.4	46.0	200	-15.8	167.6	67	2.00	Vertical
725.140	32.2	40.7	46.0	200	-13.8	159.3	310	1.15	Vertical
855.074	33.2	45.7	46.0	200	-12.8	154.3	236	1.98	Vertical

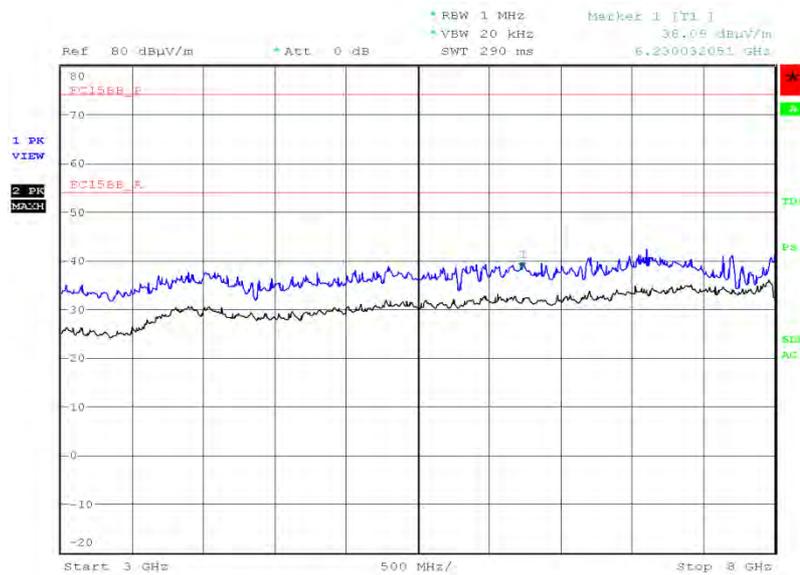


1 GHz to 3 GHz



Date: 9.JAN.2014 22:34:27

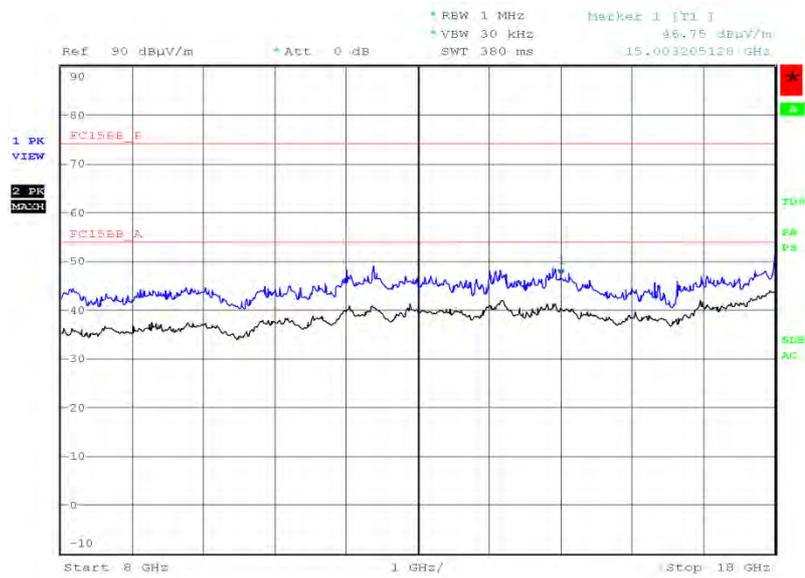
3 GHz to 8 GHz



Date: 11.JAN.2014 05:26:52

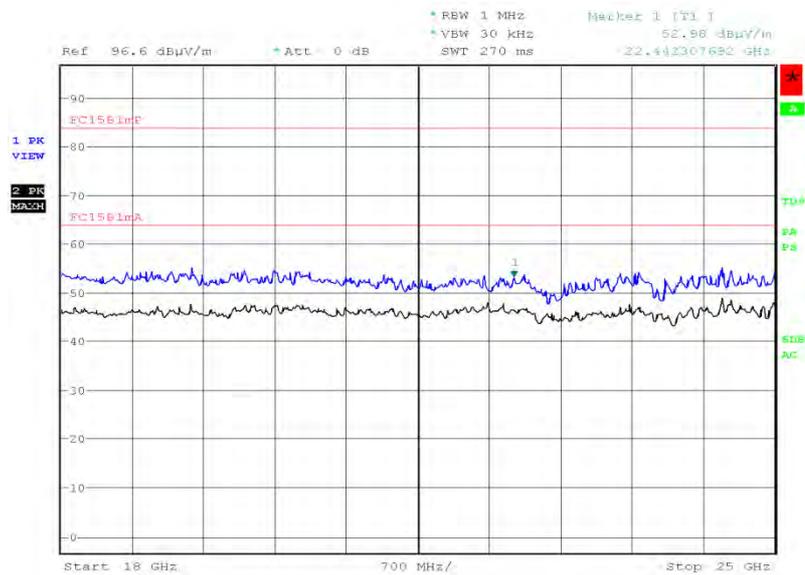


8 GHz to 18 GHz



Date: 11.JAN.2014 00:04:56

18 GHz to 25 GHz

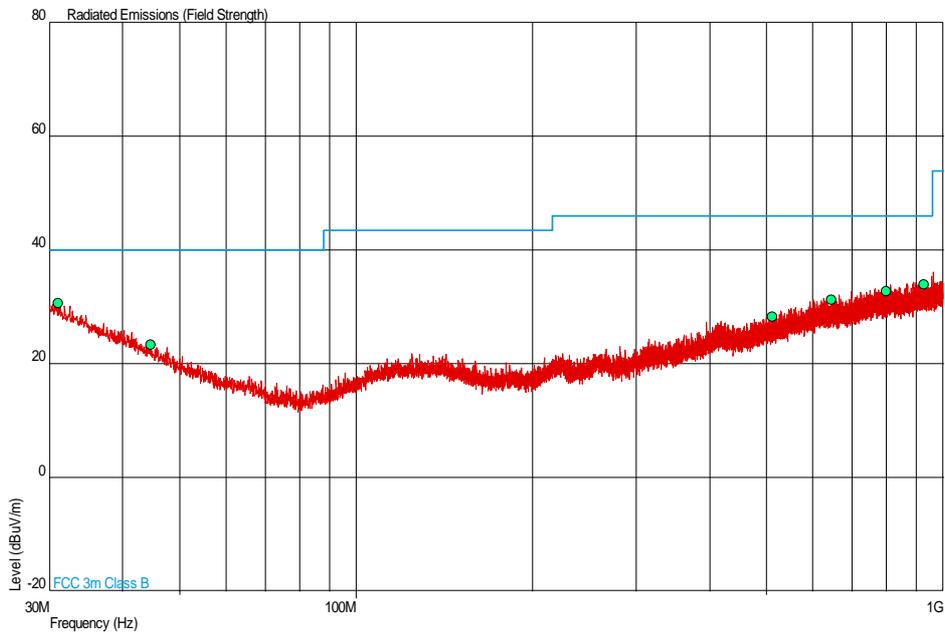


Date: 11.JAN.2014 03:32:47



2462 MHz

30 MHz to 1 GHz



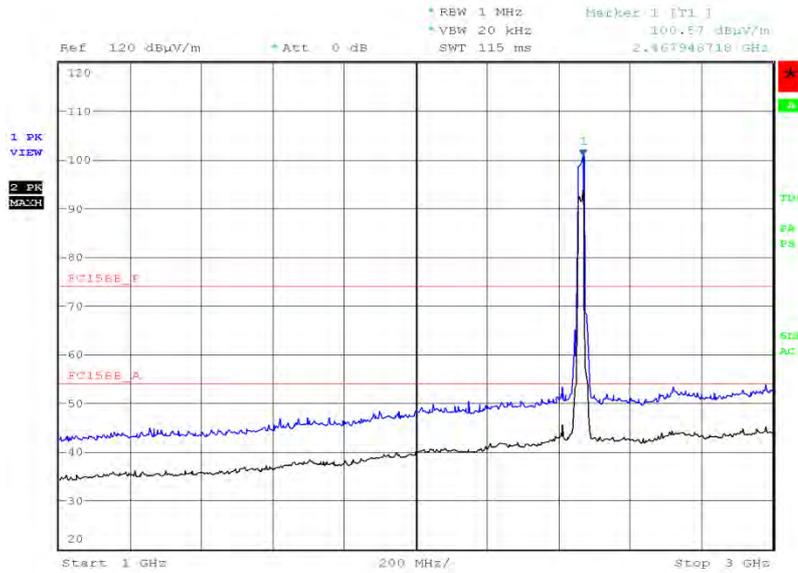
Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
31.026	30.7	34.3	40.0	100	-9.3	65.7	190	1.00	Horizontal
44.661	23.4	14.8	40.0	100	-16.6	85.2	0	1.00	Horizontal
512.197	28.4	26.3	46.0	200	-17.6	173.7	277	1.00	Vertical
644.617	31.3	36.7	46.0	200	-14.7	163.3	88	1.62	Vertical
798.516	32.7	43.2	46.0	200	-13.3	156.8	235	1.83	Horizontal
928.642	34.0	50.1	46.0	200	-12.0	149.9	311	1.00	Horizontal



1 GHz to 25 GHz

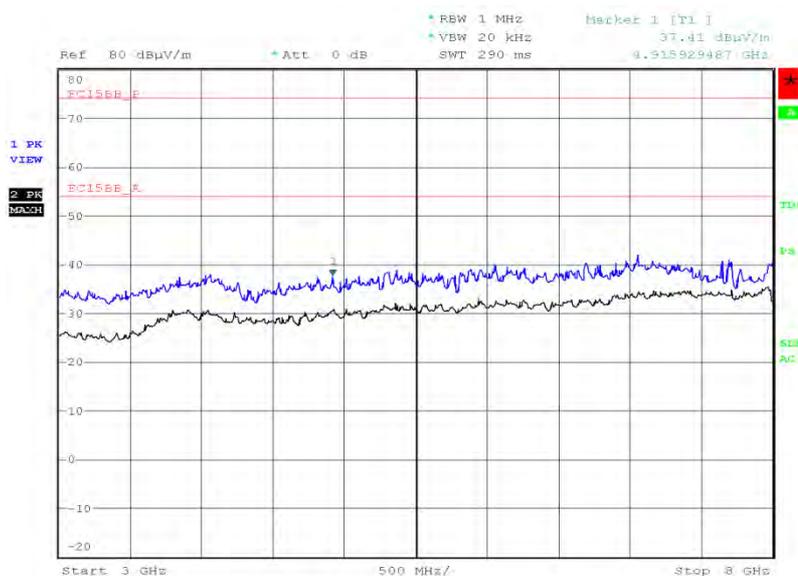
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
4.924	Horizontal	150	166	43.57	37.91

1 GHz to 3 GHz



Date: 9.JAN.2014 22:39:23

3 GHz to 8 GHz

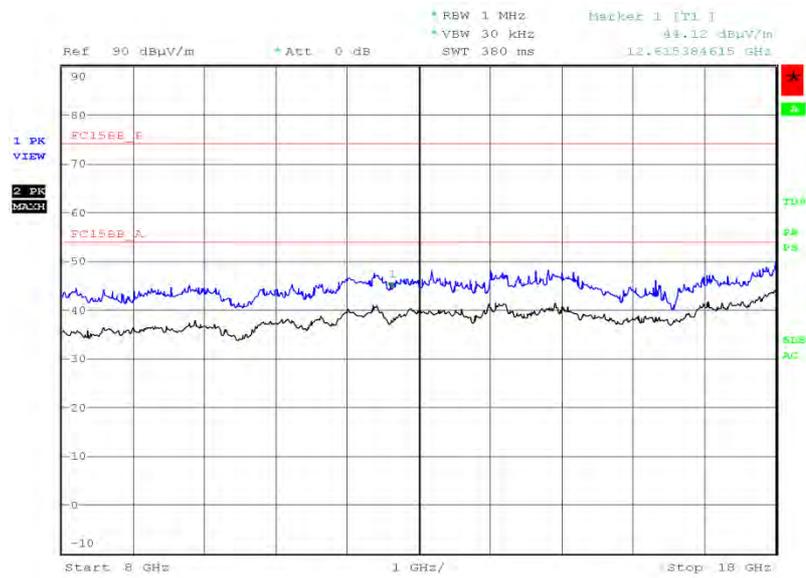


Date: 11.JAN.2014 05:28:58



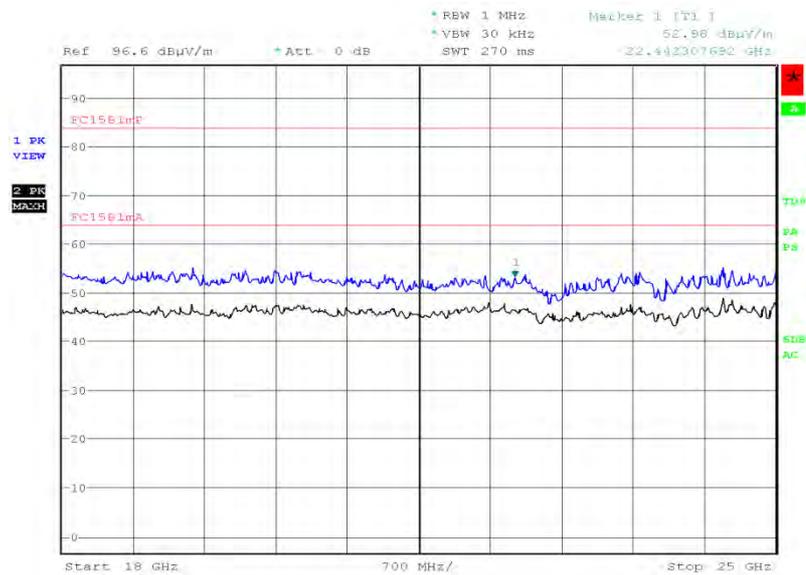
Product Service

8 GHz to 18 GHz



Date: 11.JAN.2014 00:11:08

18 GHz to 25 GHz



Date: 11.JAN.2014 03:32:47

Limit

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

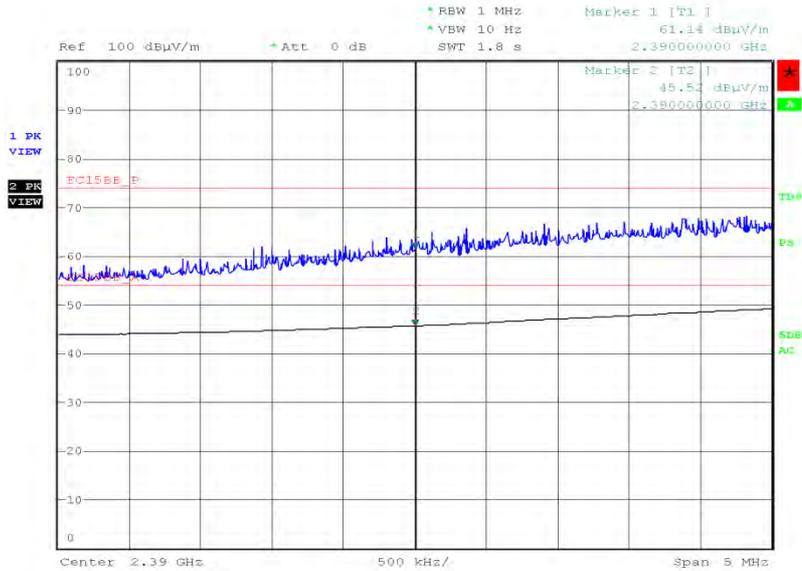


Product Service

Band Edge Emissions

2412 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	61.14	45.52

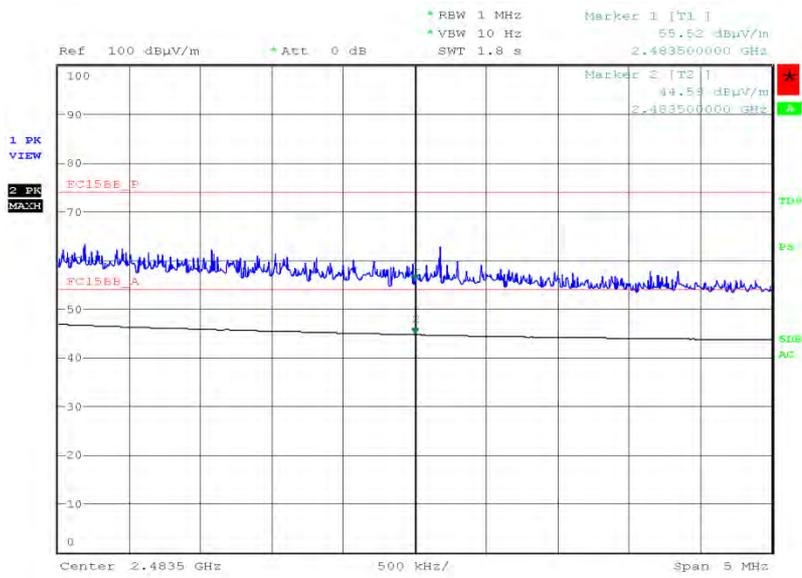


Date: 9.JAN.2014 21:35:38



2462 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	55.52	44.63



Date: 9.JAN.2014 21:41:20

Limit

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



Product Service

802.11(n)

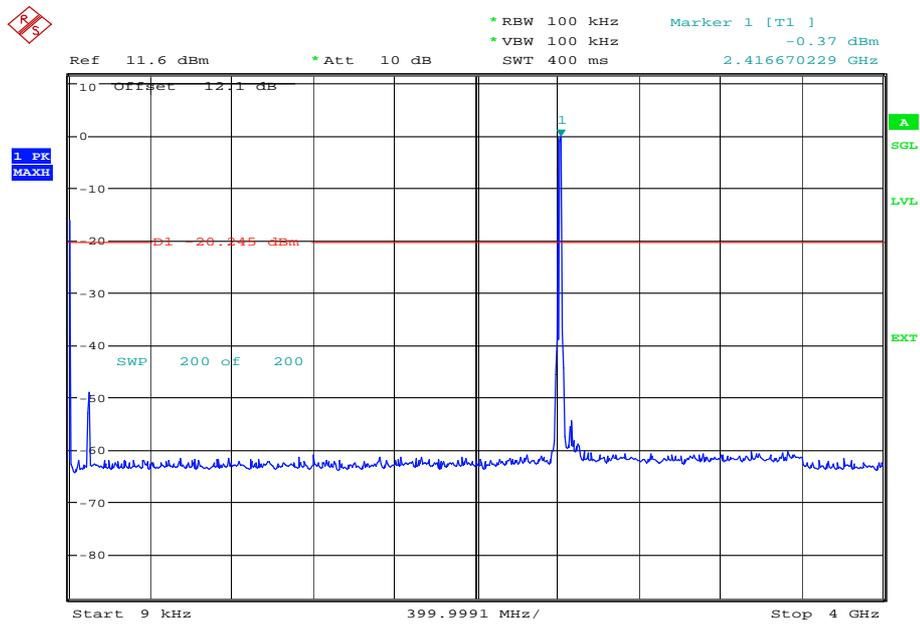
4.0 V DC Supply

Spurious Conducted Emissions

6.5 Mbps

2412 MHz

9 kHz to 4 GHz

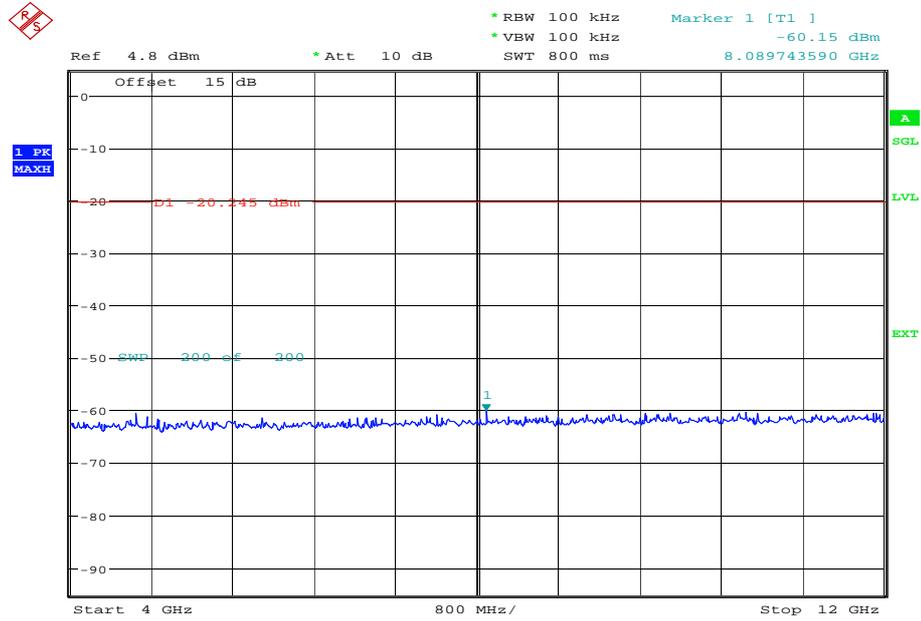


Date: 8.JAN.2014 16:41:42



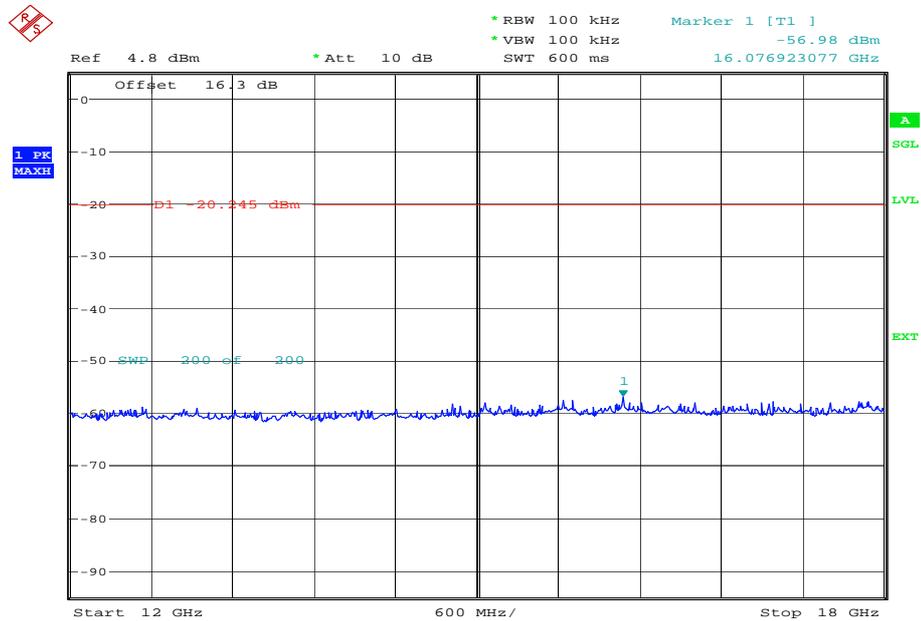
Product Service

### 4 GHz to 12 GHz



Date: 9.JAN.2014 13:04:44

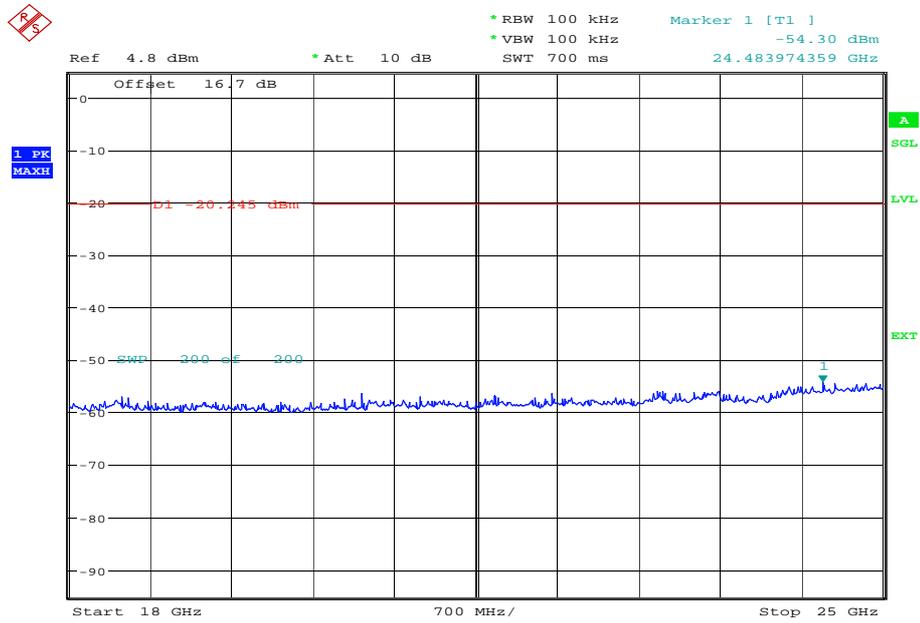
### 12 GHz to 18 GHz



Date: 9.JAN.2014 13:07:55



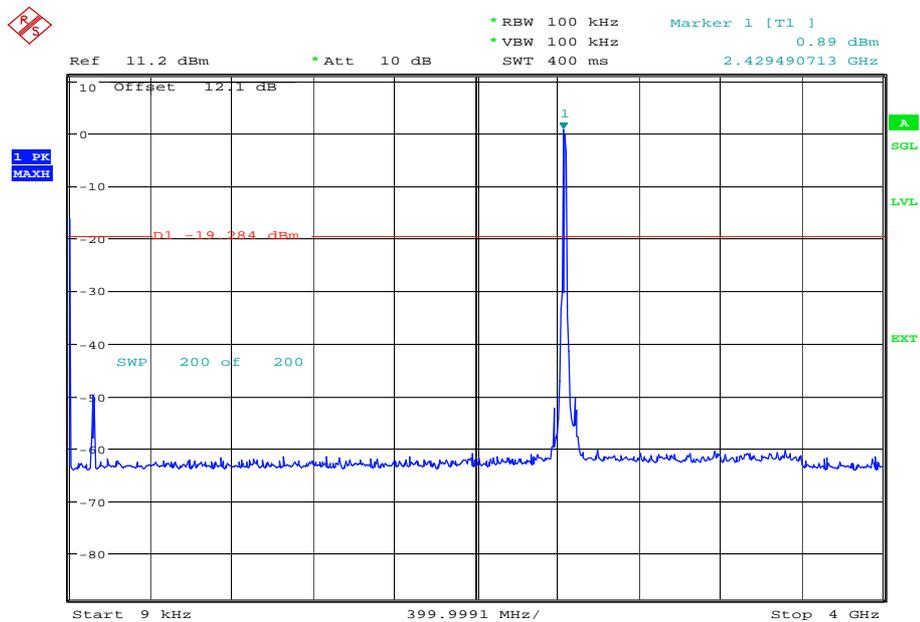
18 GHz to 25 GHz



Date: 8.JAN.2014 19:24:31

2437 MHz

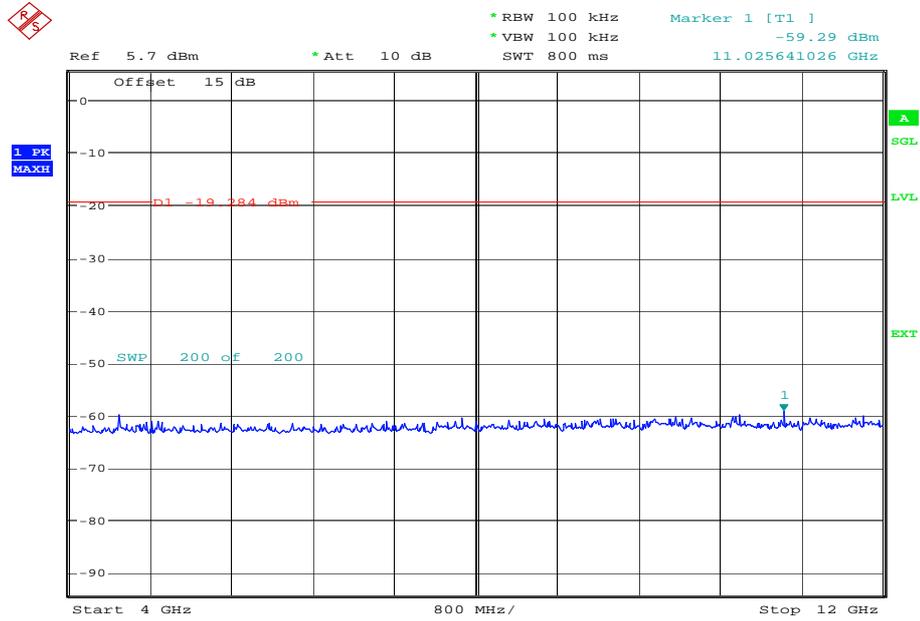
9 kHz to 4 GHz



Date: 8.JAN.2014 16:44:53

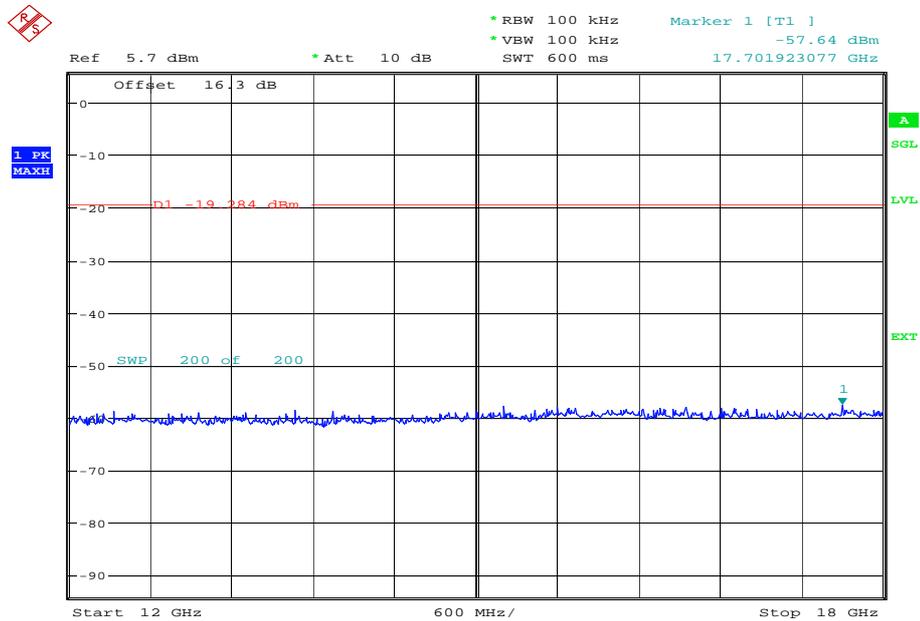


4 GHz to 12 GHz



Date: 9.JAN.2014 13:12:03

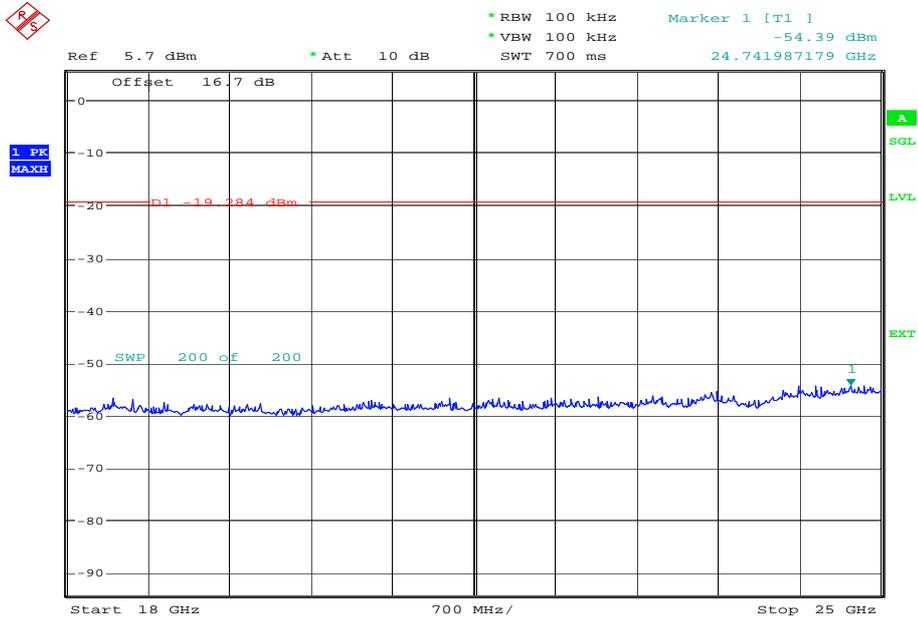
12 GHz to 18 GHz



Date: 9.JAN.2014 13:14:31



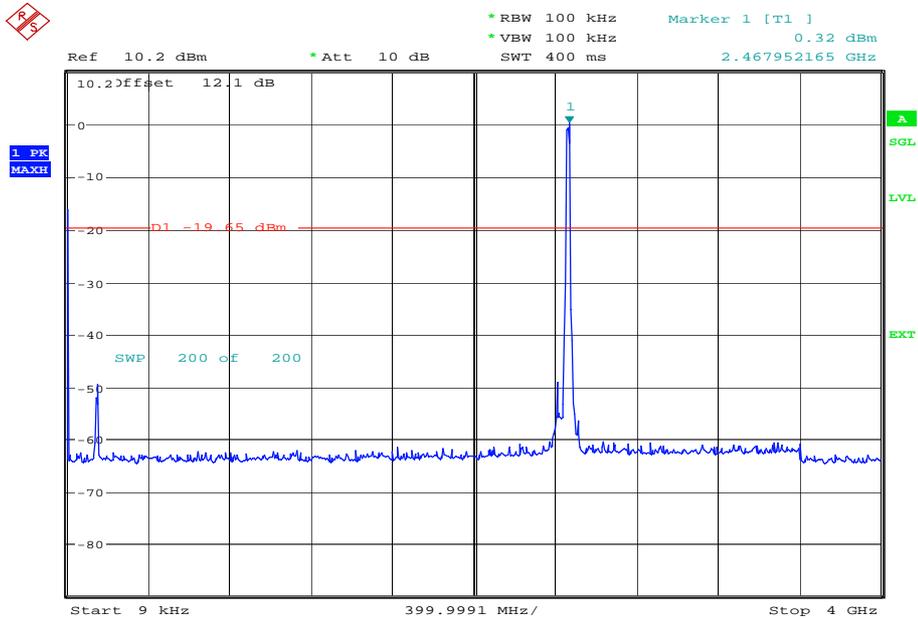
18 GHz to 25 GHz



Date: 8.JAN.2014 19:13:18

2462 MHz

9 kHz to 4 GHz

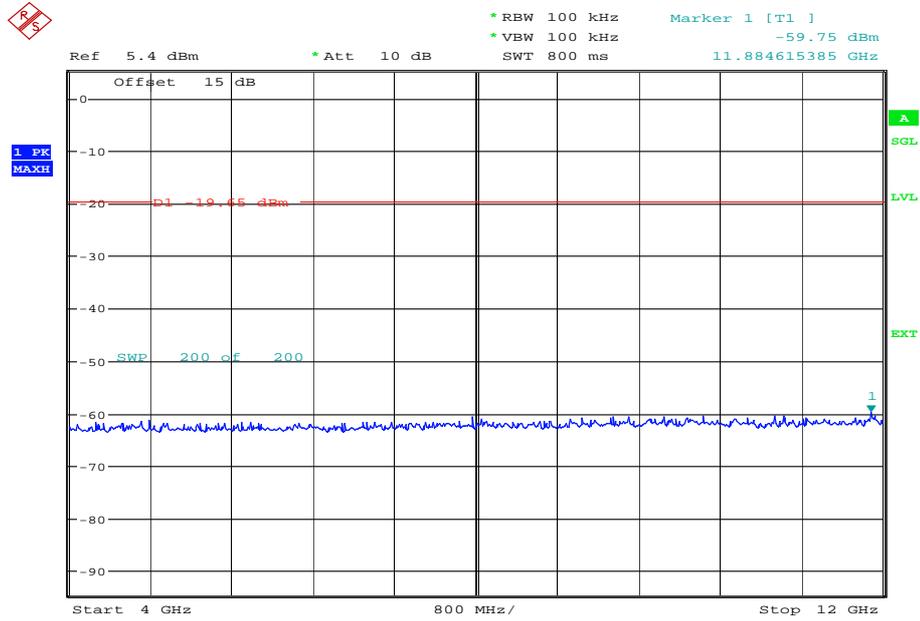


Date: 8.JAN.2014 16:48:09



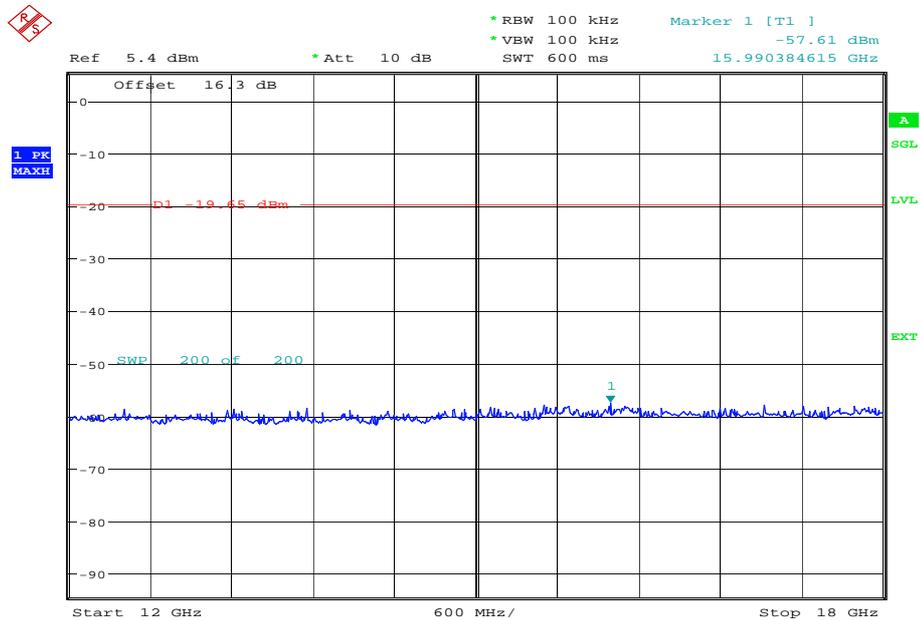
Product Service

### 4 GHz to 12 GHz



Date: 9.JAN.2014 13:18:40

### 12 GHz to 18 GHz

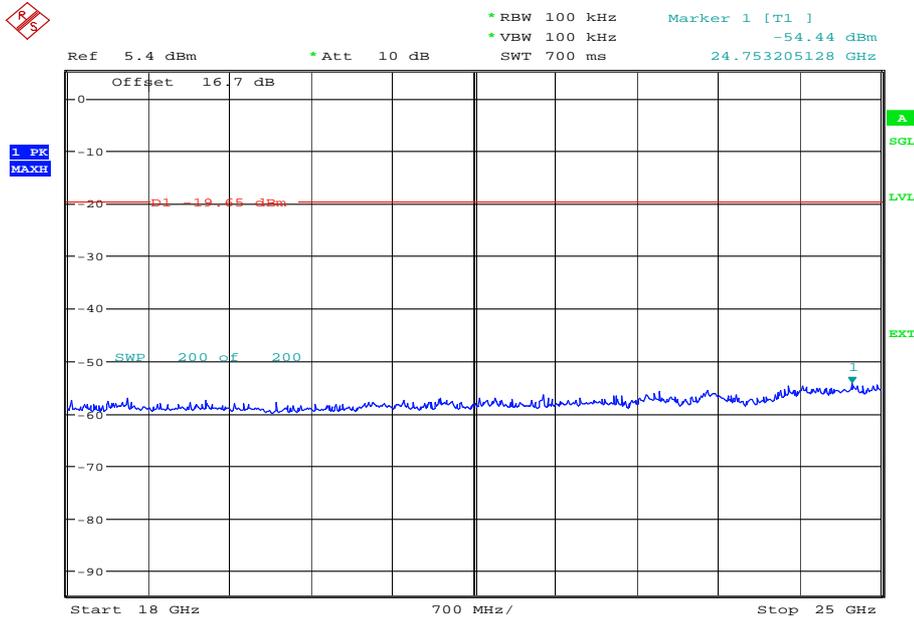


Date: 9.JAN.2014 13:21:12



Product Service

18 GHz to 25 GHz



Date: 8.JAN.2014 19:17:28

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.

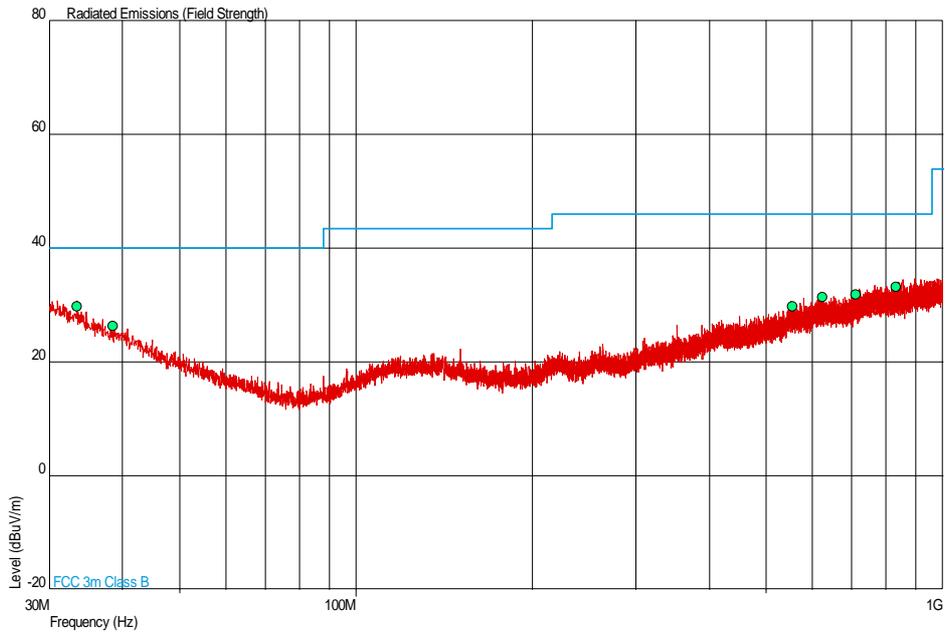
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Spurious Radiated Emissions

2412 MHz

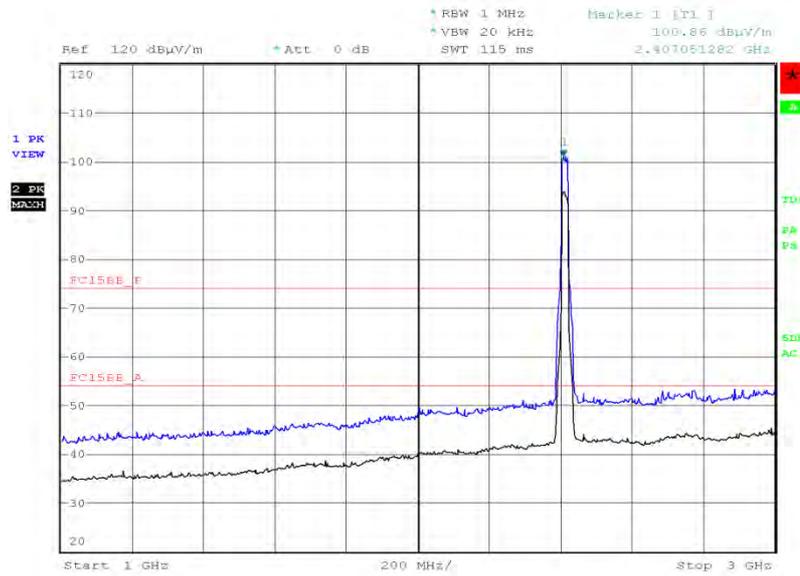
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
33.433	29.8	30.9	40.0	100	-10.2	69.1	26	1.11	Vertical
38.468	26.4	20.9	40.0	100	-13.6	79.1	356	1.00	Vertical
554.267	29.7	30.5	46.0	200	-16.3	169.5	12	1.00	Vertical
623.580	31.3	36.7	46.0	200	-14.7	163.3	216	1.02	Vertical
712.073	31.9	39.4	46.0	200	-14.1	160.6	61	2.01	Vertical
833.720	33.2	45.7	46.0	200	-12.8	154.3	82	1.00	Vertical

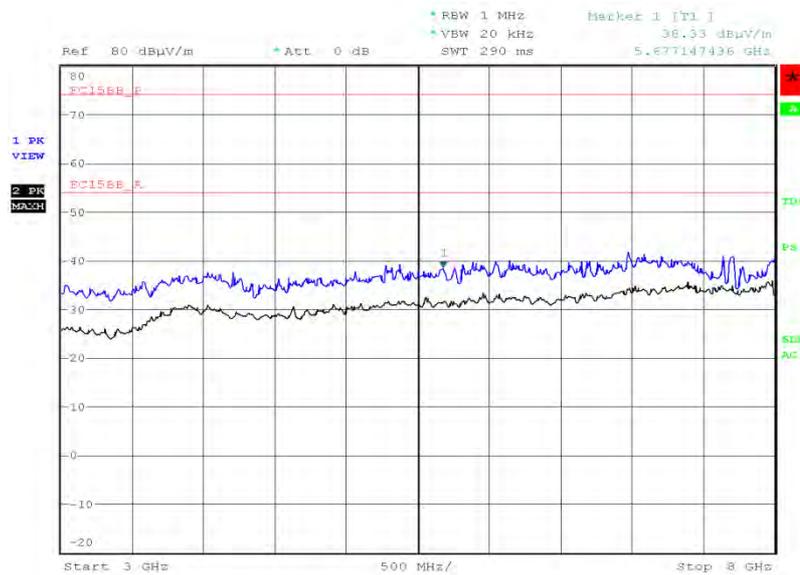


1 GHz to 3 GHz



Date: 9.JAN.2014 22:46:12

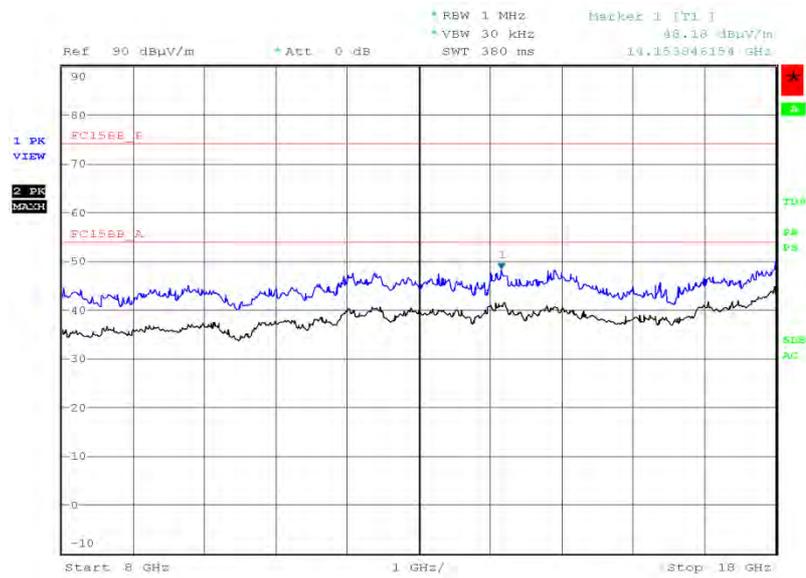
3 GHz to 8 GHz



Date: 11.JAN.2014 05:32:47

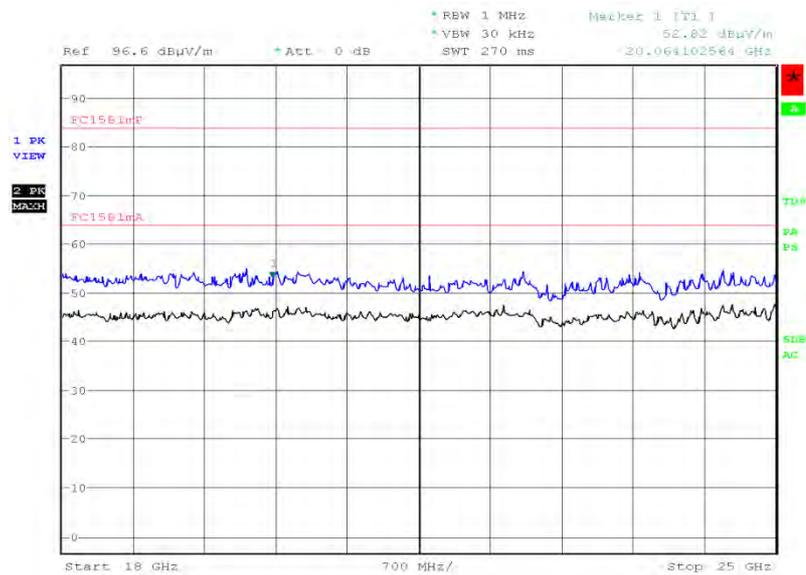


8 GHz to 18 GHz



Date: 11.JAN.2014 00:15:57

18 GHz to 25 GHz



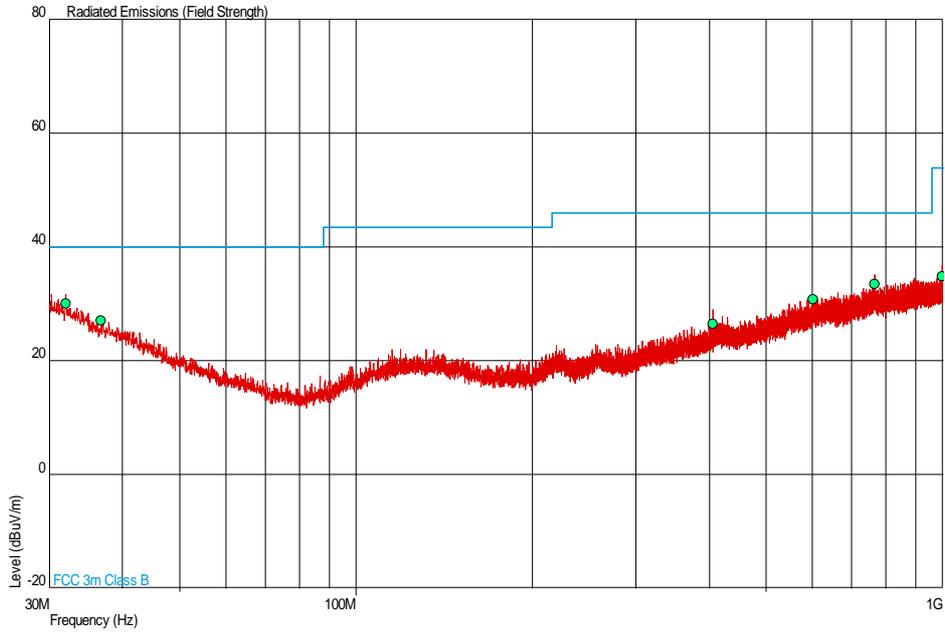
Date: 11.JAN.2014 03:43:20



Product Service

2437 MHz

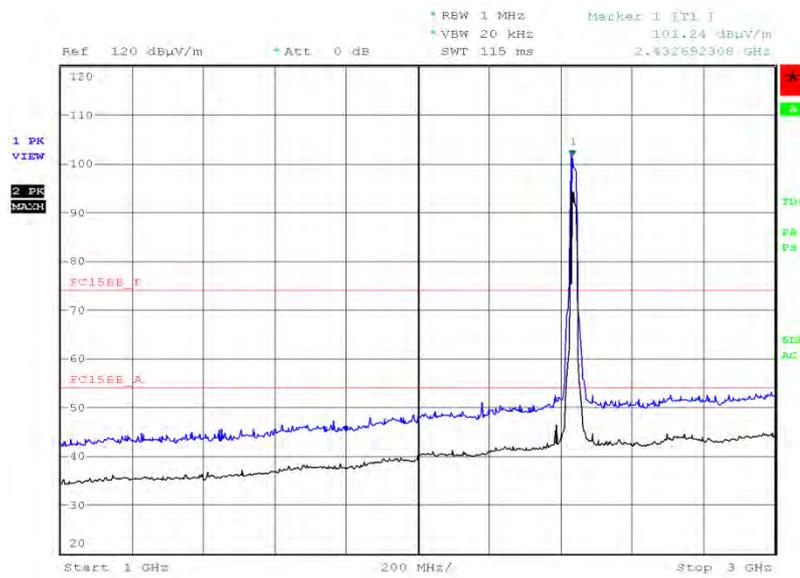
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
31.985	30.1	32.0	40.0	100	-9.9	68.0	30	1.00	Vertical
36.792	27.1	22.6	40.0	100	-12.9	77.4	212	1.00	Vertical
405.468	26.5	21.1	46.0	200	-19.5	178.9	2	1.00	Vertical
600.449	30.9	35.1	46.0	200	-15.1	164.9	324	1.00	Vertical
764.639	33.5	47.3	46.0	200	-12.5	152.7	239	1.00	Vertical
999.158	34.8	55.0	54.0	501	-19.2	446.0	262	1.00	Vertical

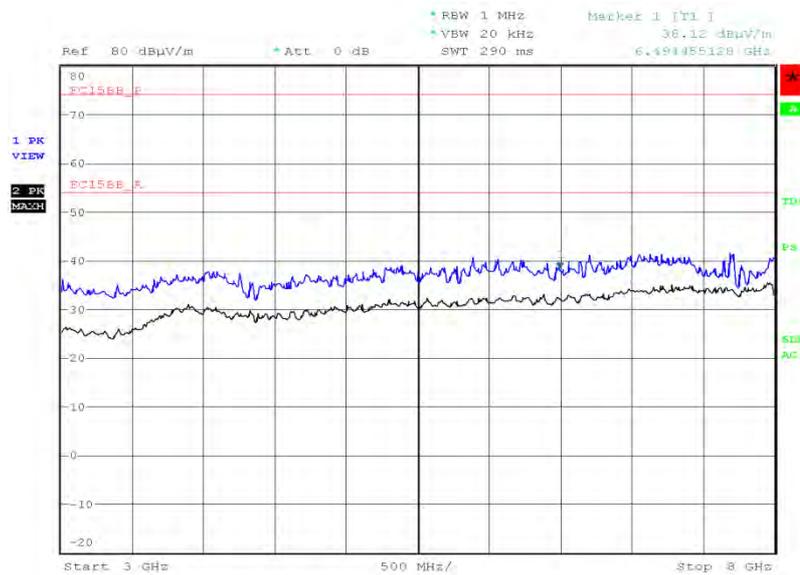


1 GHz to 3 GHz



Date: 9.JAN.2014 22:51:04

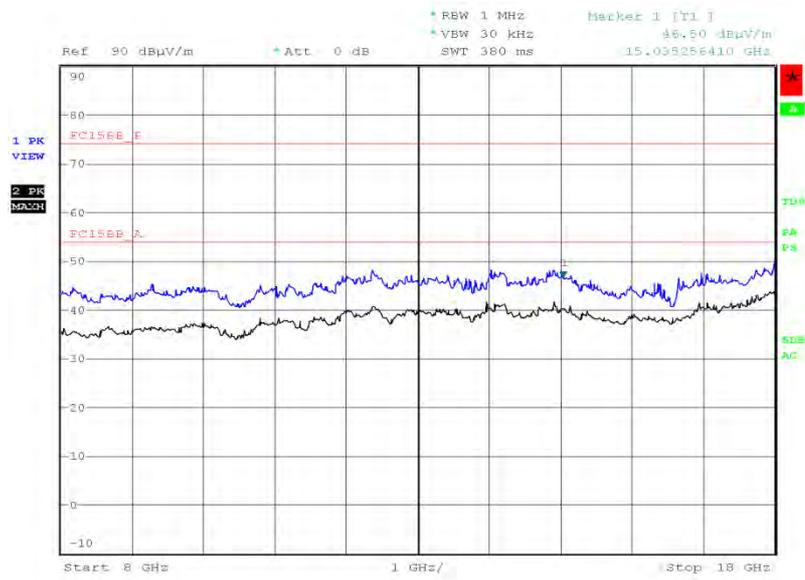
3 GHz to 8 GHz



Date: 11.JAN.2014 05:36:40

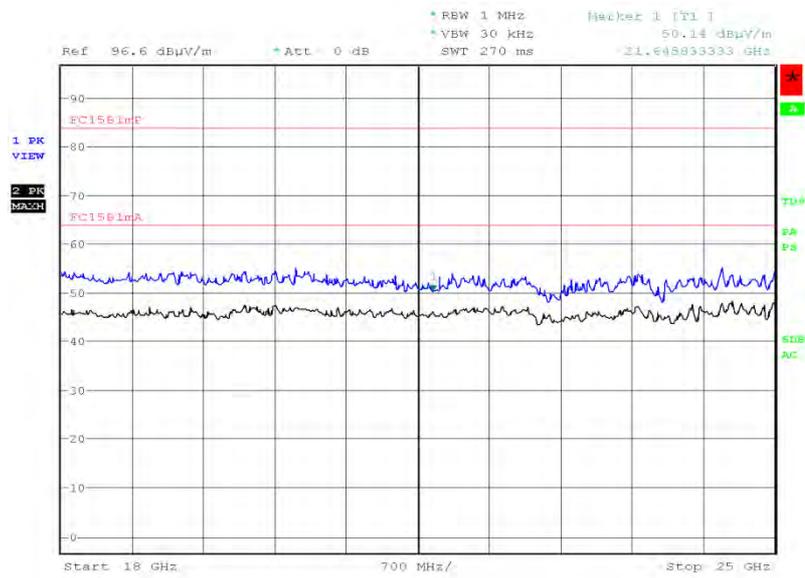


8 GHz to 18 GHz



Date: 11.JAN.2014 00:24:11

18 GHz to 25 GHz



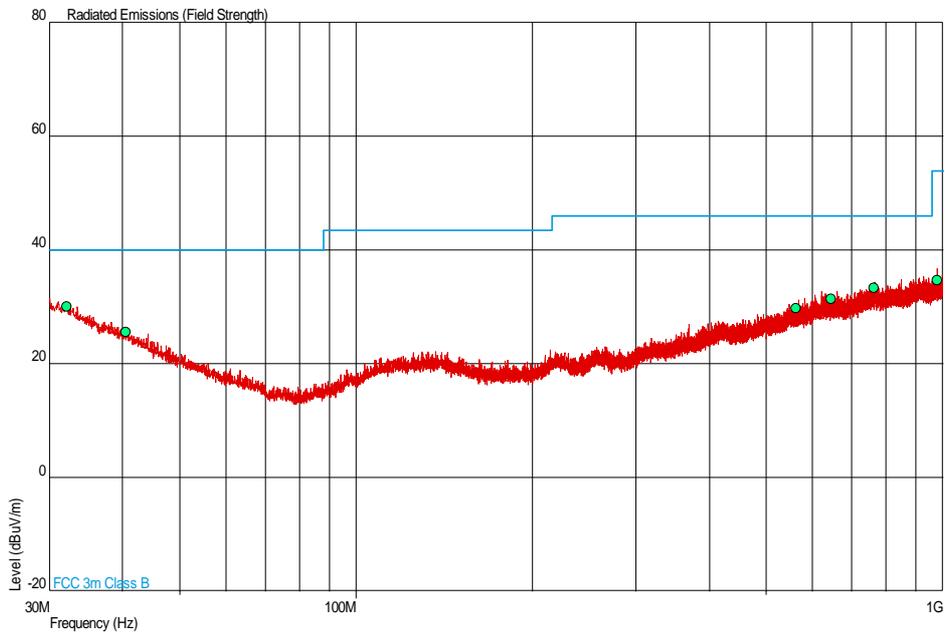
Date: 11.JAN.2014 03:48:37



Product Service

2462 MHz

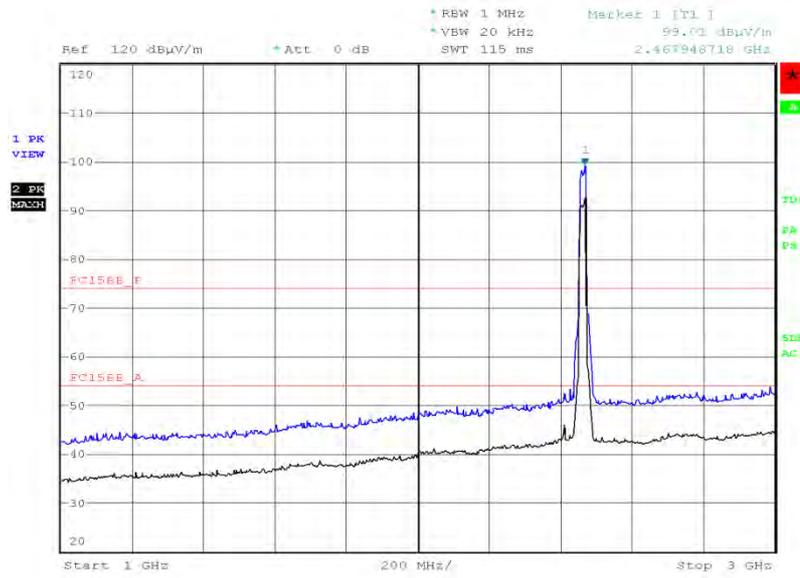
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
32.096	30.1	32.0	40.0	100	-9.9	68.0	19	1.00	Vertical
40.475	25.7	19.3	40.0	100	-14.3	80.7	265	1.00	Vertical
562.165	29.7	30.5	46.0	200	-16.3	169.5	3	1.00	Vertical
646.120	31.4	37.2	46.0	200	-14.6	162.8	43	1.00	Vertical
763.123	33.3	46.2	46.0	200	-12.7	153.8	356	1.00	Horizontal
978.710	34.6	53.7	54.0	501	-19.4	447.3	66	1.00	Vertical

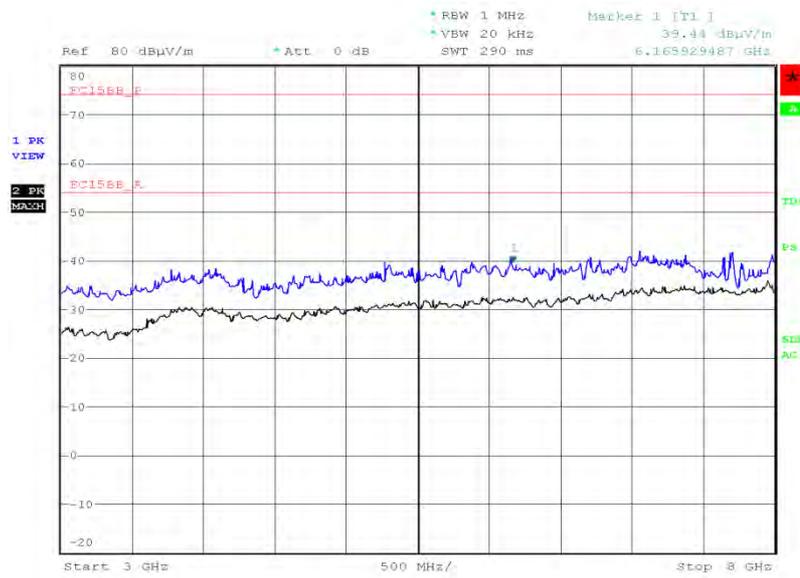


1 GHz to 3 GHz



Date: 9.JAN.2014 22:56:24

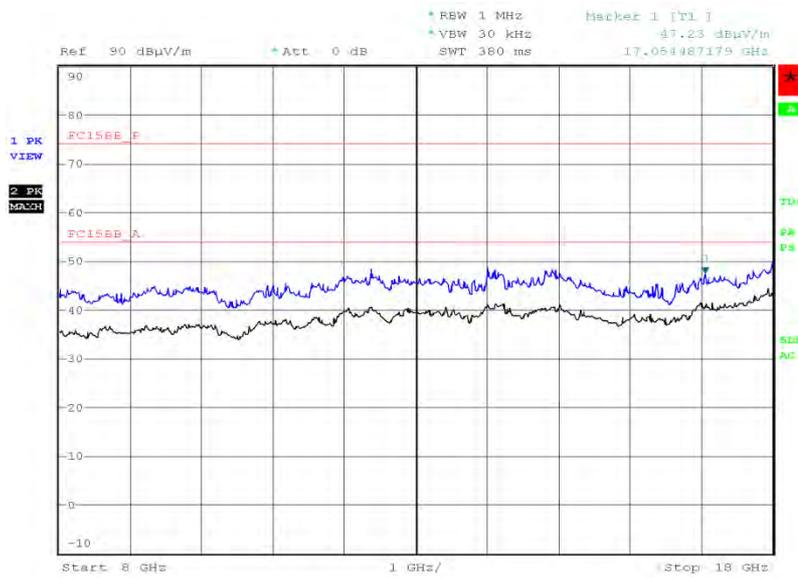
3 GHz to 8 GHz



Date: 11.JAN.2014 05:39:09

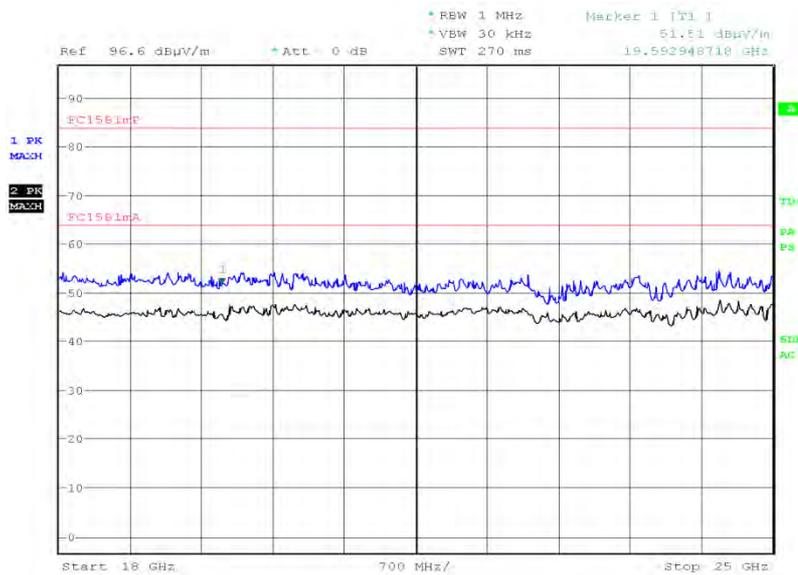


8 GHz to 18 GHz



Date: 11.JAN.2014 00:30:42

18 GHz to 25 GHz



Date: 11.JAN.2014 03:52:50

Limit

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

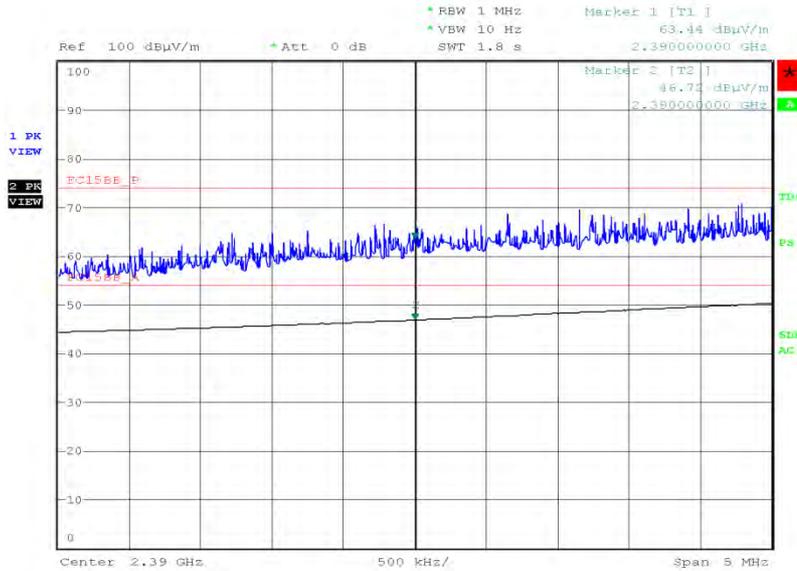


Product Service

Band Edge Emissions

2412 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	63.44	46.72

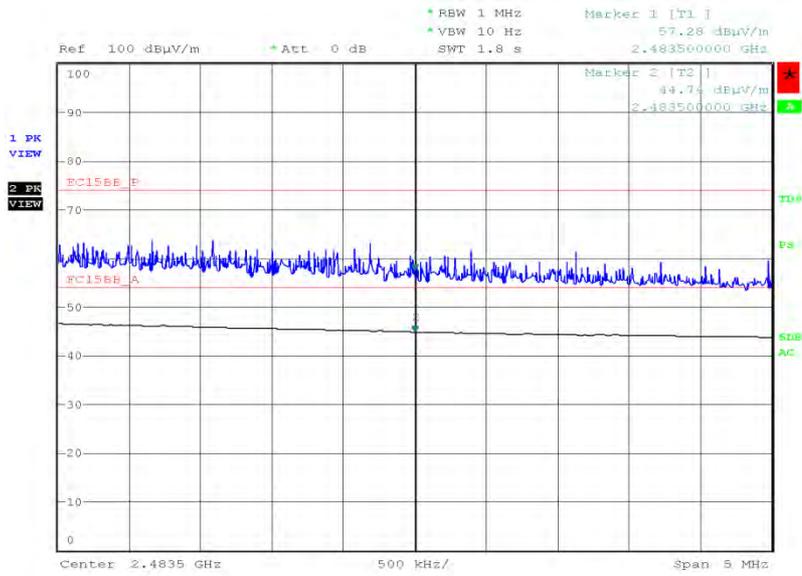


Date: 9.JAN.2014 21:25:00



2462 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	57.28	44.74



Date: 9.JAN.2014 21:21:33

Limit

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



Product Service

Bluetooth Low Energy

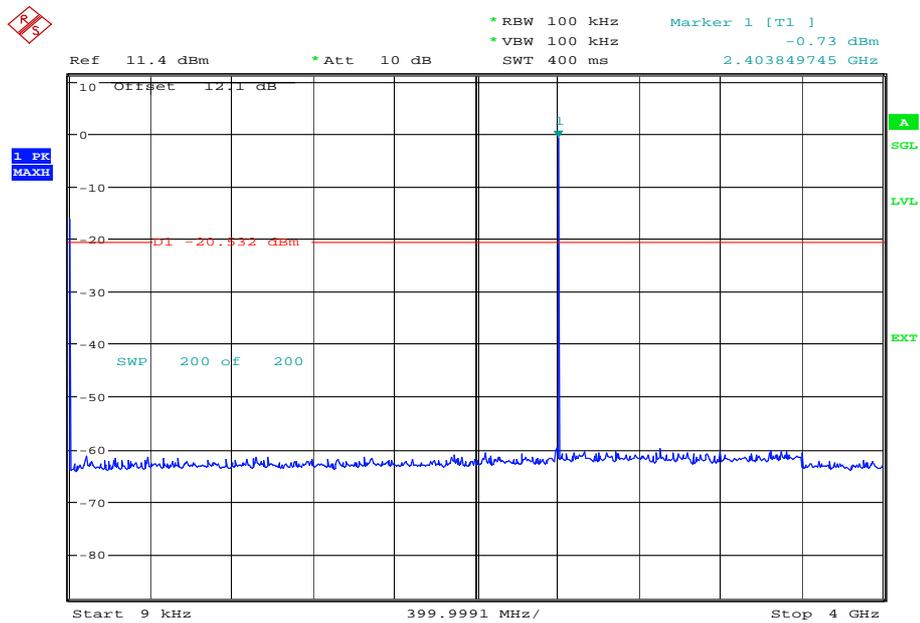
4.0 V DC Supply

Spurious Conducted Emissions

BLE

2402 MHz

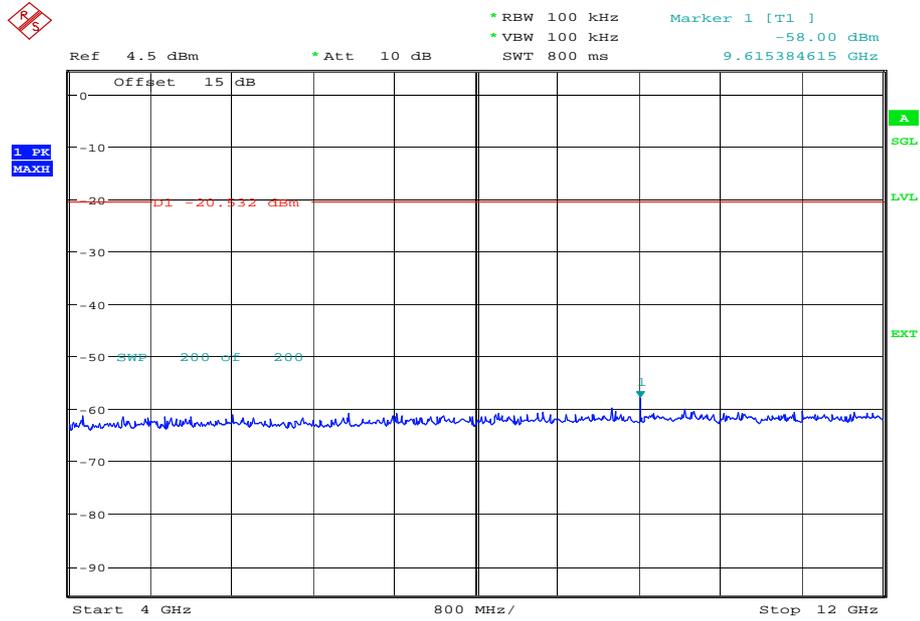
9 kHz to 4 GHz



Date: 8.JAN.2014 16:52:40

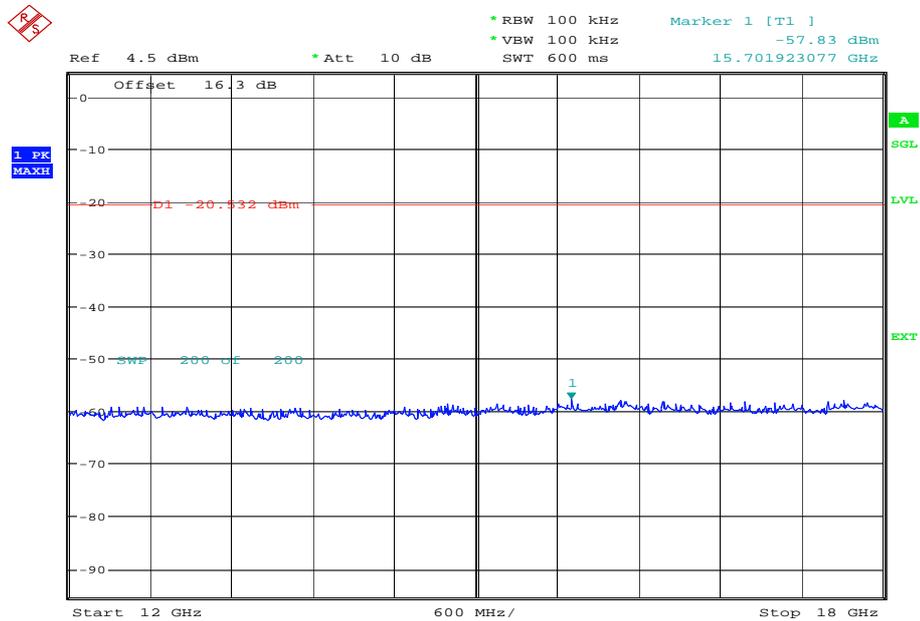


4 GHz to 12 GHz



Date: 9.JAN.2014 16:16:11

12 GHz to 18 GHz

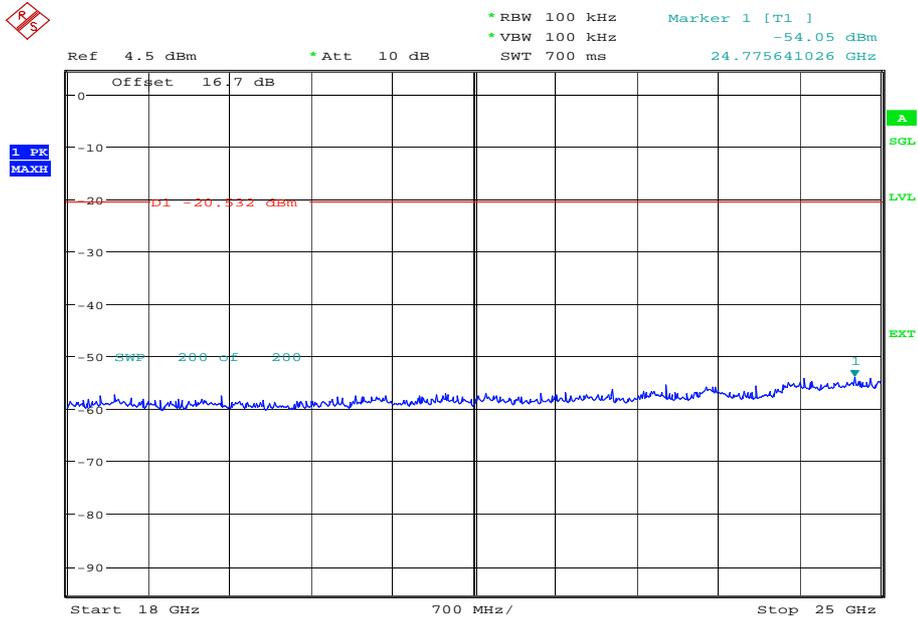


Date: 9.JAN.2014 14:59:27



Product Service

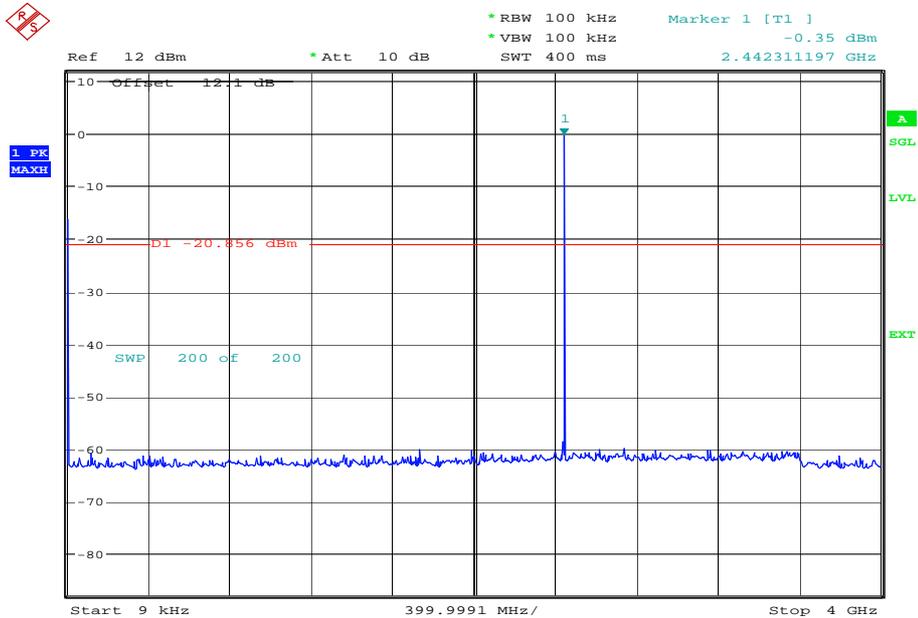
18 GHz to 25 GHz



Date: 9.JAN.2014 16:45:57

2440 MHz

9 kHz to 4 GHz

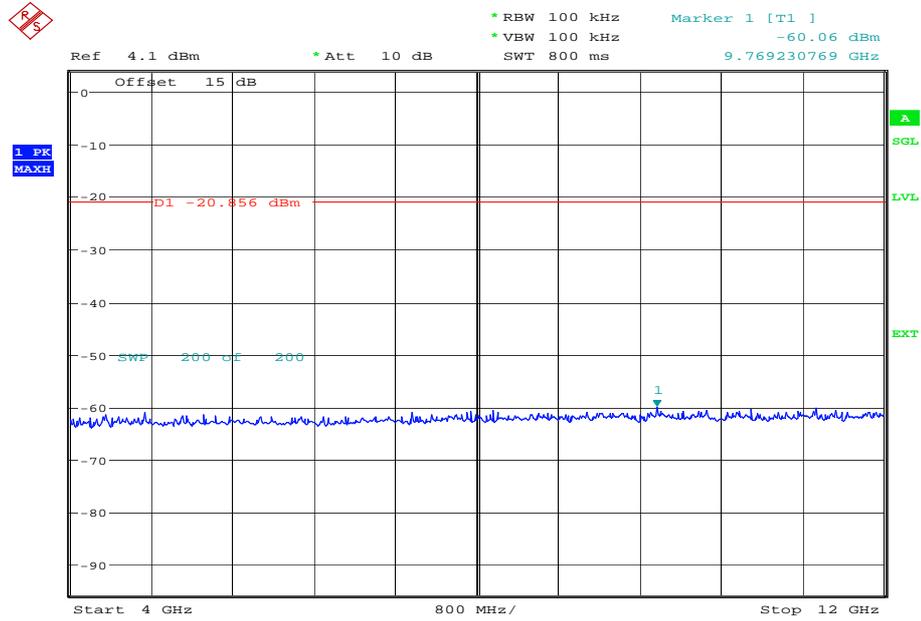


Date: 8.JAN.2014 16:55:37



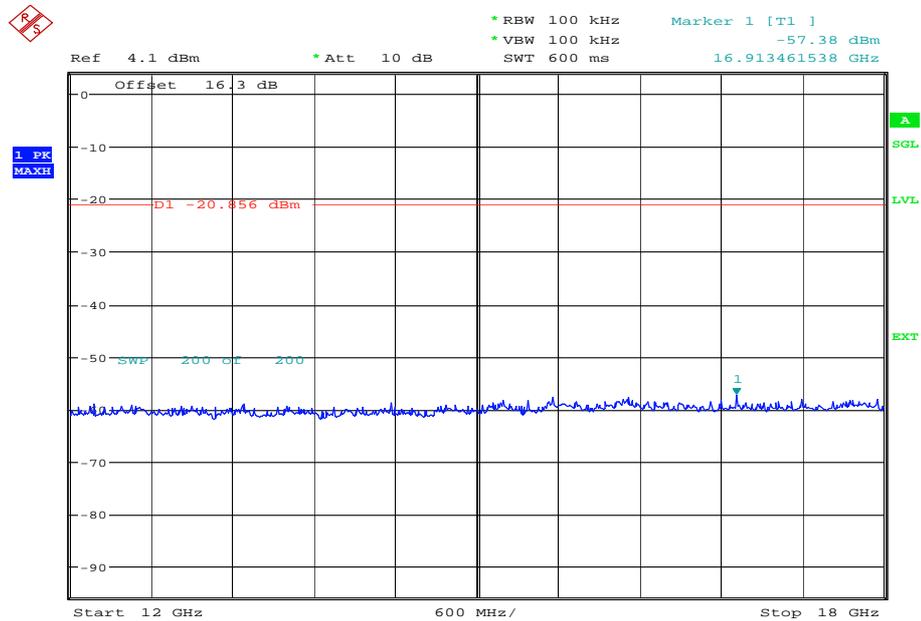
Product Service

### 4 GHz to 12 GHz



Date: 9.JAN.2014 15:03:21

### 12 GHz to 18 GHz

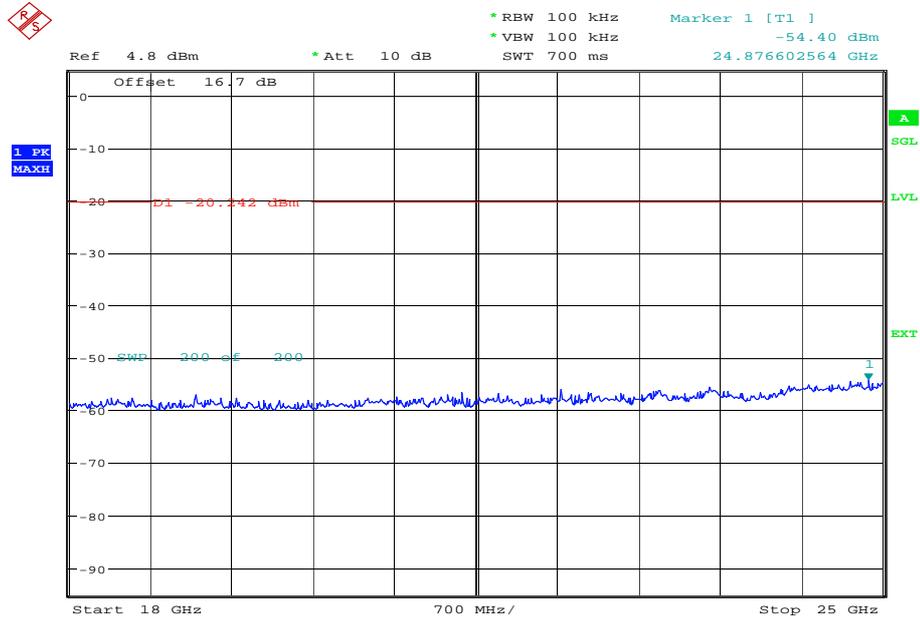


Date: 9.JAN.2014 15:11:06



Product Service

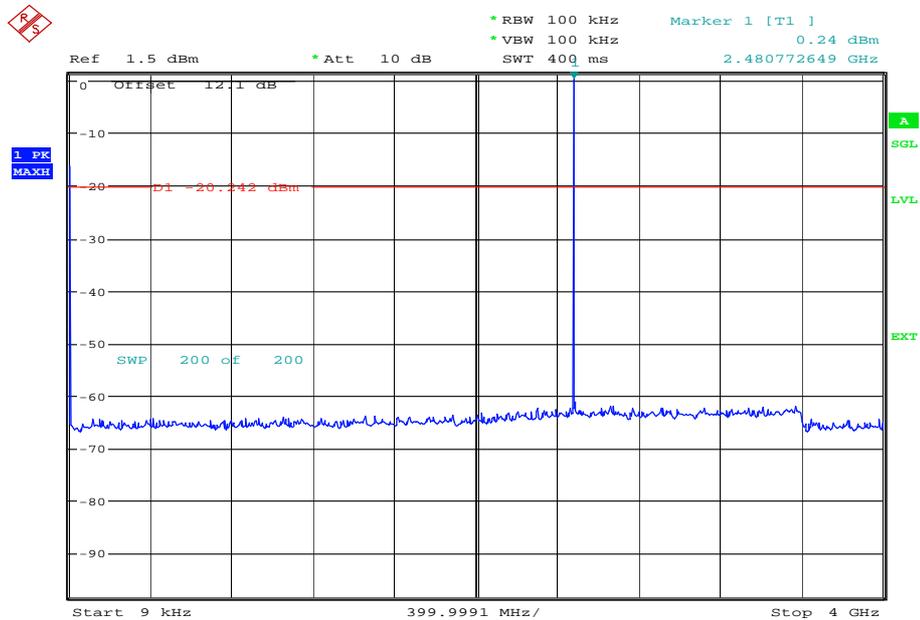
18 GHz to 25 GHz



Date: 8.JAN.2014 18:31:08

2480 MHz

9 kHz to 4 GHz

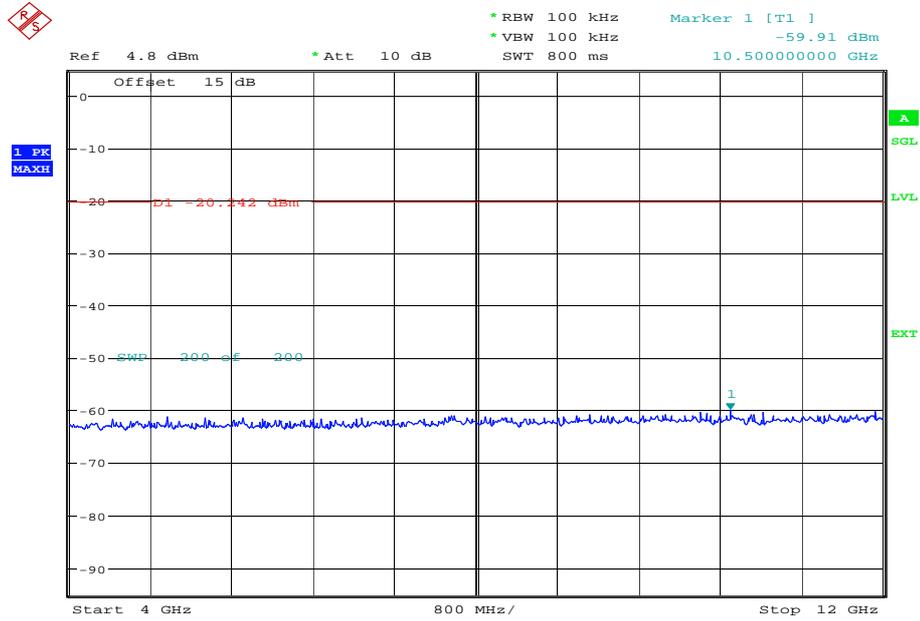


Date: 8.JAN.2014 16:58:42



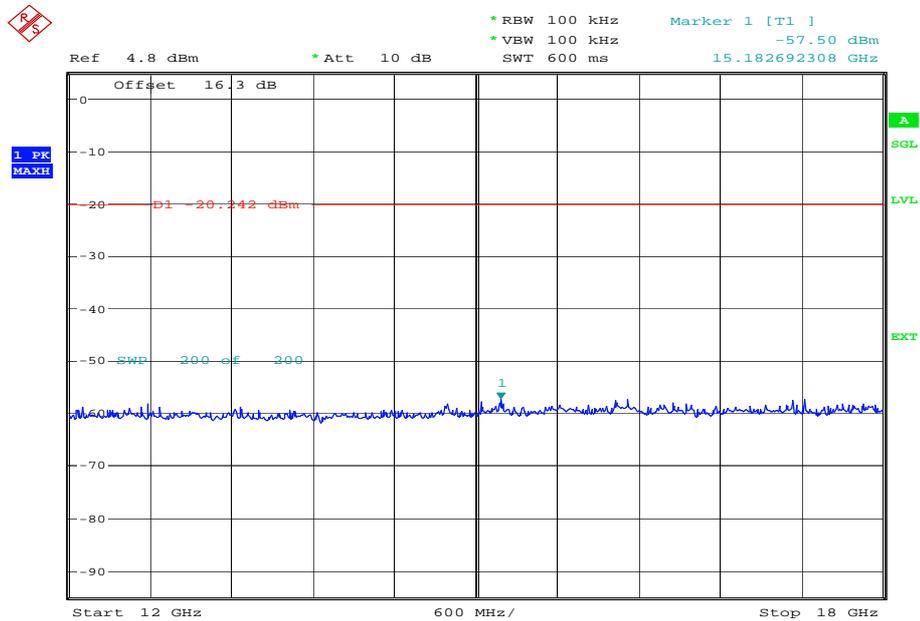
Product Service

### 4 GHz to 12 GHz



Date: 9.JAN.2014 15:18:16

### 12 GHz to 18 GHz

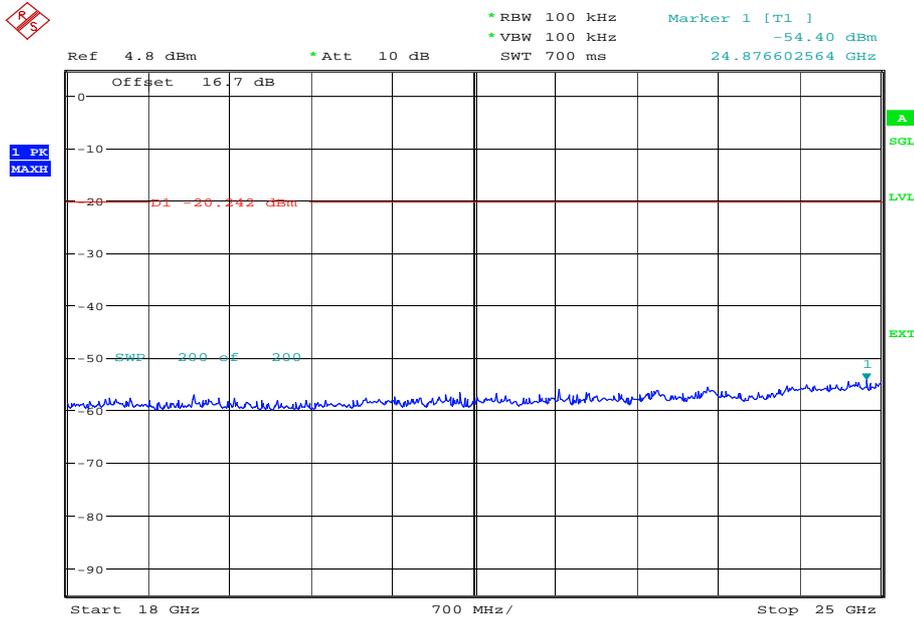


Date: 9.JAN.2014 15:20:47



Product Service

18 GHz to 25 GHz



Date: 8.JAN.2014 18:31:08

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.

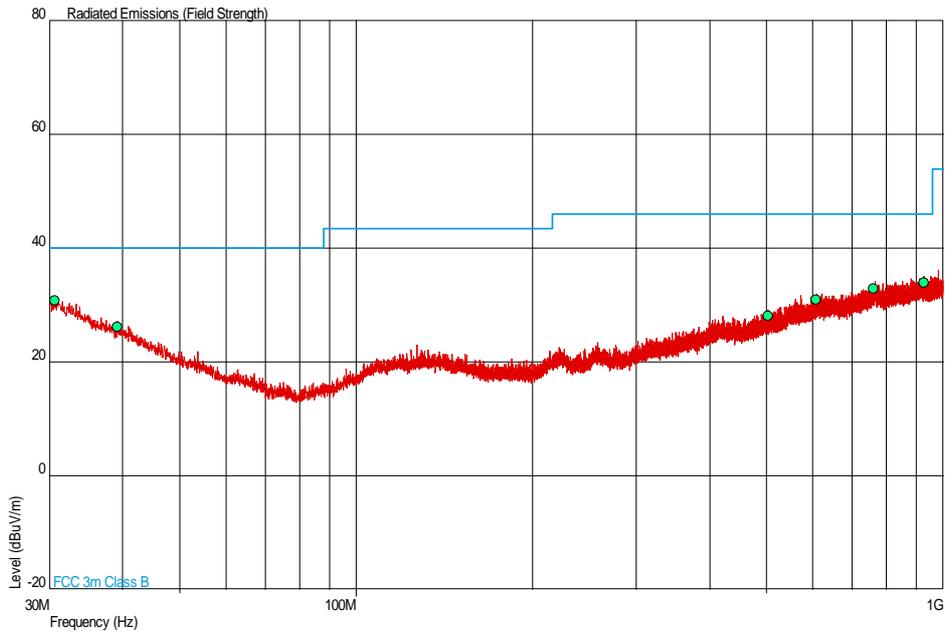
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.



Spurious Radiated Emissions

2402 MHz

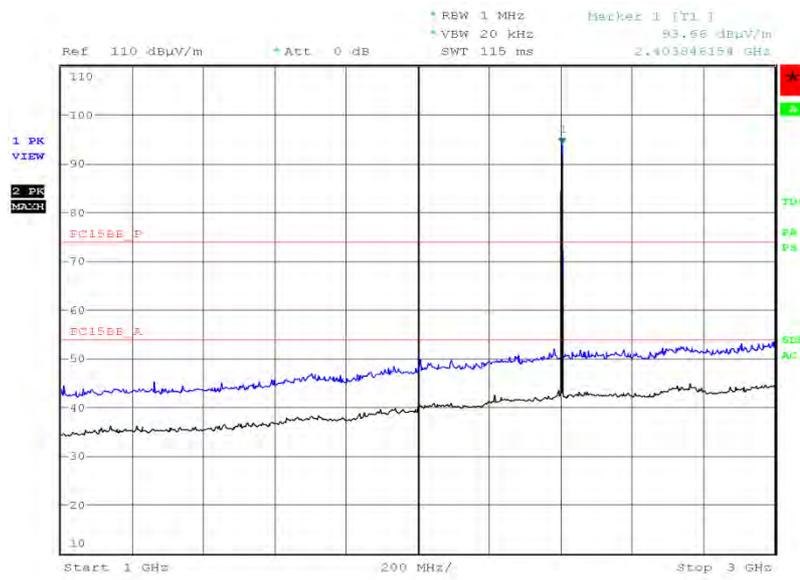
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
30.630	30.9	35.1	40.0	100	-9.1	64.9	83	1.00	Vertical
39.212	26.1	20.2	40.0	100	-13.9	79.8	133	1.00	Horizontal
502.387	28.1	25.4	46.0	200	-17.9	174.6	189	1.04	Horizontal
606.451	31.0	35.5	46.0	200	-15.0	164.5	200	1.00	Horizontal
761.442	32.9	44.2	46.0	200	-13.1	155.8	136	2.41	Horizontal
928.127	34.0	50.1	46.0	200	-12.0	149.9	91	1.00	Vertical

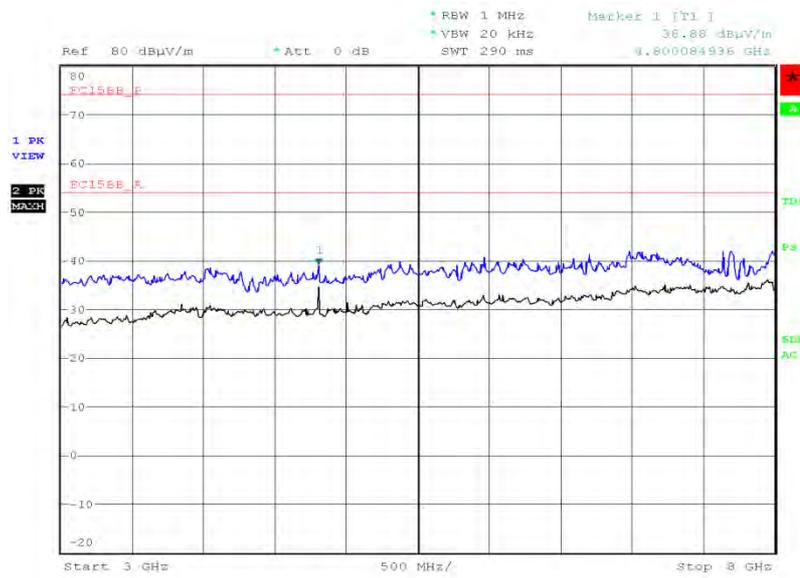


1 GHz to 3 GHz



Date: 10.JAN.2014 03:33:58

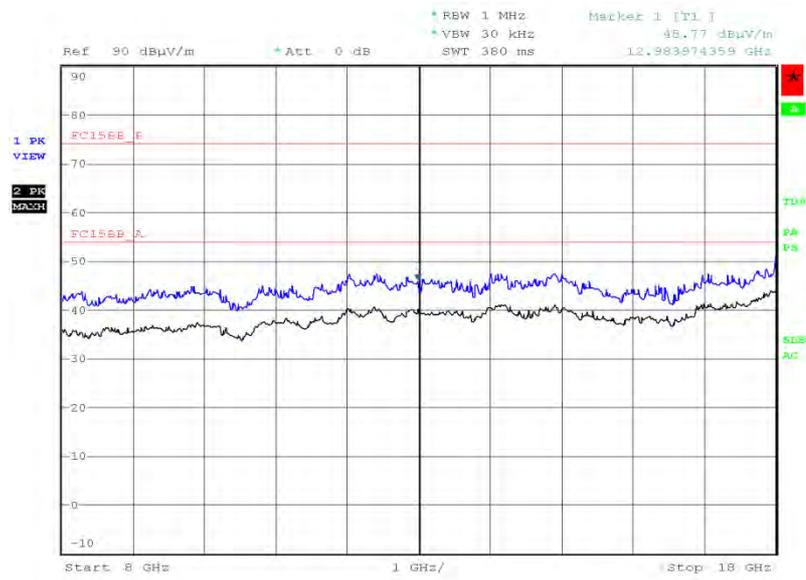
3 GHz to 8 GHz



Date: 10.JAN.2014 21:57:29

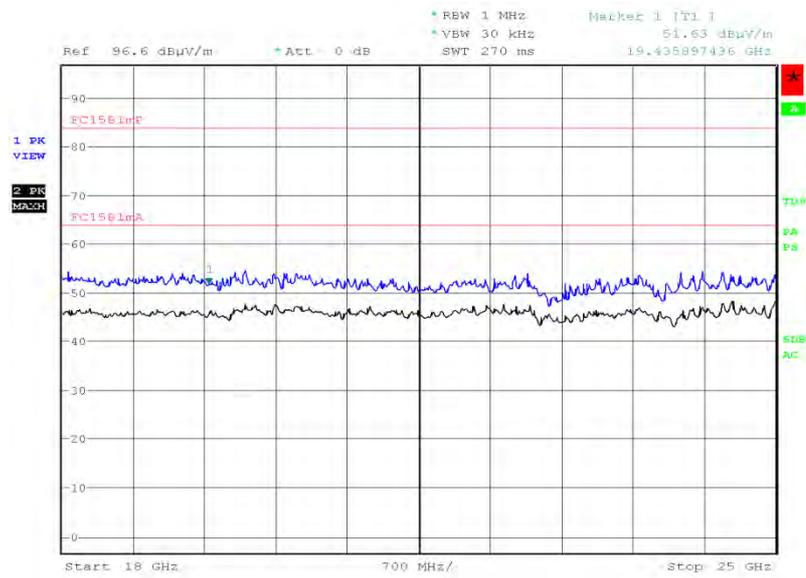


8 GHz to 18 GHz



Date: 11.JAN.2014 00:45:07

18 GHz to 25 GHz

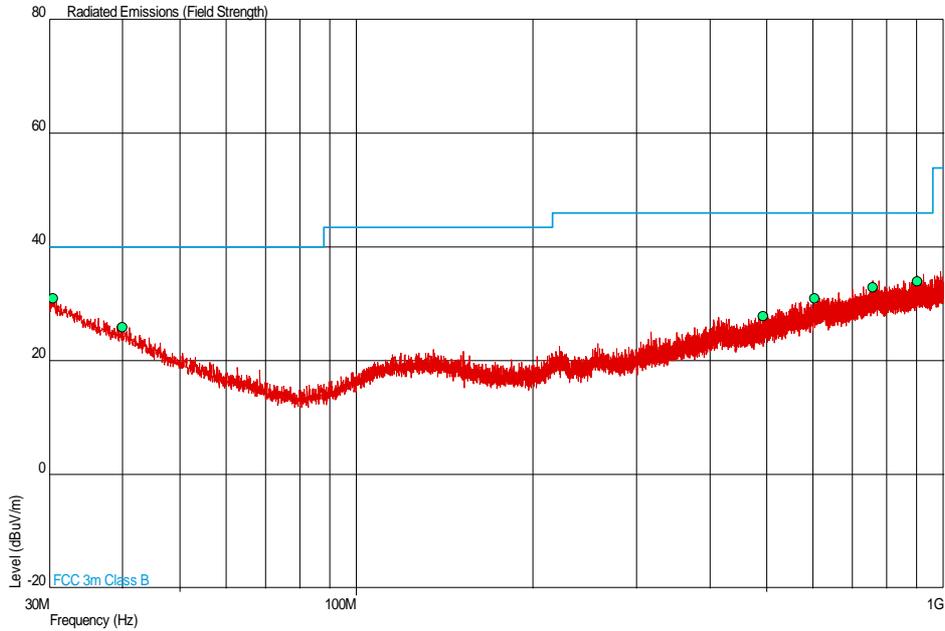


Date: 11.JAN.2014 02:38:16



2440 MHz

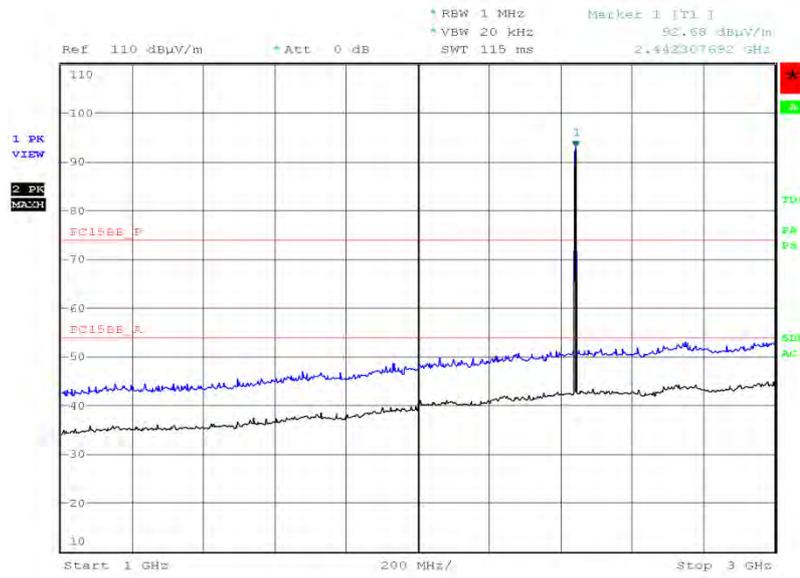
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
30.443	31.0	35.5	40.0	100	-9.0	64.5	192	1.00	Horizontal
39.974	25.9	19.7	40.0	100	-14.1	80.3	177	3.20	Horizontal
493.435	27.9	24.8	46.0	200	-18.1	175.2	360	3.22	Vertical
602.998	30.9	35.1	46.0	200	-15.1	164.9	0	1.00	Horizontal
758.300	32.9	44.2	46.0	200	-13.1	155.8	360	2.41	Vertical
904.115	34.0	50.1	46.0	200	-12.0	149.9	316	1.00	Horizontal

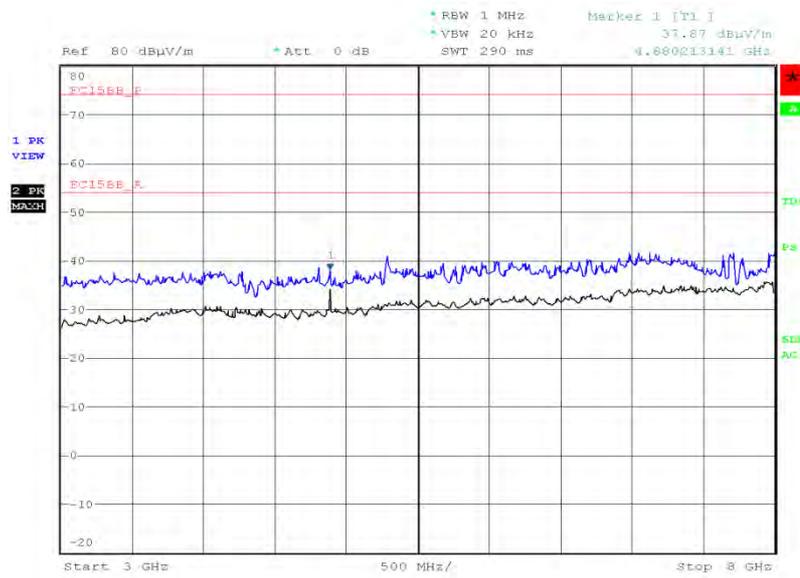


1 GHz to 3 GHz



Date: 10.JAN.2014 03:19:19

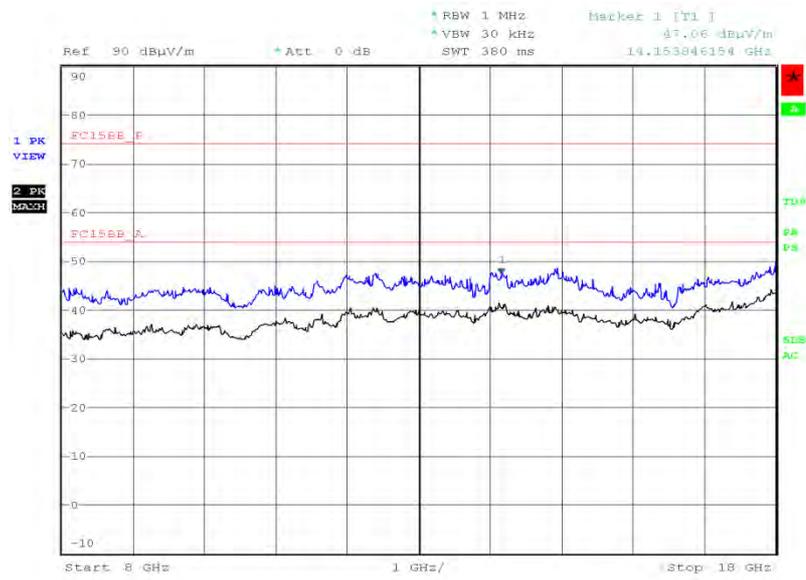
3 GHz to 8 GHz



Date: 10.JAN.2014 22:01:46

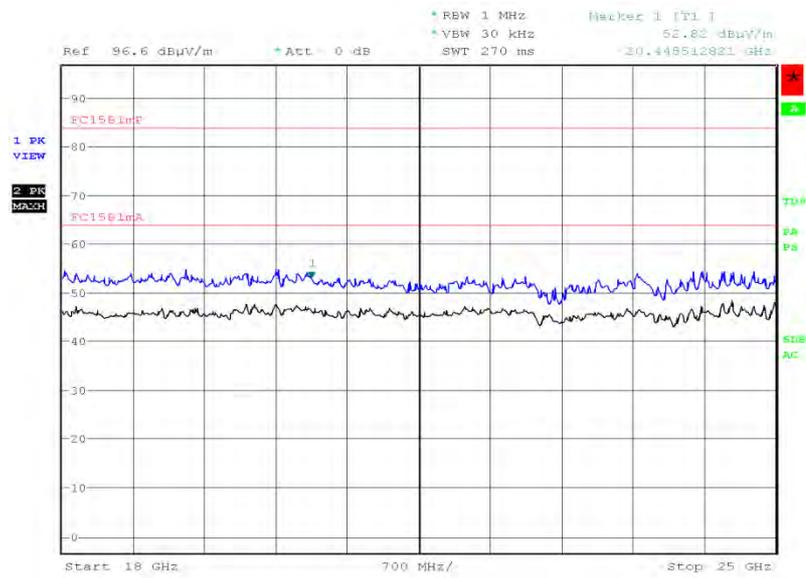


8 GHz to 18 GHz



Date: 11.JAN.2014 00:50:36

18 GHz to 25 GHz

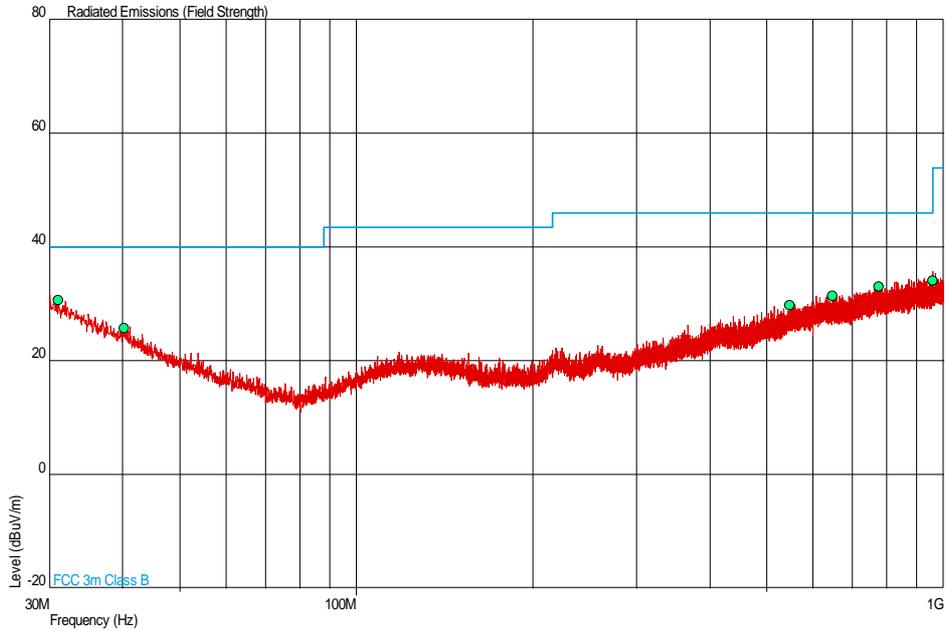


Date: 11.JAN.2014 02:45:33



2480 MHz

30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (dV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
31.128	30.6	33.9	40.0	100	-9.4	66.1	108	1.00	Vertical
40.223	25.7	19.3	40.0	100	-14.3	80.7	265	3.87	Vertical
546.673	29.7	30.5	46.0	200	-16.3	169.5	193	1.29	Horizontal
647.080	31.4	37.2	46.0	200	-14.6	162.8	294	1.00	Horizontal
775.043	33.1	45.2	46.0	200	-12.9	154.8	0	1.00	Horizontal
958.035	34.2	51.3	46.0	200	-11.8	148.7	177	1.00	Horizontal

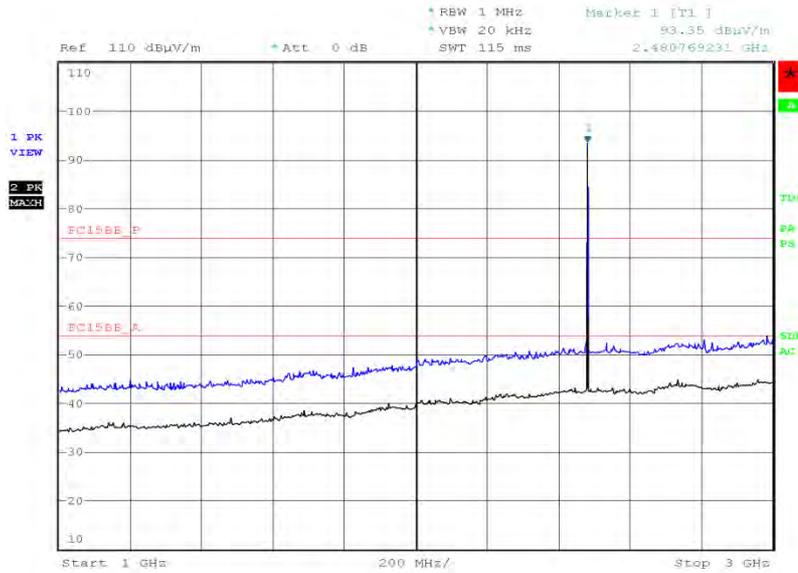


Product Service

1 GHz to 25 GHz

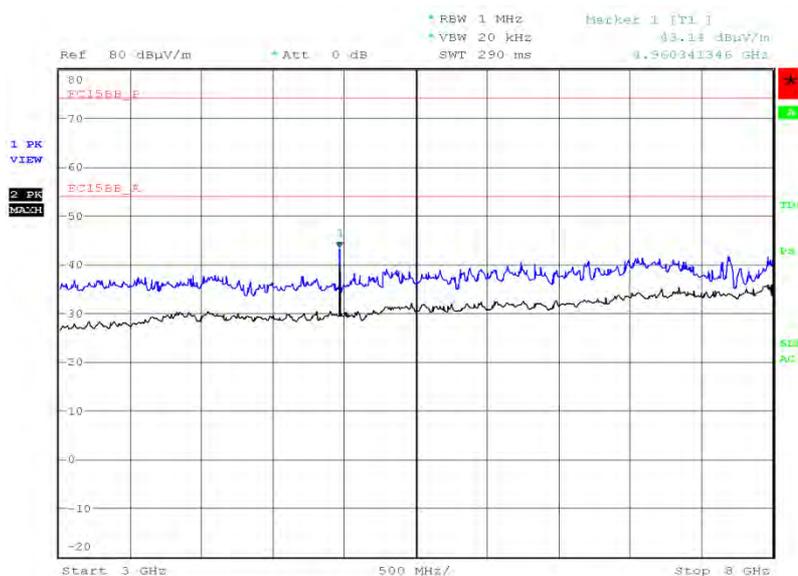
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
4.960	Horizontal	100	219	45.01	35.88

1 GHz to 3 GHz



Date: 10.JAN.2014 03:59:18

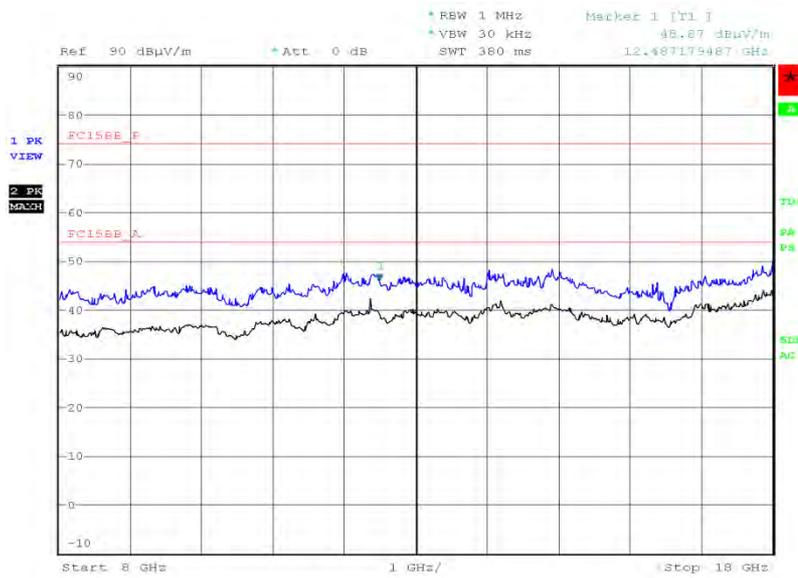
3 GHz to 8 GHz



Date: 10.JAN.2014 22:05:50

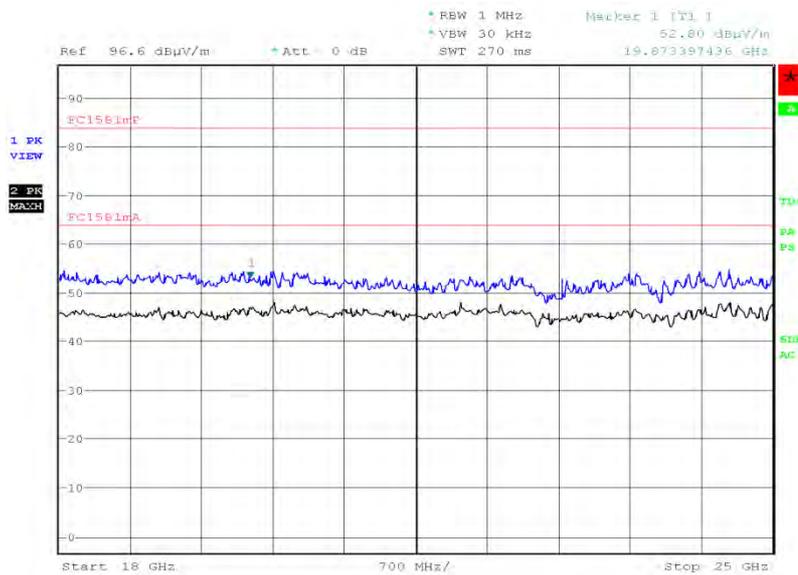


8 GHz to 18 GHz



Date: 11.JAN.2014 00:57:16

18 GHz to 25 GHz



Date: 11.JAN.2014 02:50:01

Limit

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

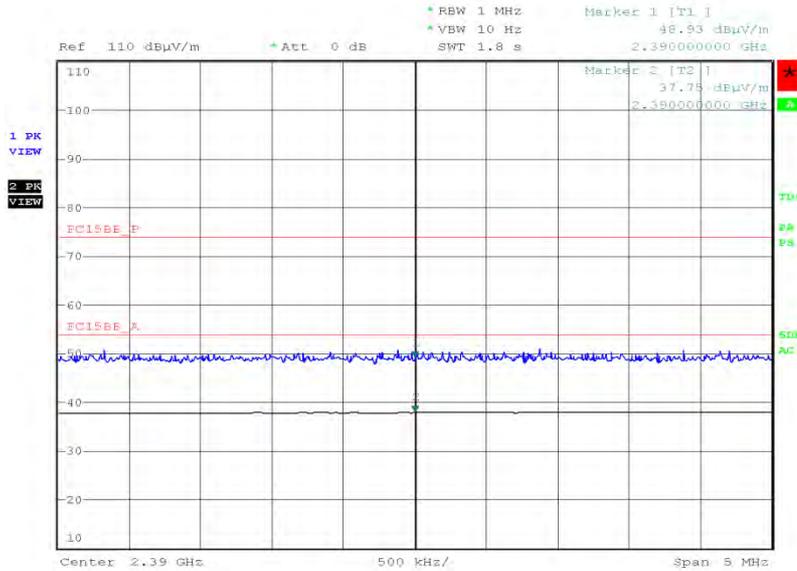


Product Service

Band Edge Emissions

2402 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	48.93	37.75

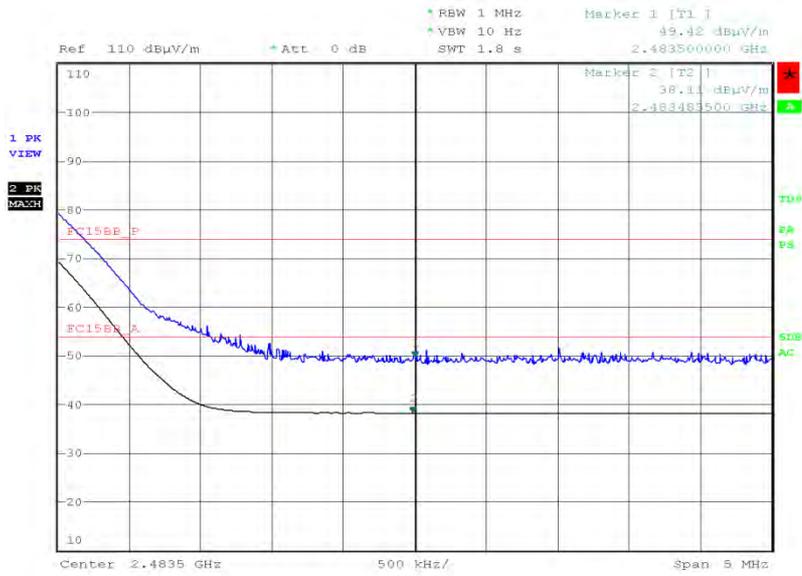


Date: 10.JAN.2014 03:40:00



2480 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	49.42	38.12



Date: 10.JAN.2014 04:04:30

Limit

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



Product Service

## **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**

SHL24 S/N: IMEI 004401115003390 - Modification State 0

### **2.5.3 Date of Test**

7 January 2014 & 8 January 2014

### **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	24.7°C
Relative Humidity	35.1%



Product Service

**2.5.7 Test Results**

802.11(b)

4.0 V DC Supply

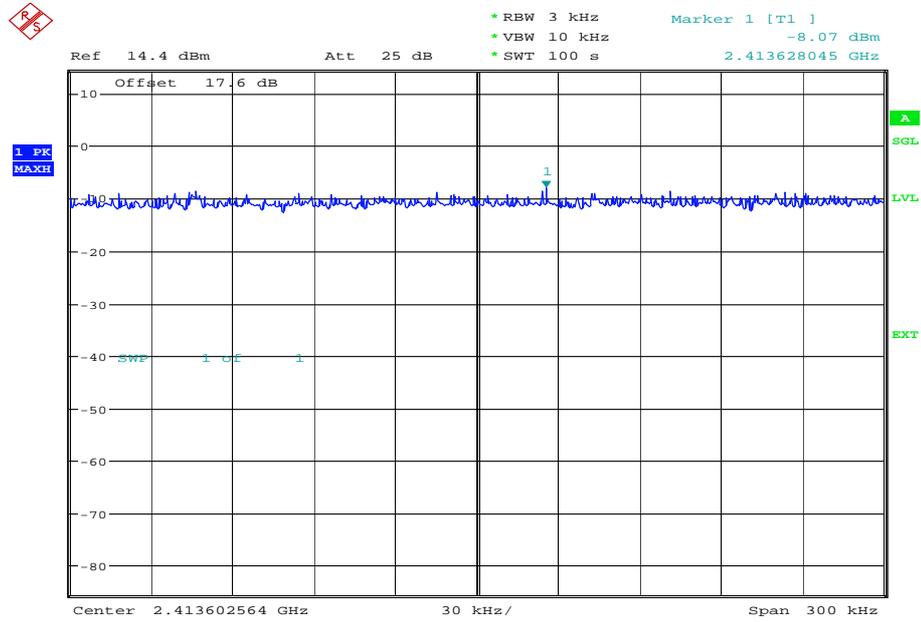
Frequency	Data Rate (Mbps)	Power Spectral Density in 3 kHz Bands (dBm)
2412 MHz	1	-8.07
	2	-7.24
	5.5	-6.60
	11	-7.41
2437 MHz	1	-8.19
	2	-7.94
	5.5	-8.09
	11	-8.54
2462 MHz	1	-7.80
	2	-8.42
	5.5	-8.88
	11	-8.39



Product Service

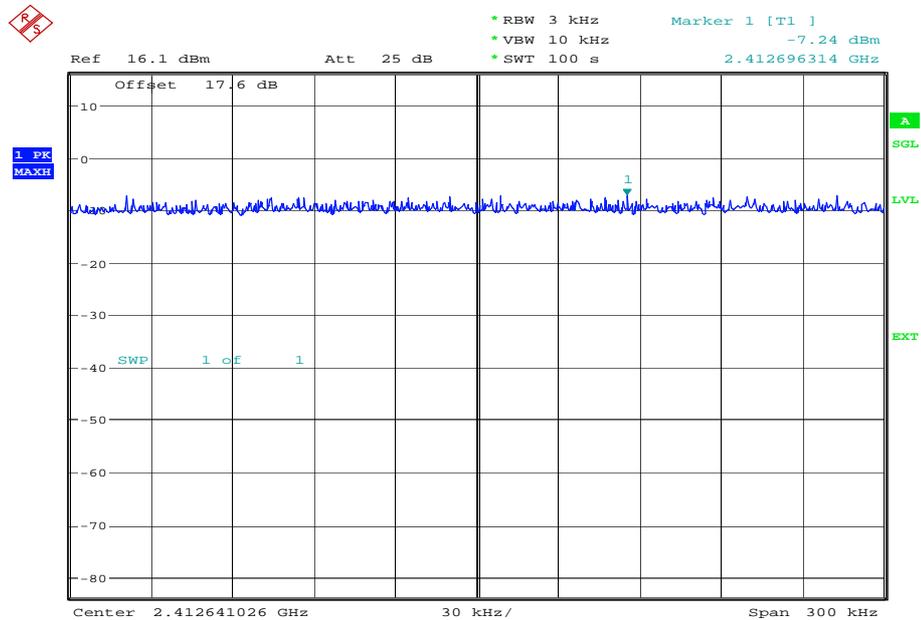
2412 MHz

1 Mbps



Date: 6.JAN.2014 14:56:45

2 Mbps

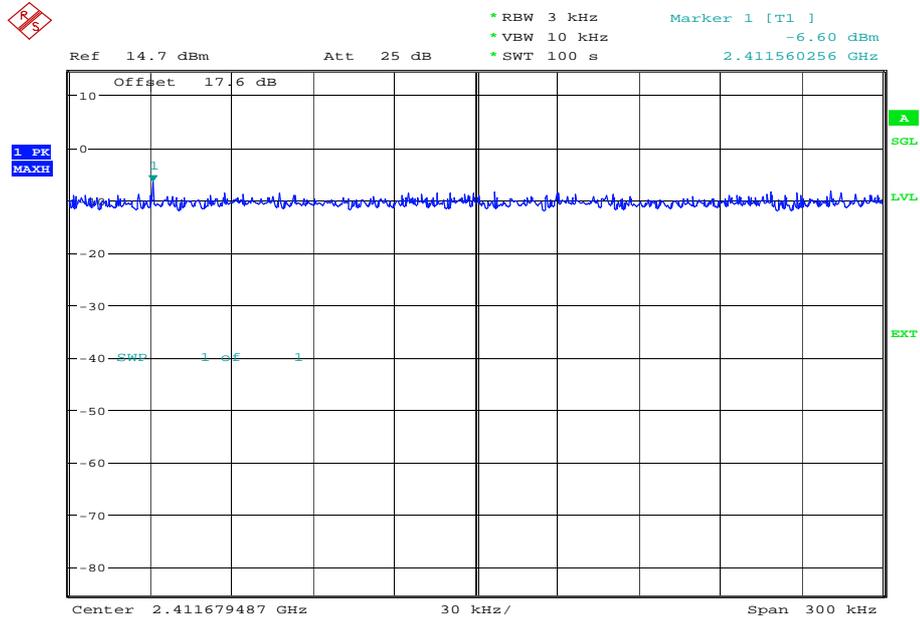


Date: 6.JAN.2014 16:12:31



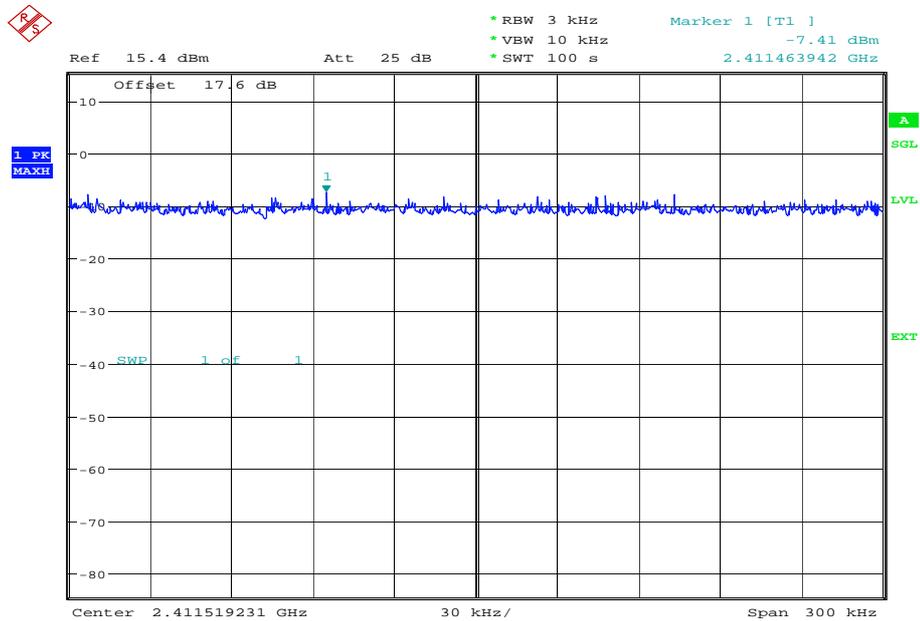
Product Service

5.5 Mbps



Date: 6.JAN.2014 16:27:51

11 Mbps



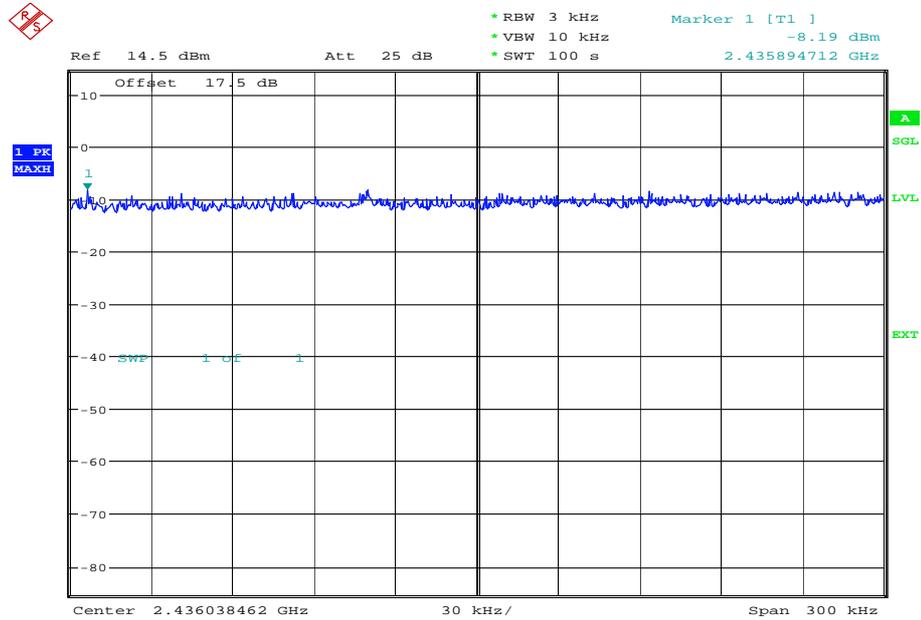
Date: 6.JAN.2014 16:59:53



Product Service

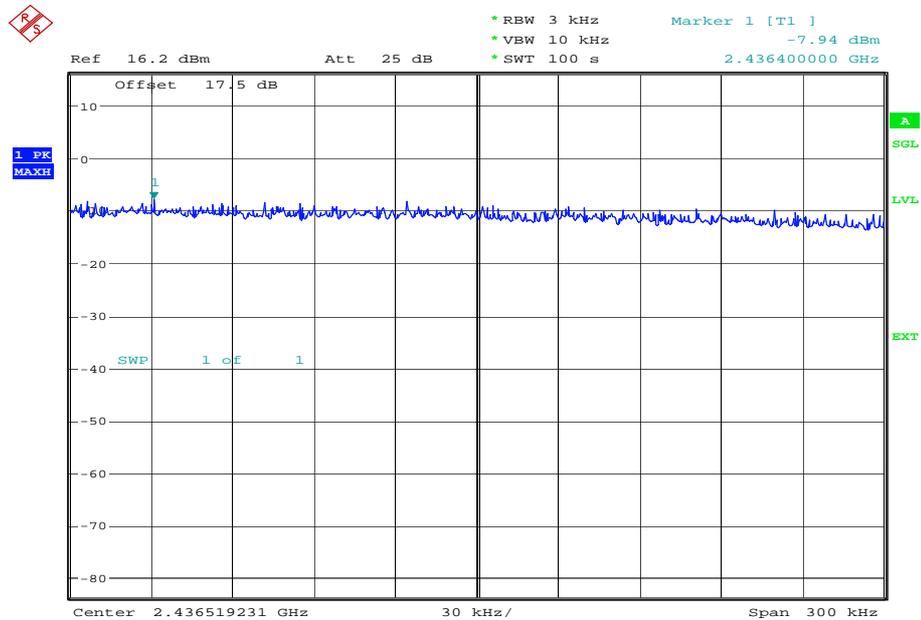
2437 MHz

1 Mbps



Date: 6.JAN.2014 15:02:04

2 Mbps

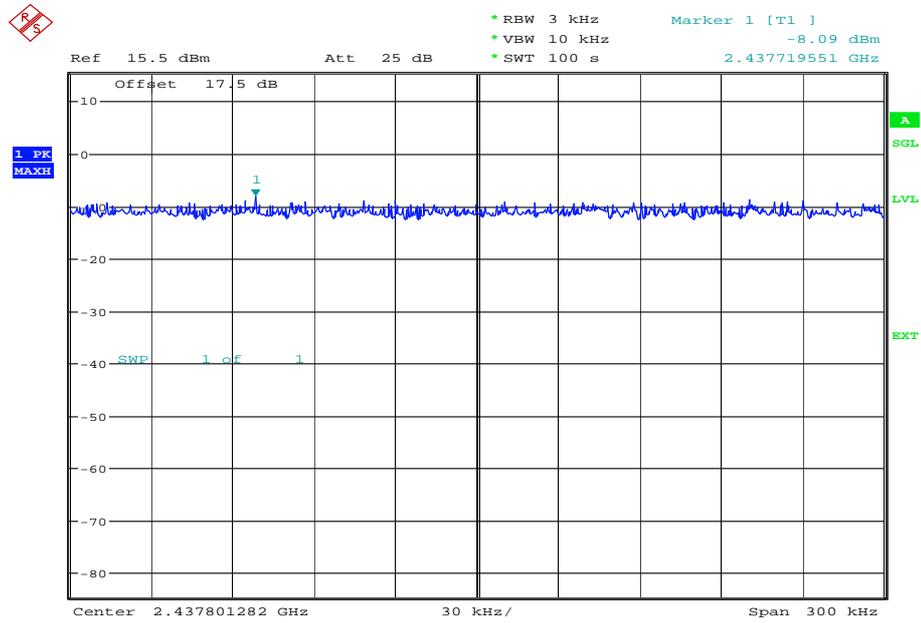


Date: 6.JAN.2014 16:17:19



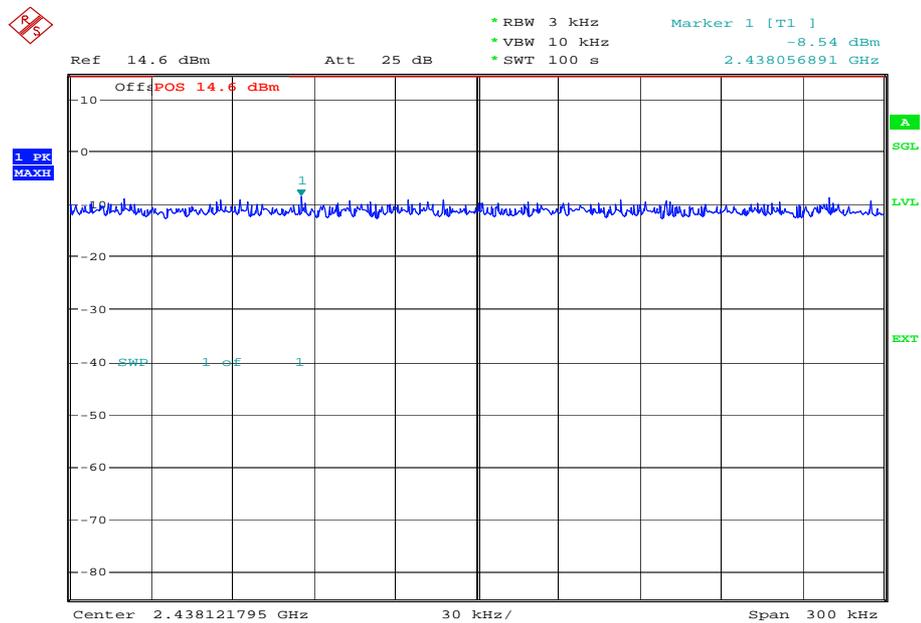
Product Service

### 5.5 Mbps



Date: 6.JAN.2014 16:49:15

### 11 Mbps



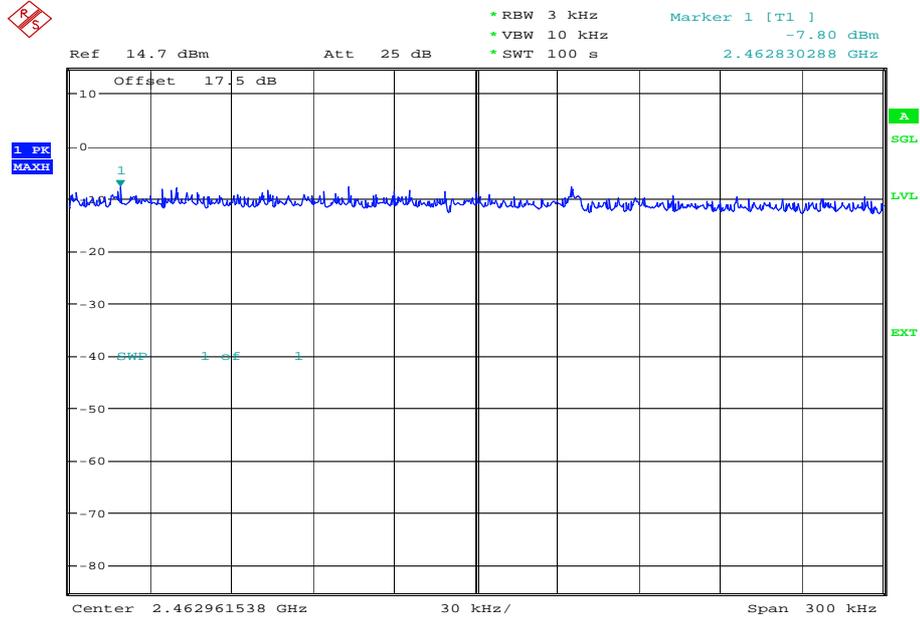
Date: 6.JAN.2014 17:07:27



Product Service

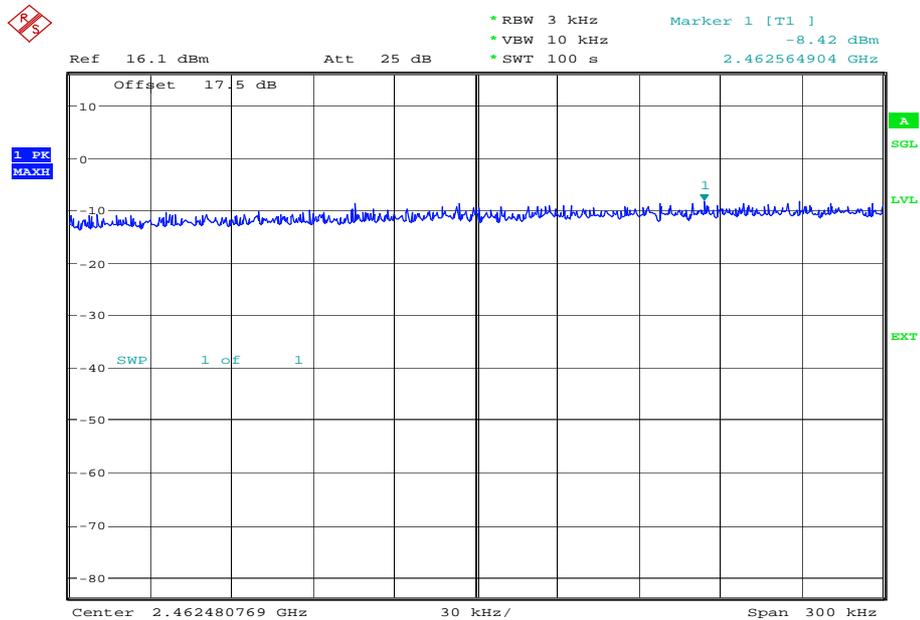
2462 MHz

1 Mbps



Date: 6.JAN.2014 15:08:36

2 Mbps

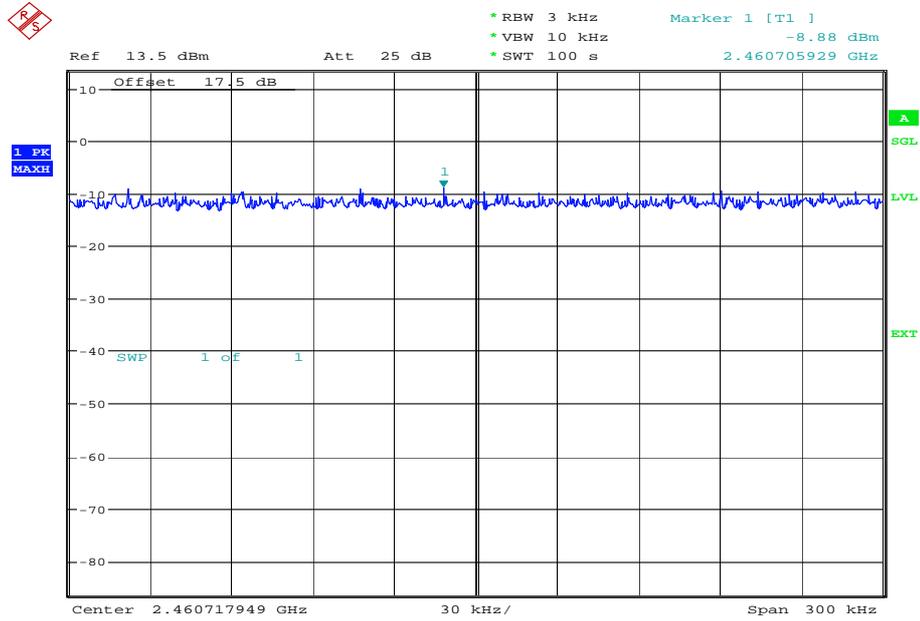


Date: 6.JAN.2014 16:22:13



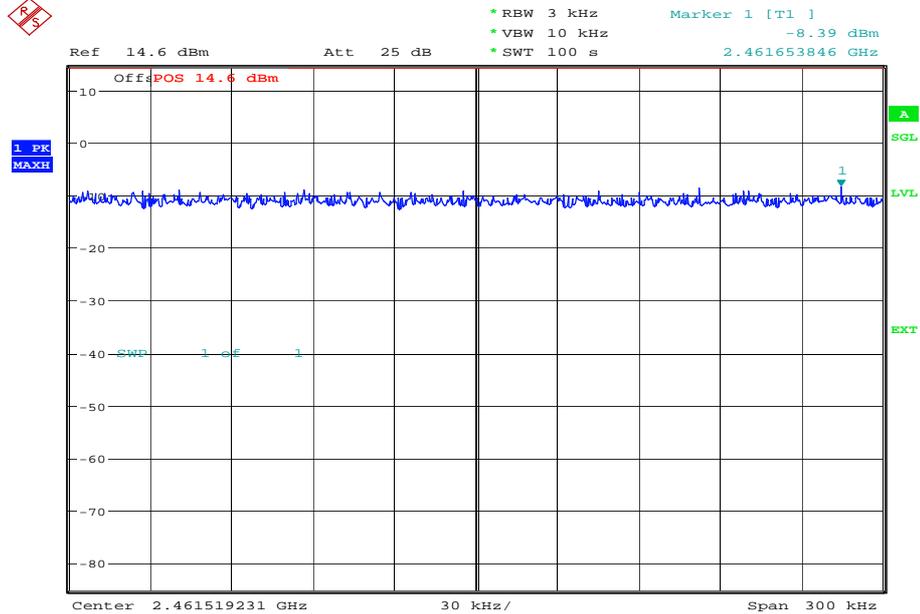
Product Service

5.5 Mbps



Date: 6.JAN.2014 16:54:13

11 Mbps



Date: 6.JAN.2014 17:12:49

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

802.11(g)

4.0 V DC Supply

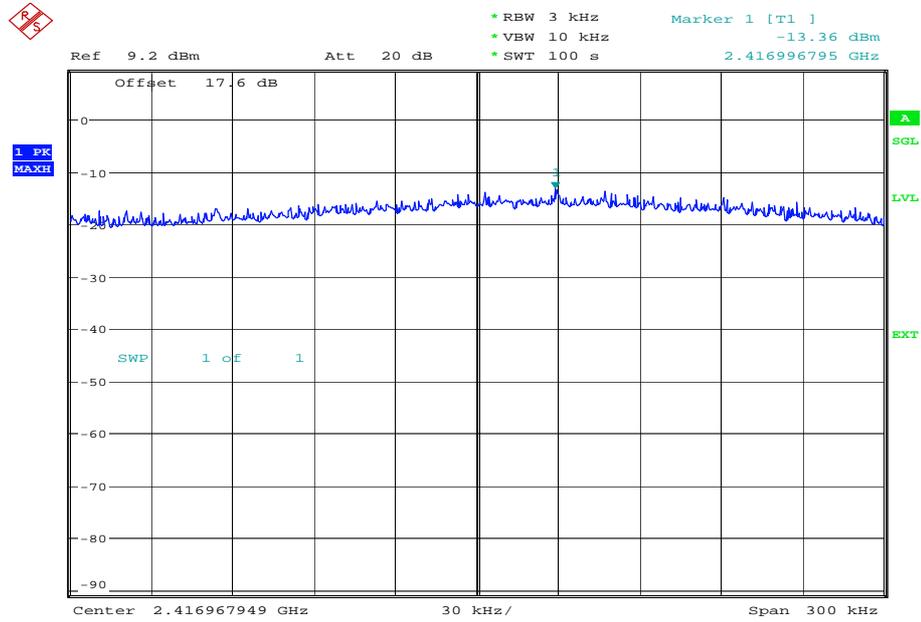
Frequency	Data Rate (Mbps)	Power Spectral Density in 3 kHz Bands (dBm)
2412 MHz	6	-13.36
	9	-12.34
	12	-12.72
	18	-13.49
	24	-13.67
	36	-13.33
	48	-13.73
	54	-14.10
2437 MHz	6	-11.99
	9	-11.80
	12	-12.58
	18	-12.44
	24	-12.49
	36	-12.31
	48	-12.45
	54	-12.55
2462 MHz	6	-12.71
	9	-14.15
	12	-13.19
	18	-13.17
	24	-12.79
	36	-12.64
	48	-12.22
	54	-12.31



Product Service

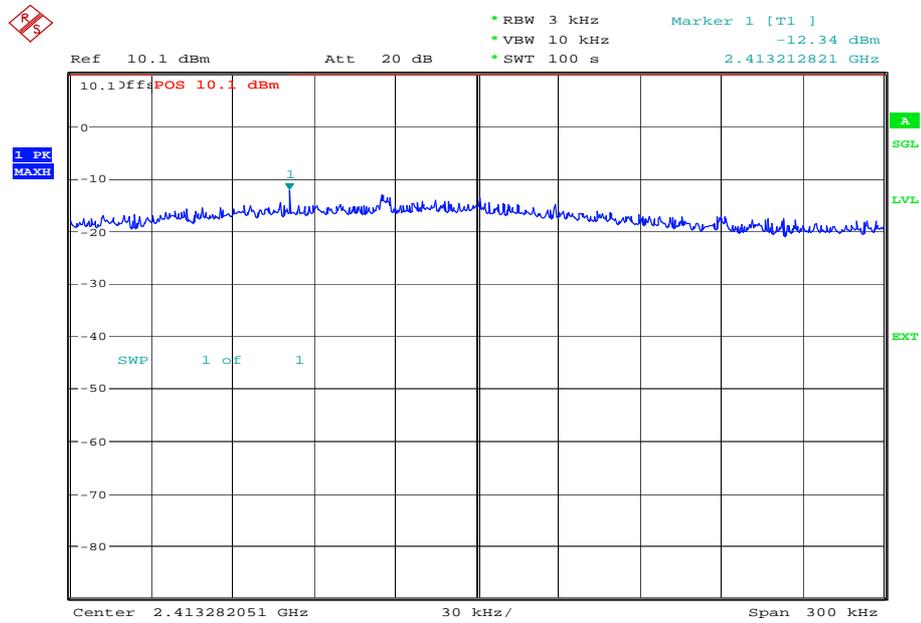
2412 MHz

6 Mbps



Date: 6.JAN.2014 17:22:06

9 Mbps

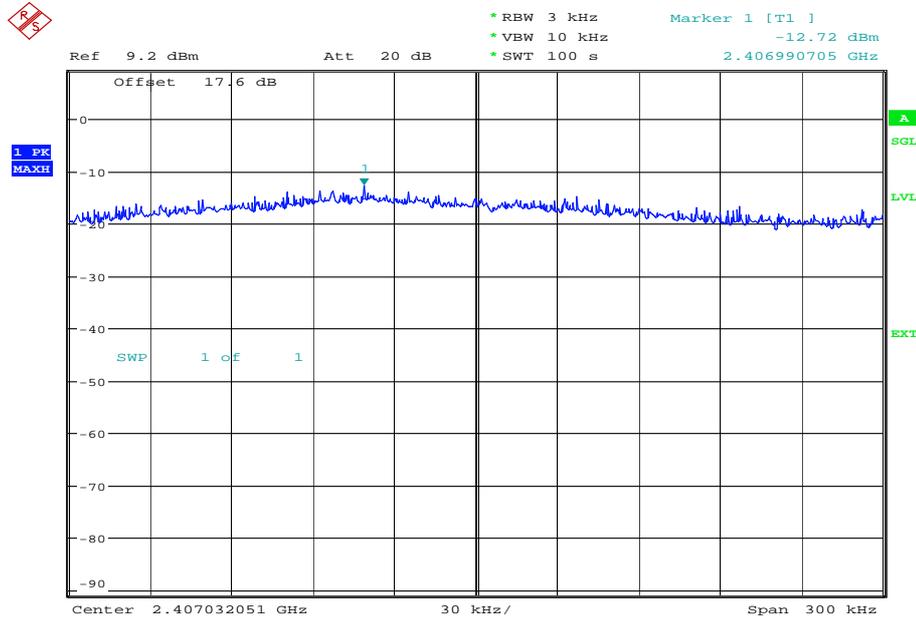


Date: 6.JAN.2014 17:43:09



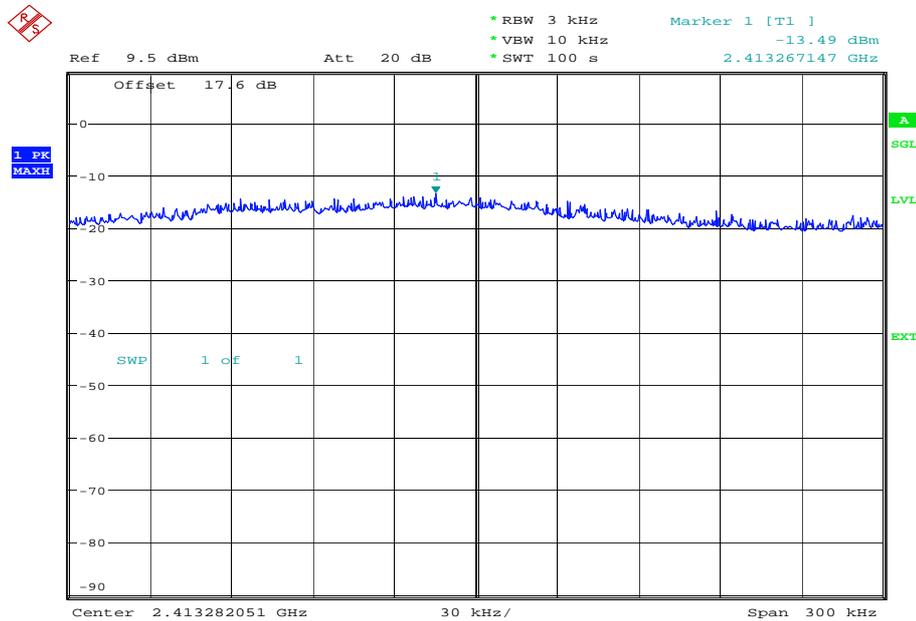
Product Service

12 Mbps



Date: 7.JAN.2014 09:33:28

18 Mbps

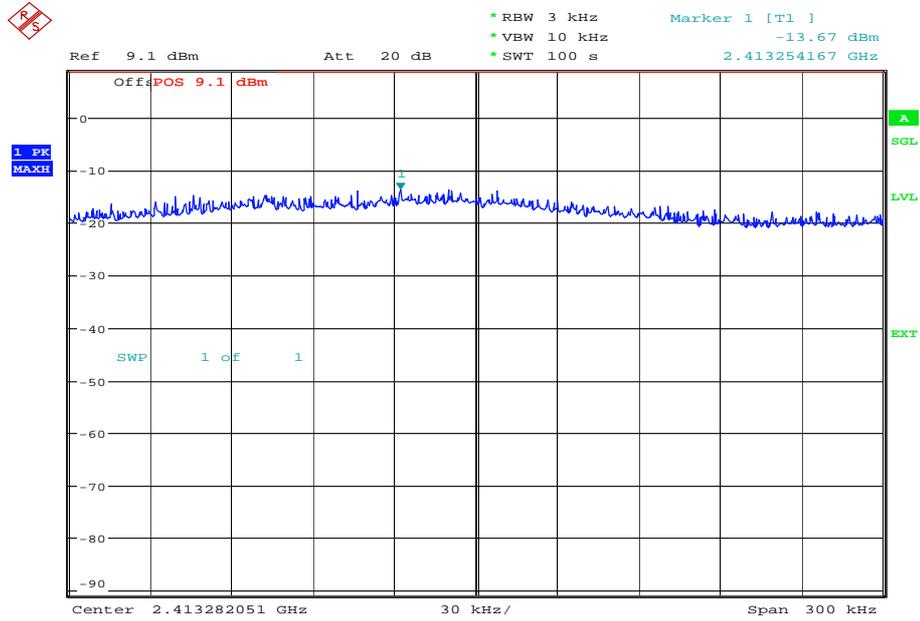


Date: 7.JAN.2014 09:51:35



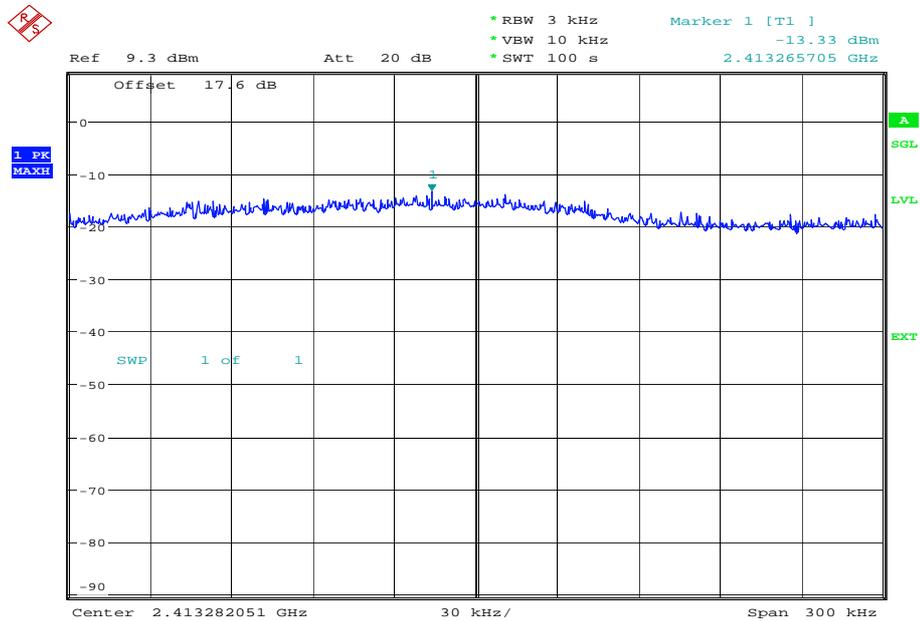
Product Service

24 Mbps



Date: 7.JAN.2014 11:00:53

36 Mbps

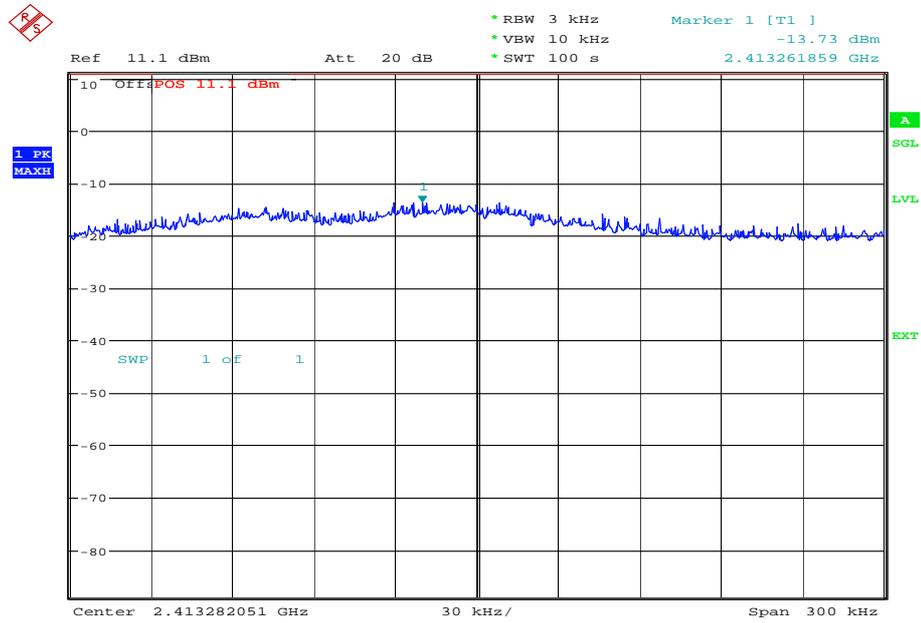


Date: 7.JAN.2014 11:19:29



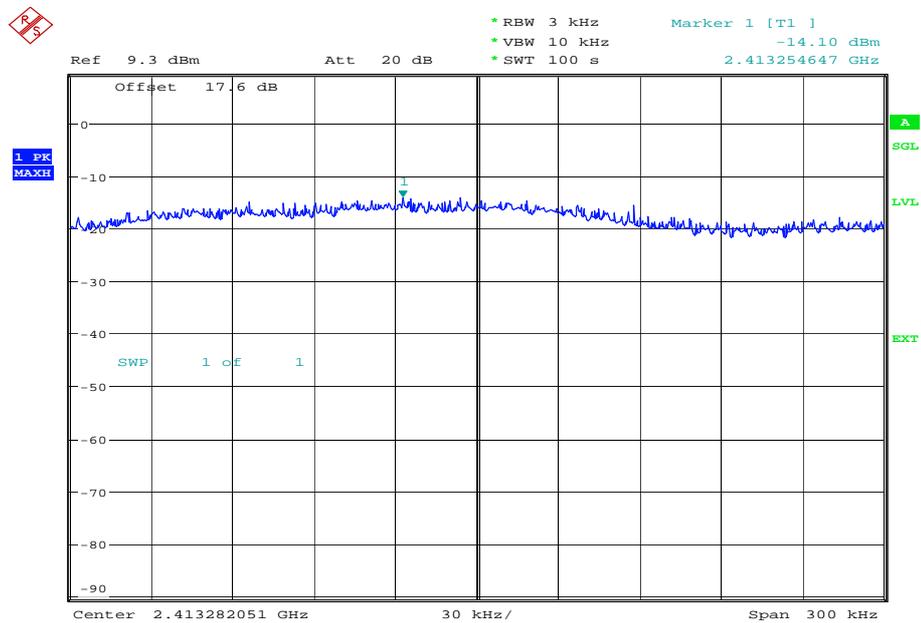
Product Service

48 Mbps



Date: 7.JAN.2014 11:36:18

54 Mbps



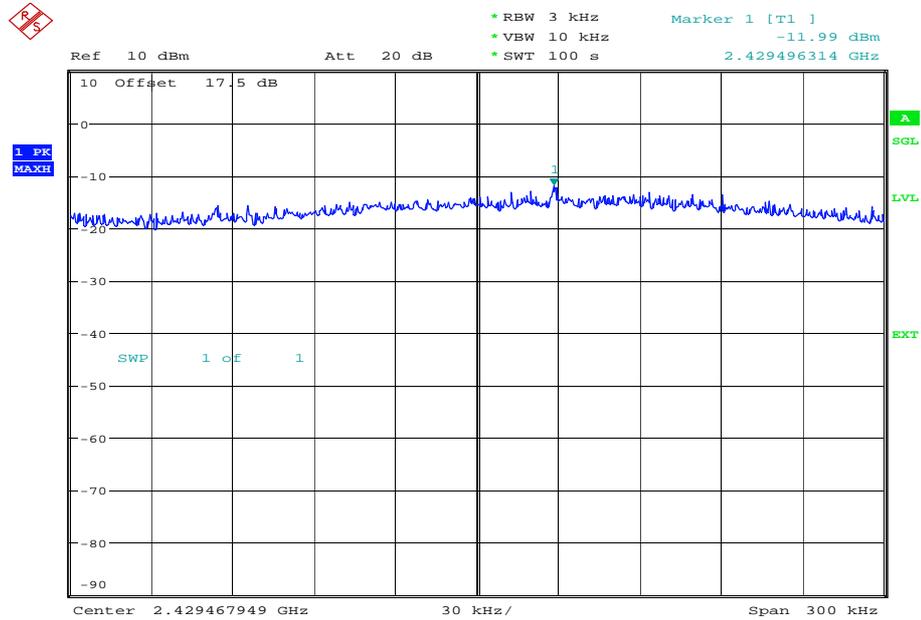
Date: 6.JAN.2014 15:34:20



Product Service

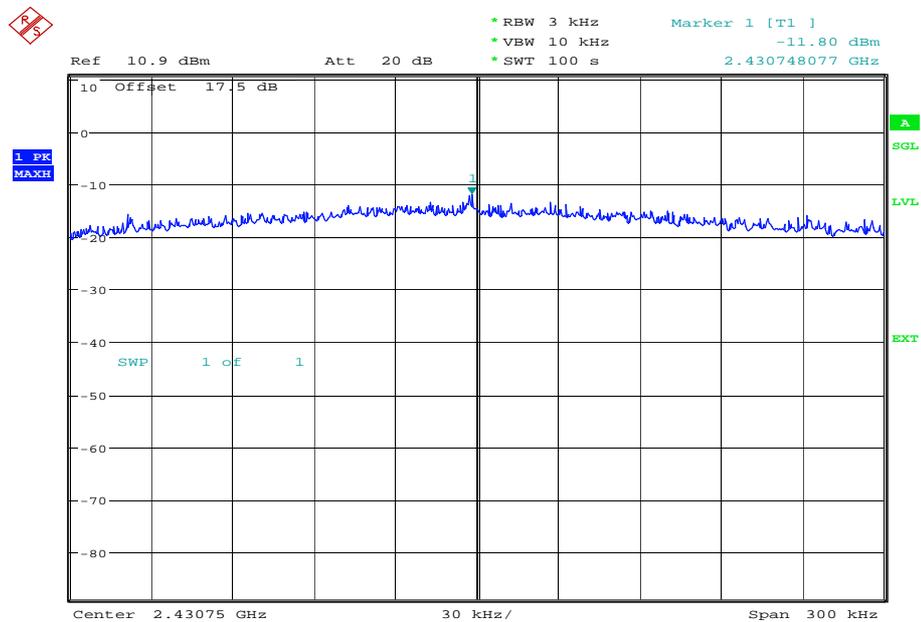
2437 MHz

6 Mbps



Date: 6.JAN.2014 17:31:00

9 Mbps

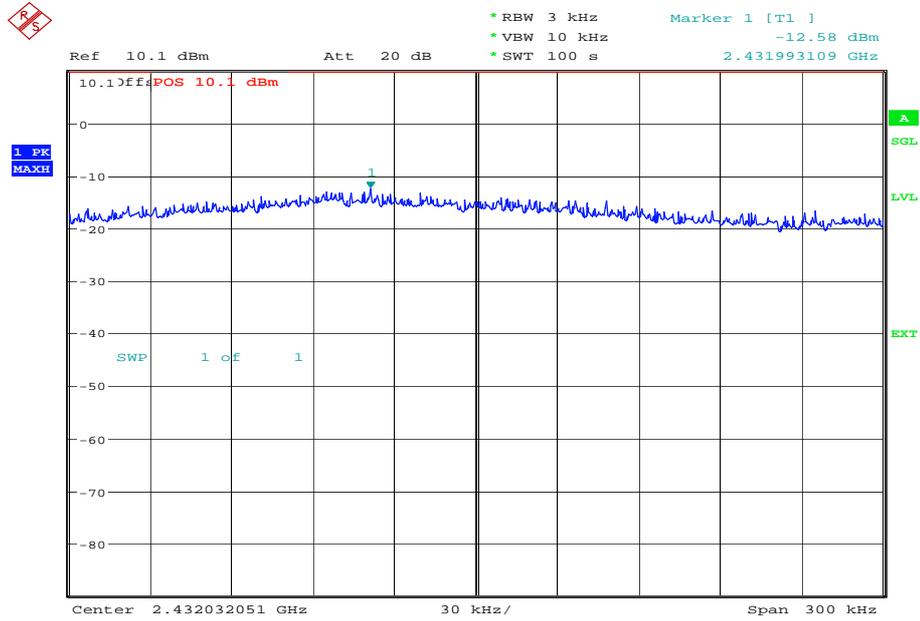


Date: 6.JAN.2014 17:47:58



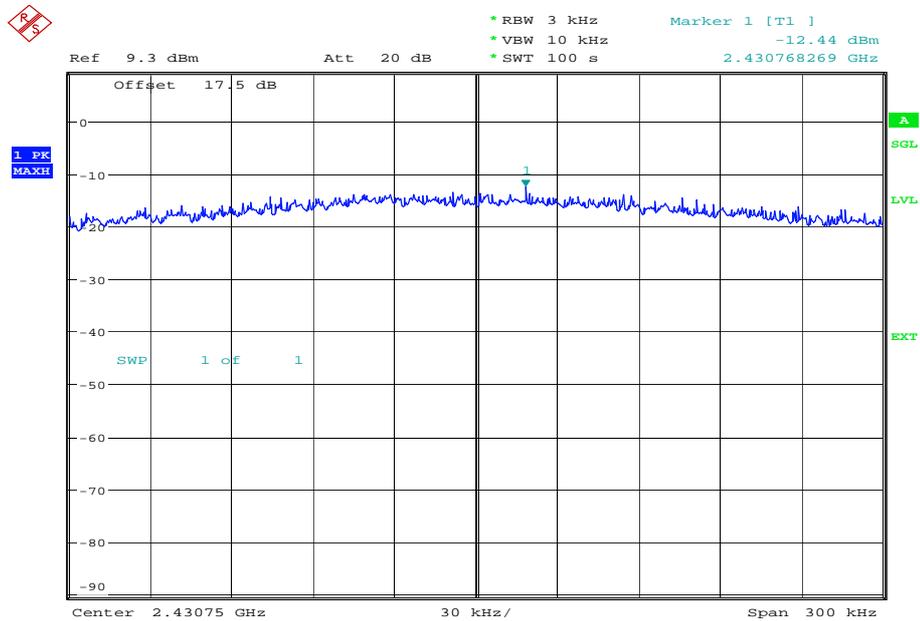
Product Service

12 Mbps



Date: 7.JAN.2014 09:41:13

18 Mbps

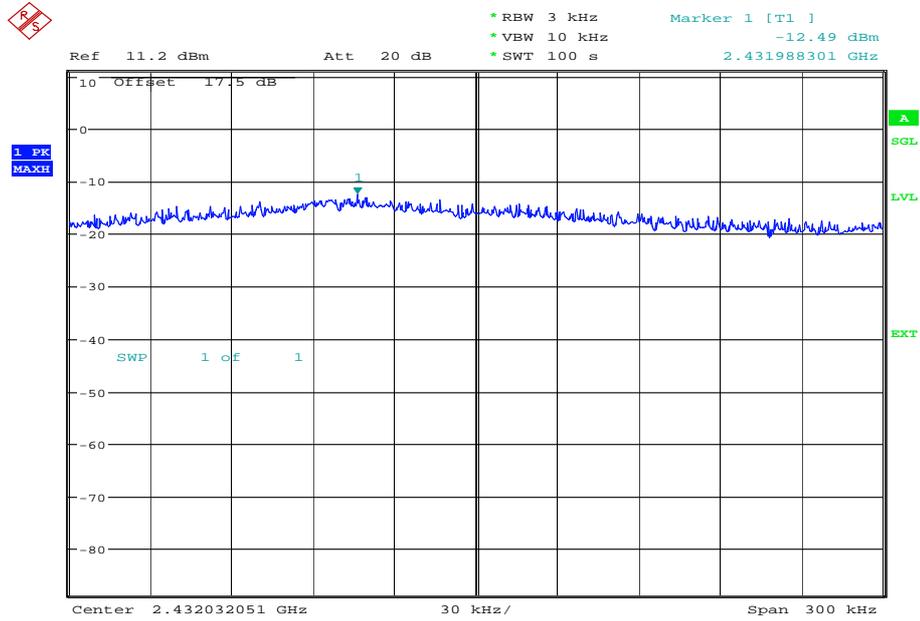


Date: 7.JAN.2014 10:43:45



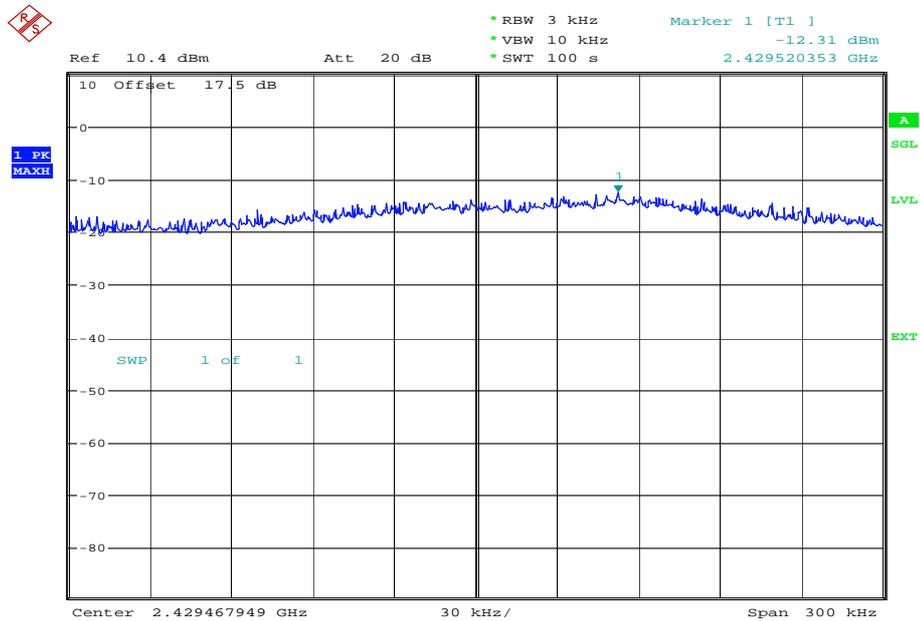
Product Service

24 Mbps



Date: 7.JAN.2014 11:05:35

36 Mbps

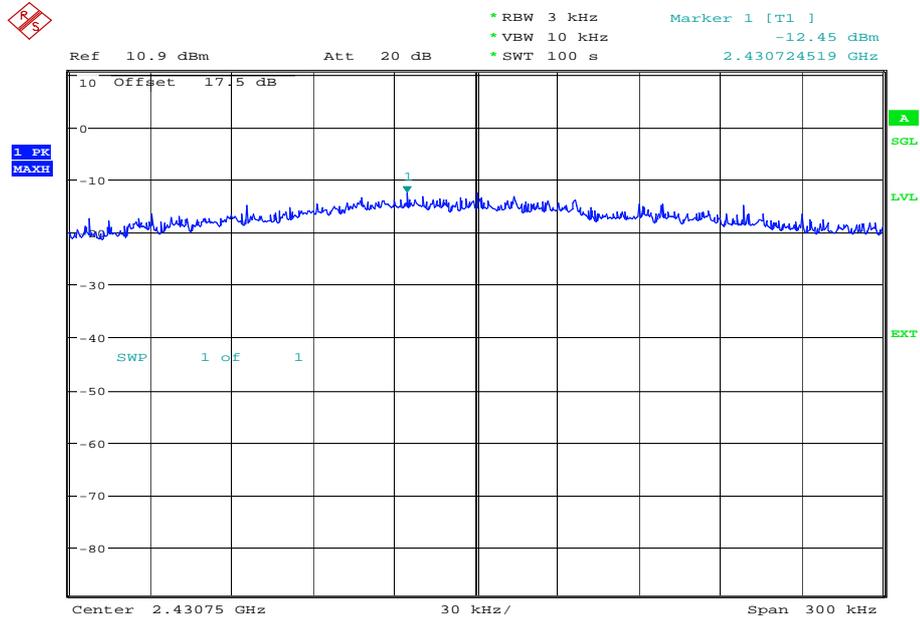


Date: 7.JAN.2014 11:24:12



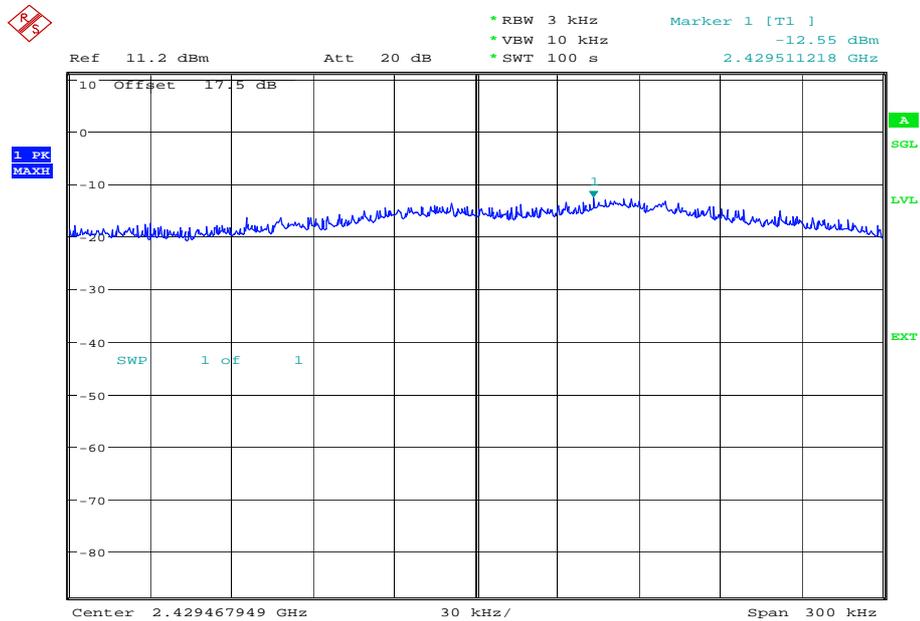
Product Service

48 Mbps



Date: 7.JAN.2014 11:40:49

54 Mbps



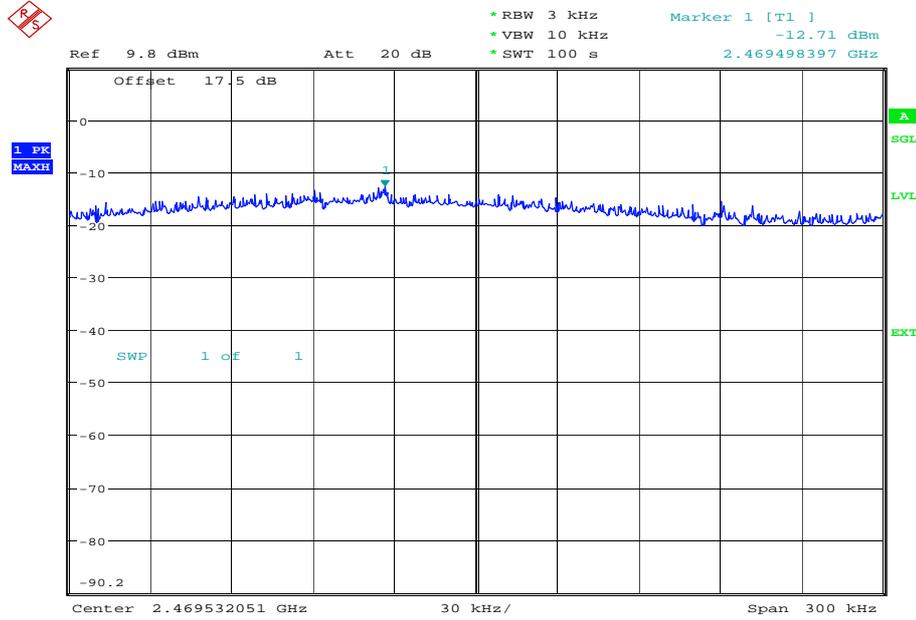
Date: 6.JAN.2014 15:28:34



Product Service

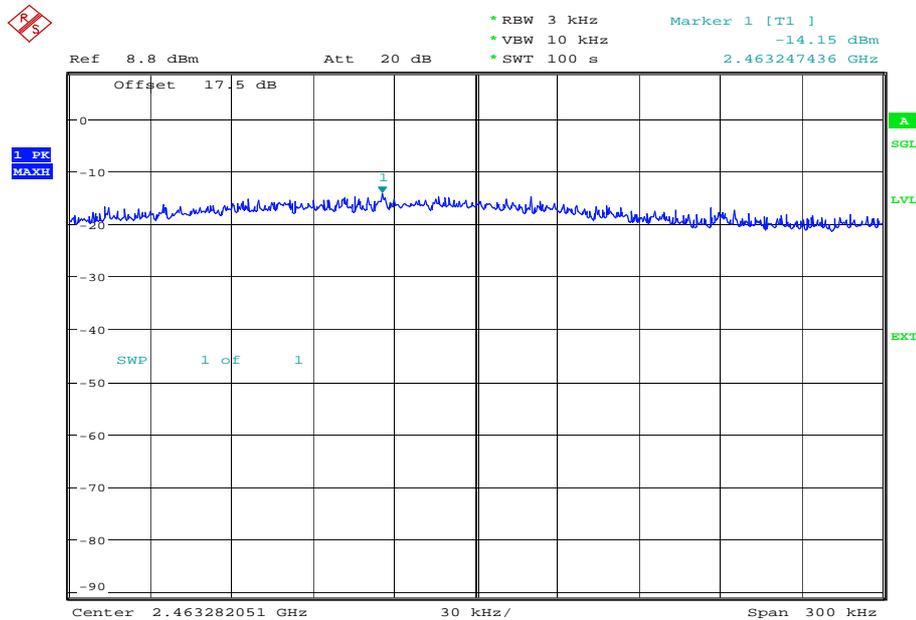
2462 MHz

6 Mbps



Date: 6.JAN.2014 17:36:18

9 Mbps

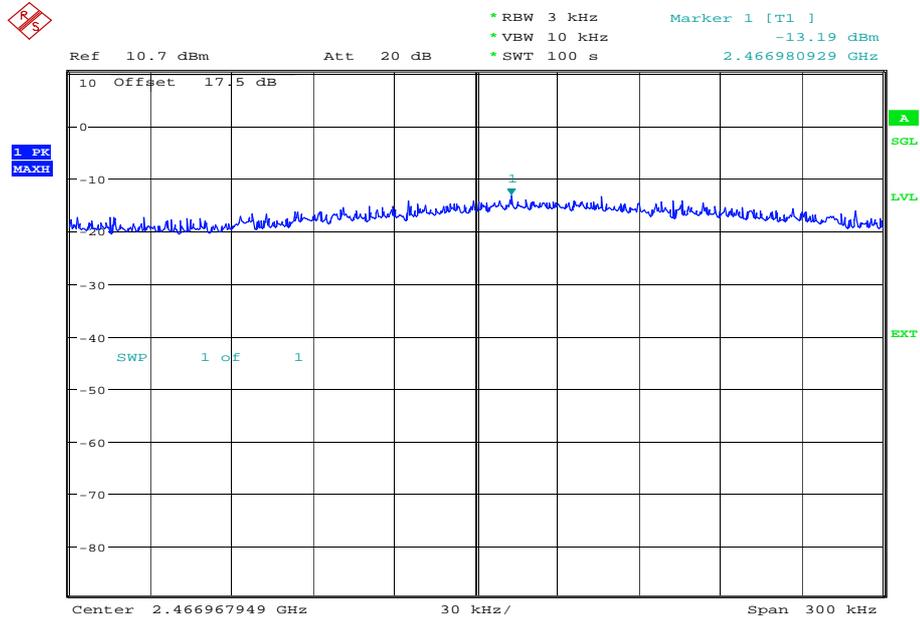


Date: 6.JAN.2014 17:52:33



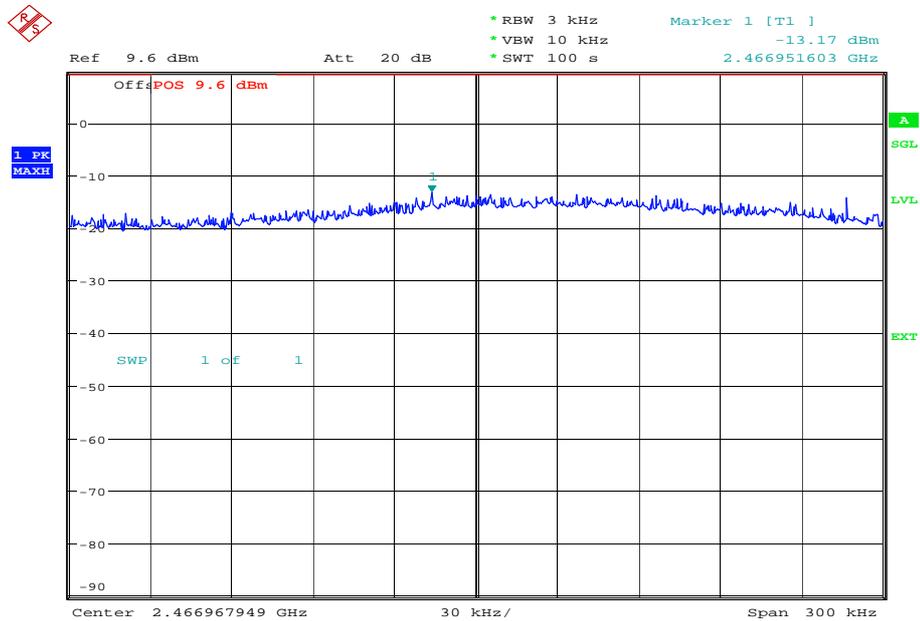
Product Service

12 Mbps



Date: 7.JAN.2014 09:45:56

18 Mbps

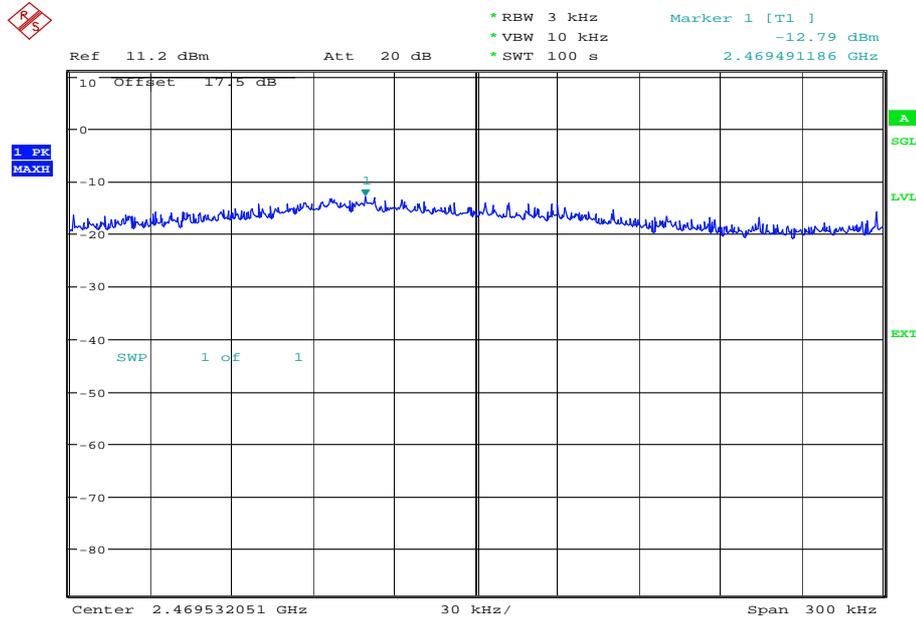


Date: 7.JAN.2014 10:53:38



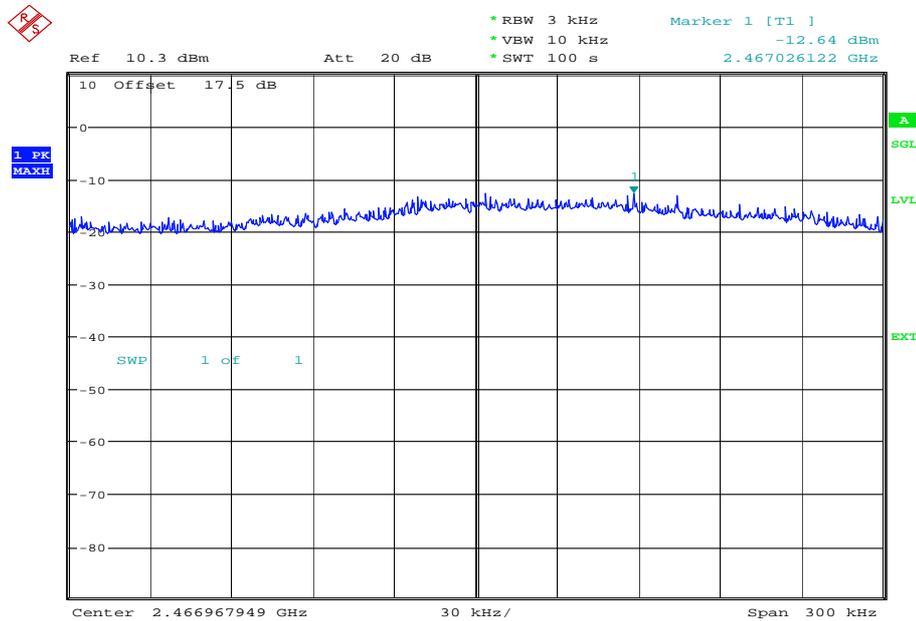
Product Service

24 Mbps



Date: 7.JAN.2014 11:10:51

36 Mbps

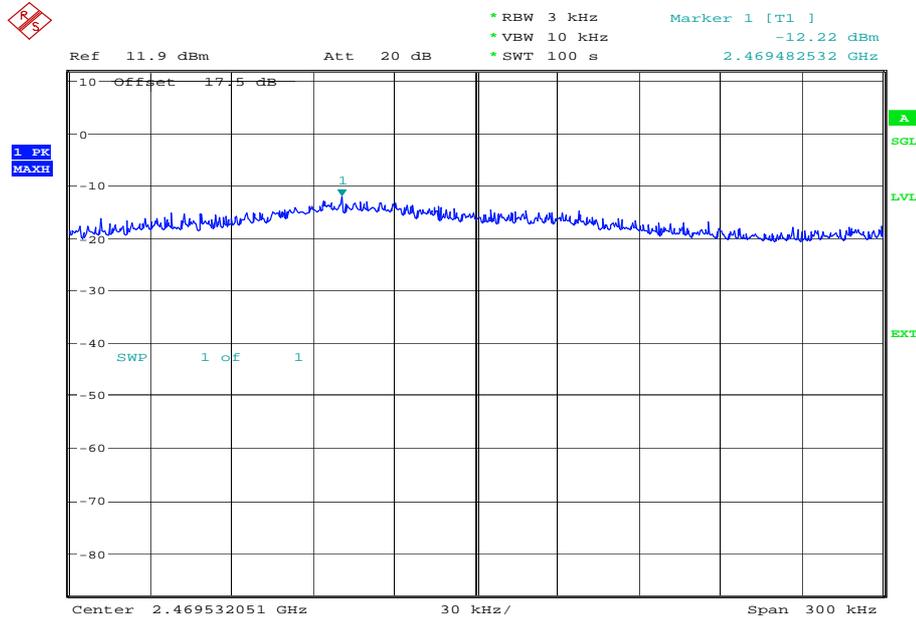


Date: 7.JAN.2014 11:30:59



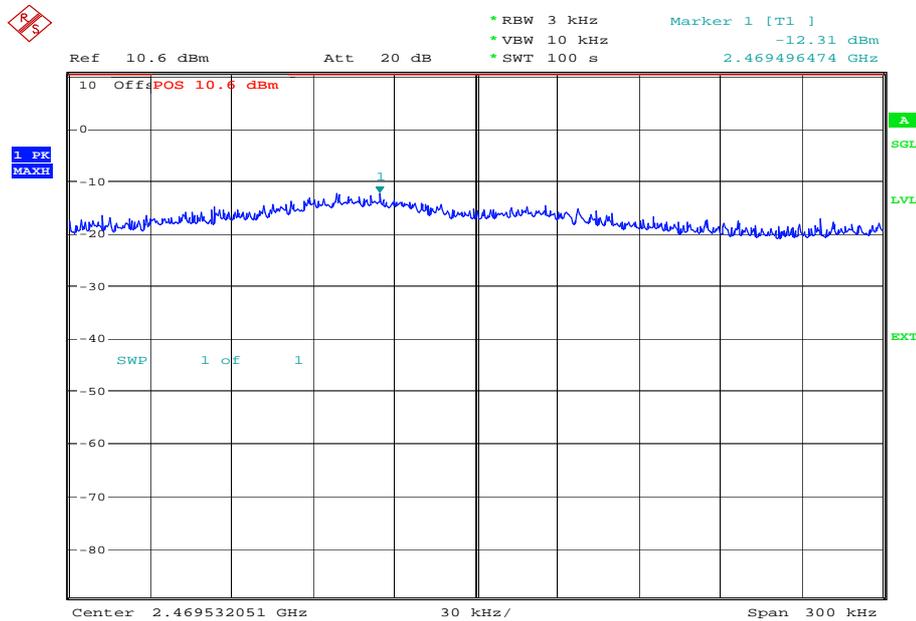
Product Service

48 Mbps



Date: 7.JAN.2014 11:45:45

54 Mbps



Date: 6.JAN.2014 15:22:41

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

802.11(n)

4.0 V DC Supply

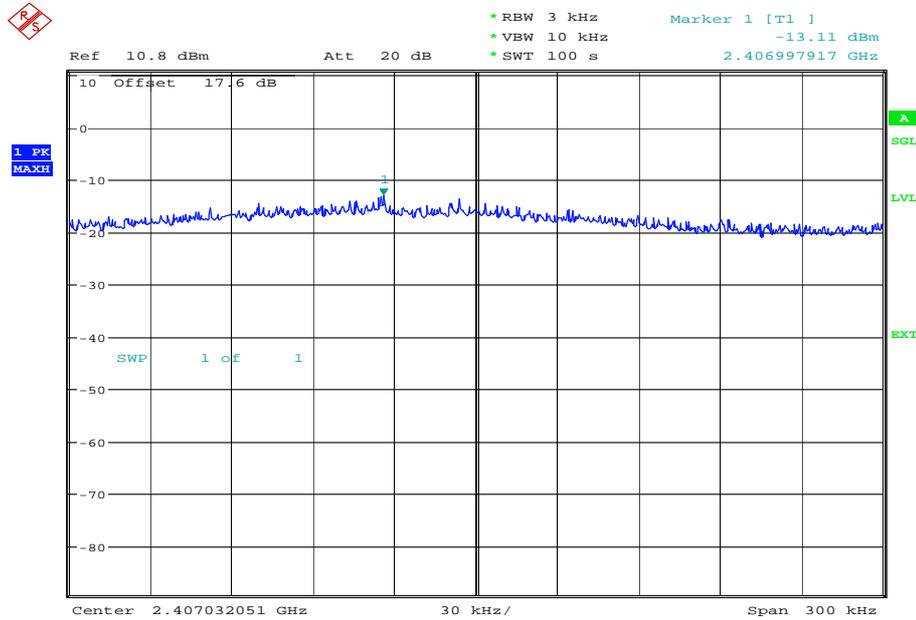
Frequency	Data Rate (Mbps)	Power Spectral Density in 3 kHz Bands (dBm)
2412 MHz	6.5	-13.11
	13	-13.93
	19.5	-14.36
	26	-12.60
	39	-12.79
	52	-13.77
	58.5	-13.26
	65	-12.99
2437 MHz	6.5	-11.63
	13	-13.48
	19.5	-13.40
	26	-13.07
	39	-13.06
	52	-11.84
	58.5	-12.90
	65	-12.47
2462 MHz	6.5	-13.79
	13	-13.16
	19.5	-12.48
	26	-12.33
	39	-12.23
	52	-12.32
	58.5	-12.05
	65	-11.24



Product Service

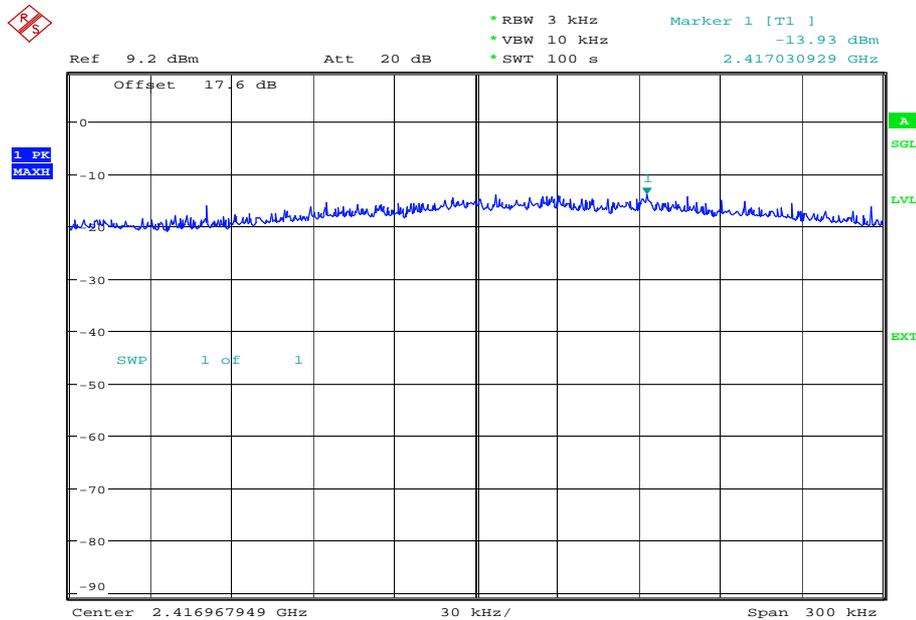
2412 MHz

6.5 Mbps



Date: 6.JAN.2014 15:41:34

13 Mbps

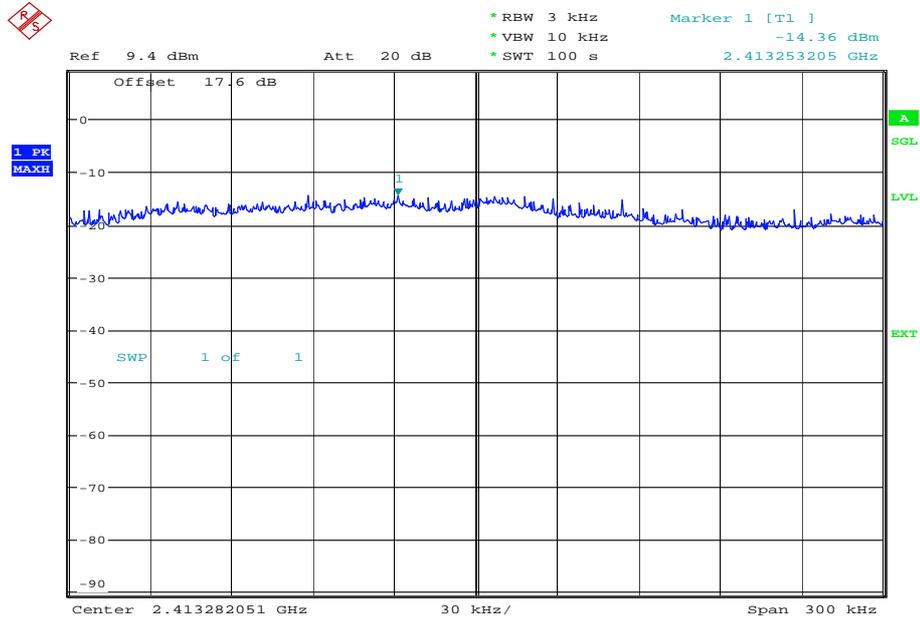


Date: 7.JAN.2014 11:54:11



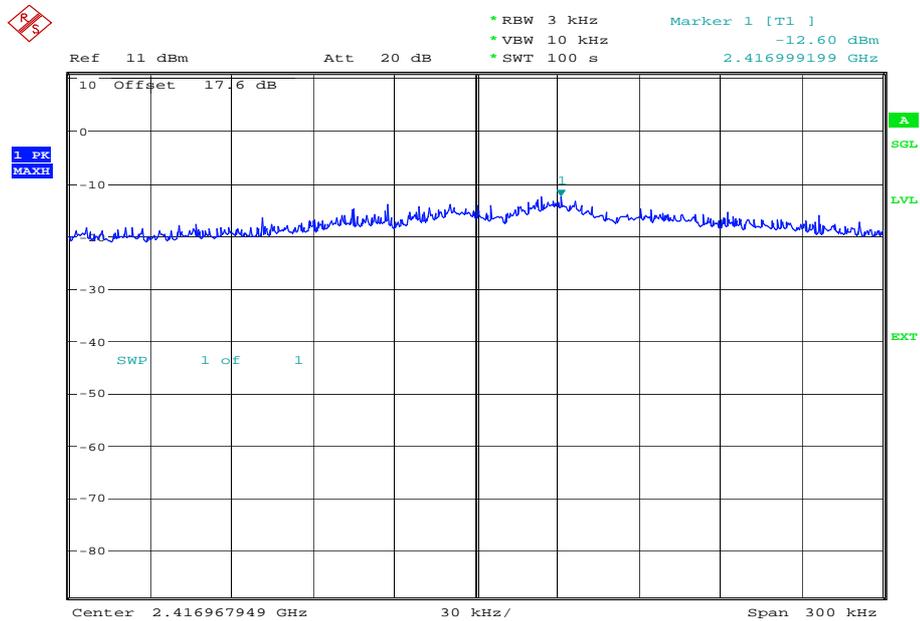
Product Service

19.5 Mbps



Date: 7.JAN.2014 12:19:53

26 Mbps

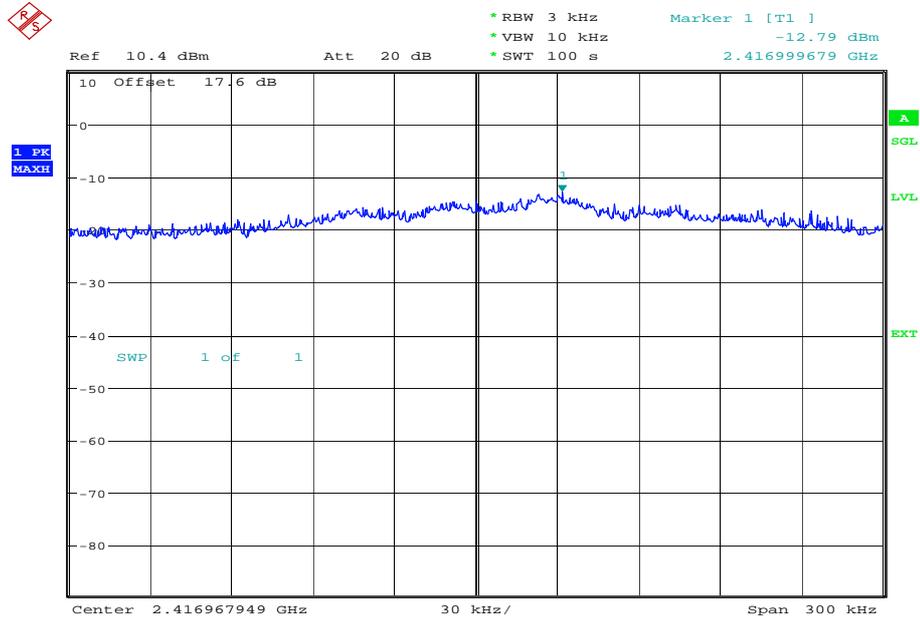


Date: 7.JAN.2014 12:36:17



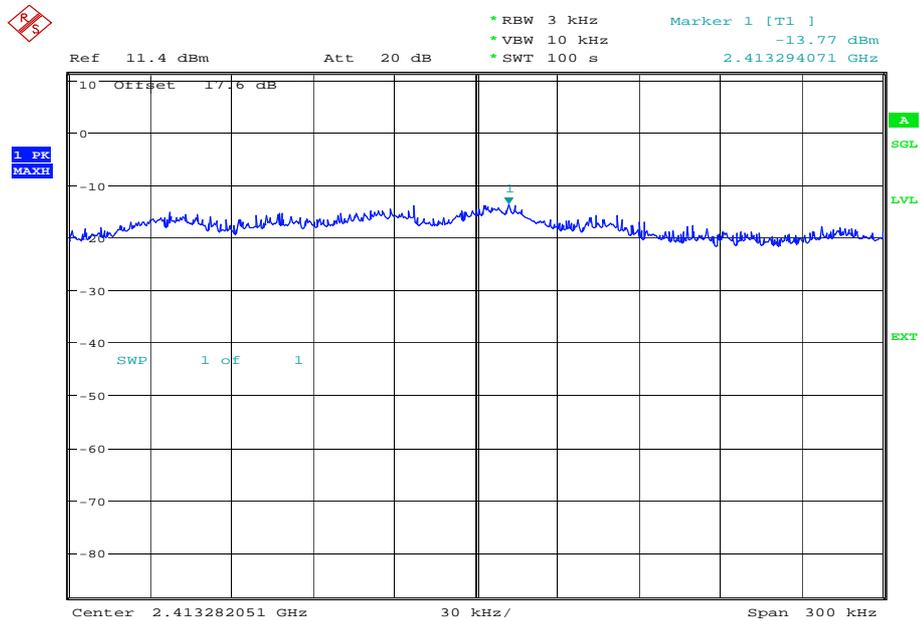
Product Service

39 Mbps



Date: 7.JAN.2014 12:52:13

52 Mbps

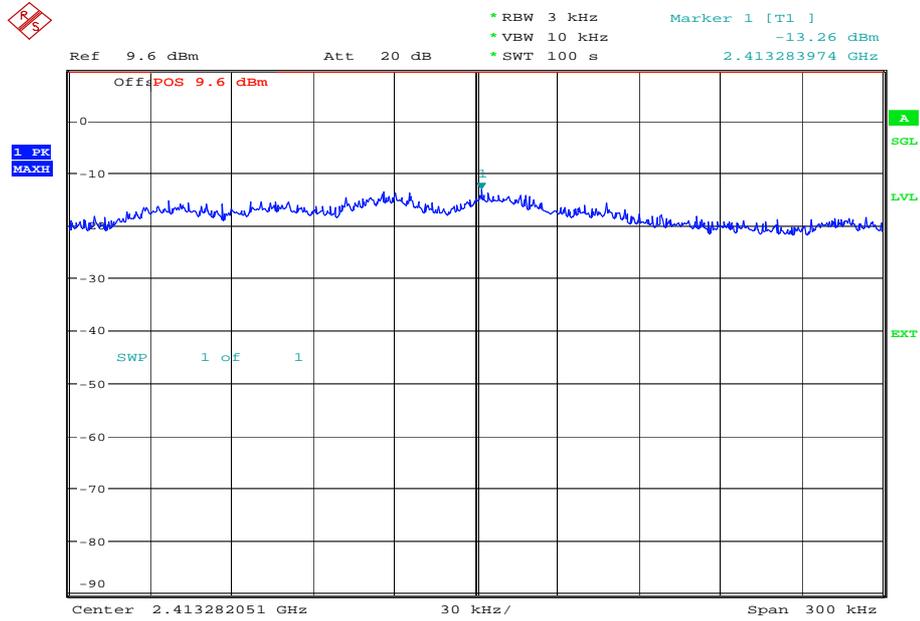


Date: 7.JAN.2014 13:11:14



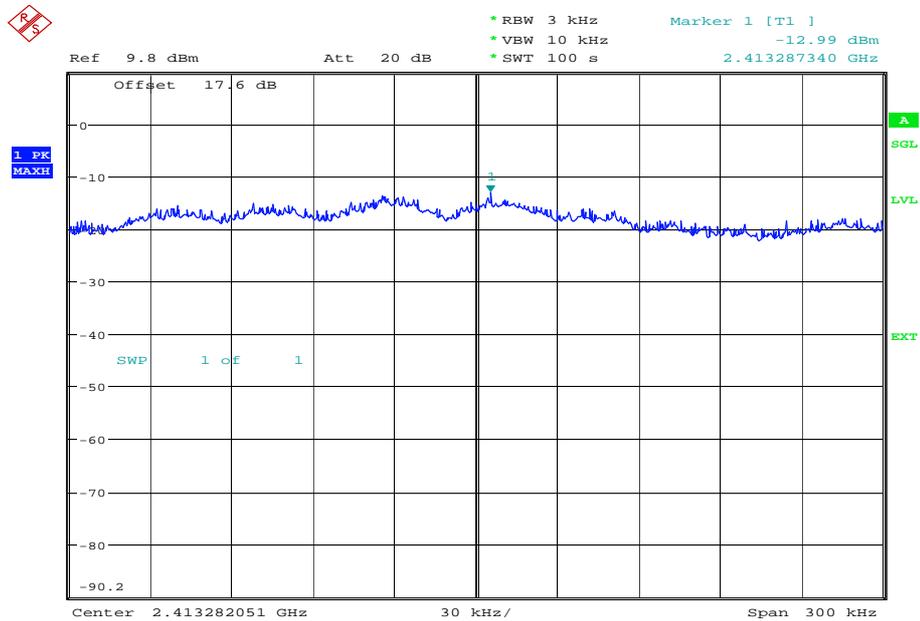
Product Service

58.5 Mbps



Date: 7.JAN.2014 14:03:56

65 Mbps



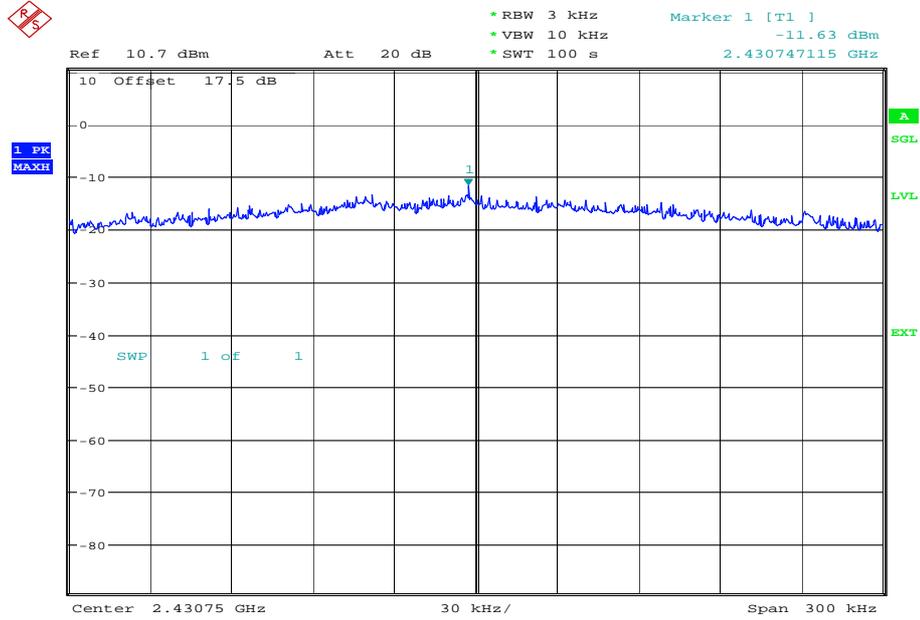
Date: 7.JAN.2014 14:20:34



Product Service

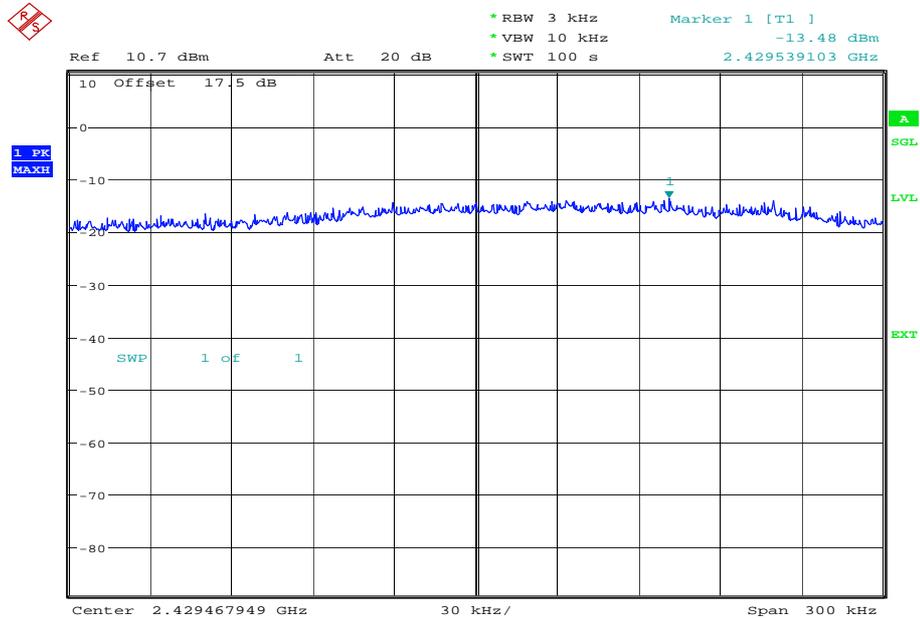
2437 MHz

6.5 Mbps



Date: 6.JAN.2014 15:48:46

13 Mbps

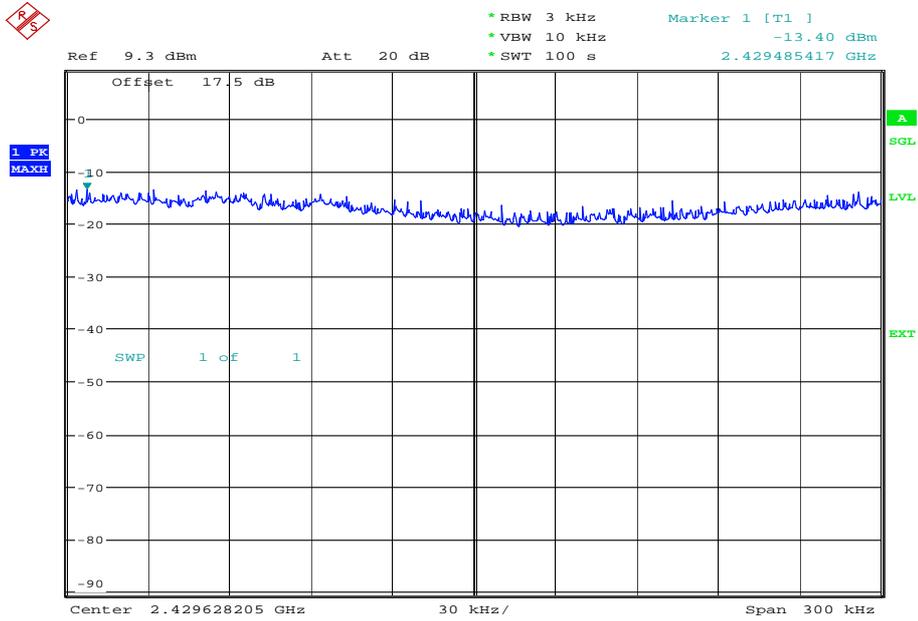


Date: 7.JAN.2014 11:59:04



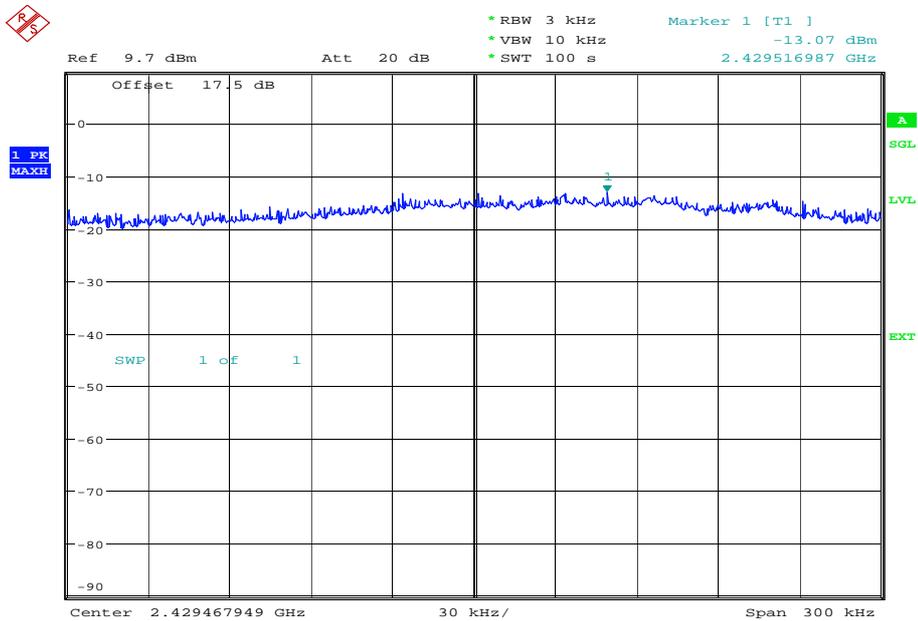
Product Service

19.5 Mbps



Date: 7.JAN.2014 12:24:51

26 Mbps

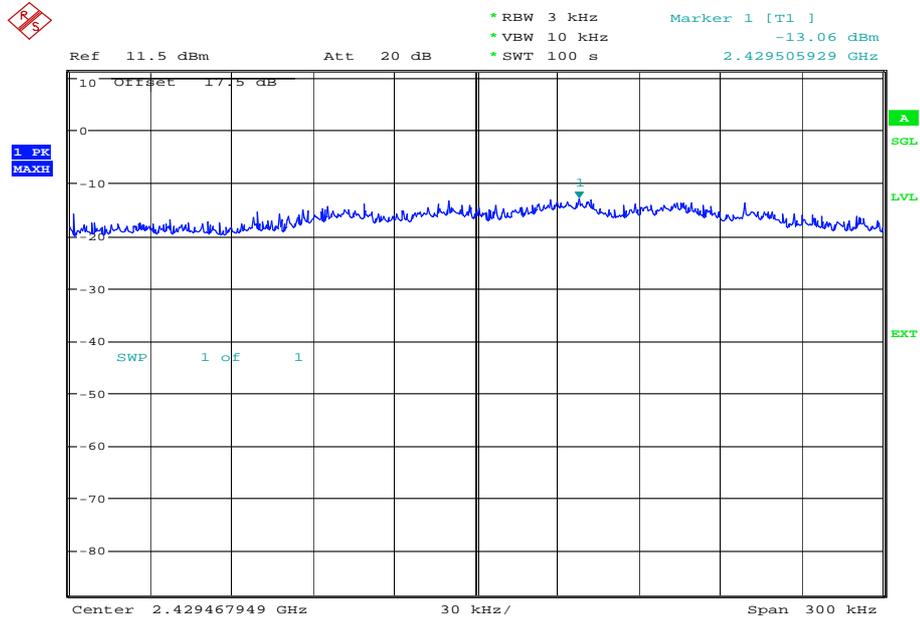


Date: 7.JAN.2014 12:41:04



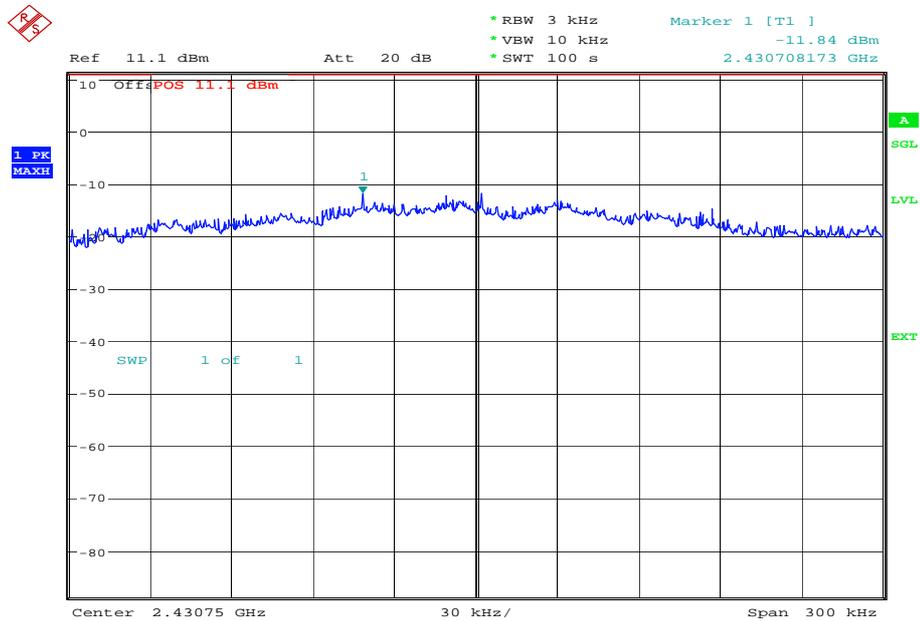
Product Service

39 Mbps



Date: 7.JAN.2014 12:57:03

52 Mbps

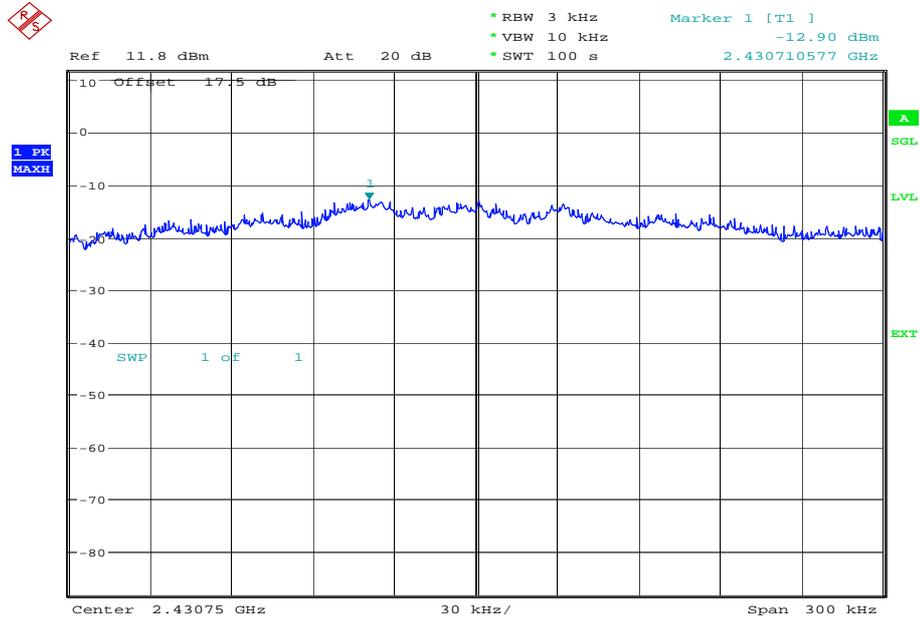


Date: 7.JAN.2014 13:16:07



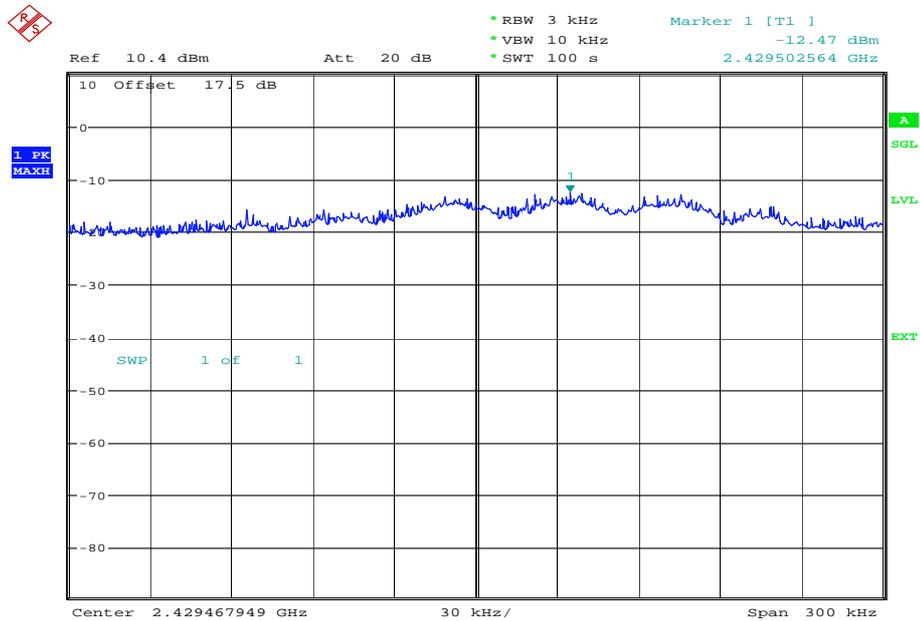
Product Service

58.5 Mbps



Date: 7.JAN.2014 14:09:00

65 Mbps



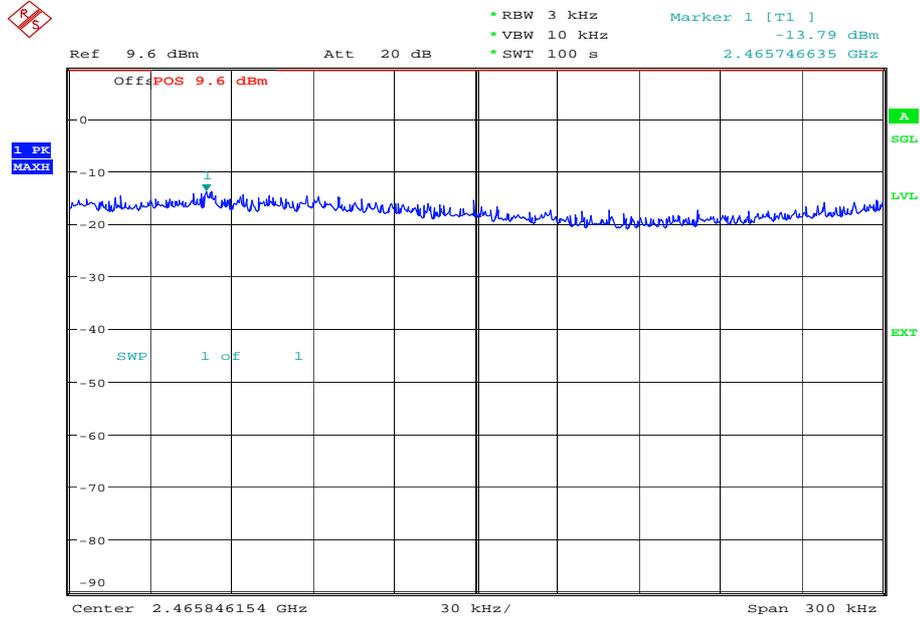
Date: 7.JAN.2014 14:26:13



Product Service

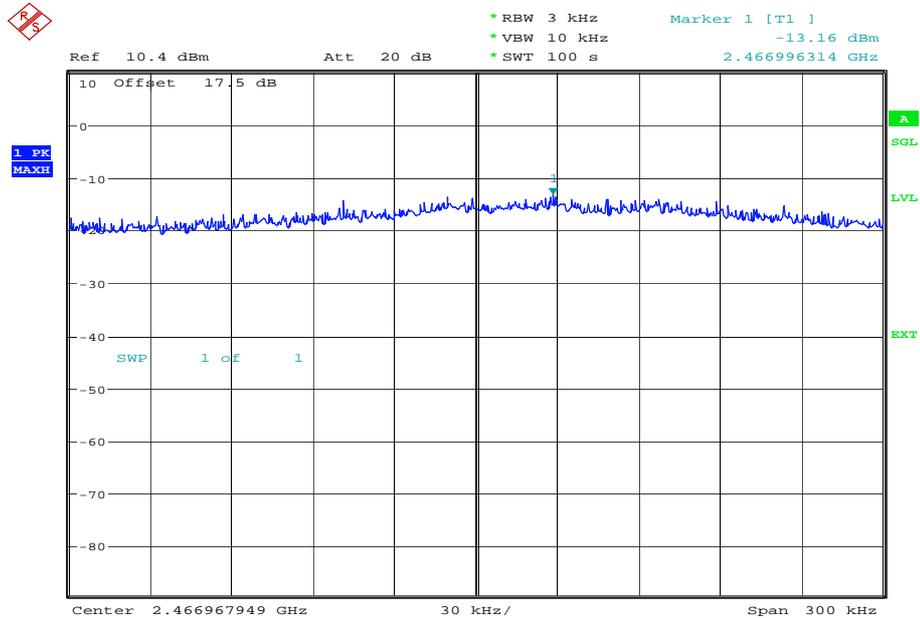
2462 MHz

6.5 Mbps



Date: 6.JAN.2014 15:53:37

13 Mbps

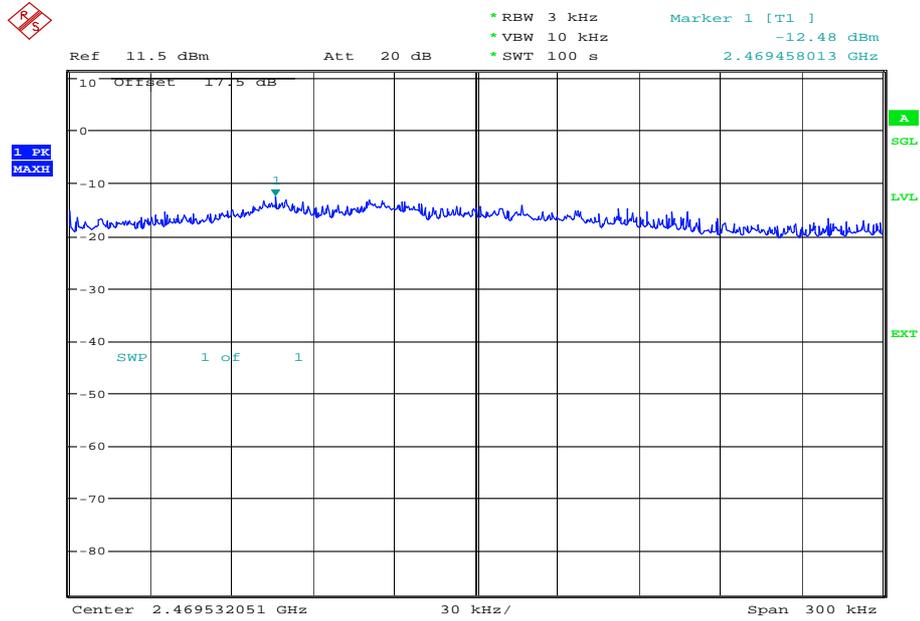


Date: 7.JAN.2014 12:03:50



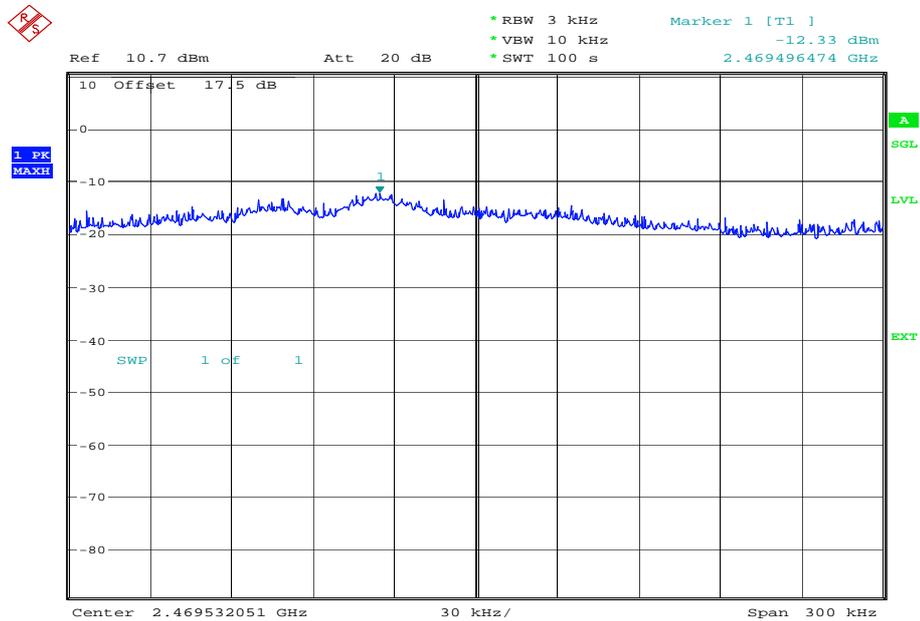
Product Service

19.5 Mbps



Date: 7.JAN.2014 12:30:59

26 Mbps

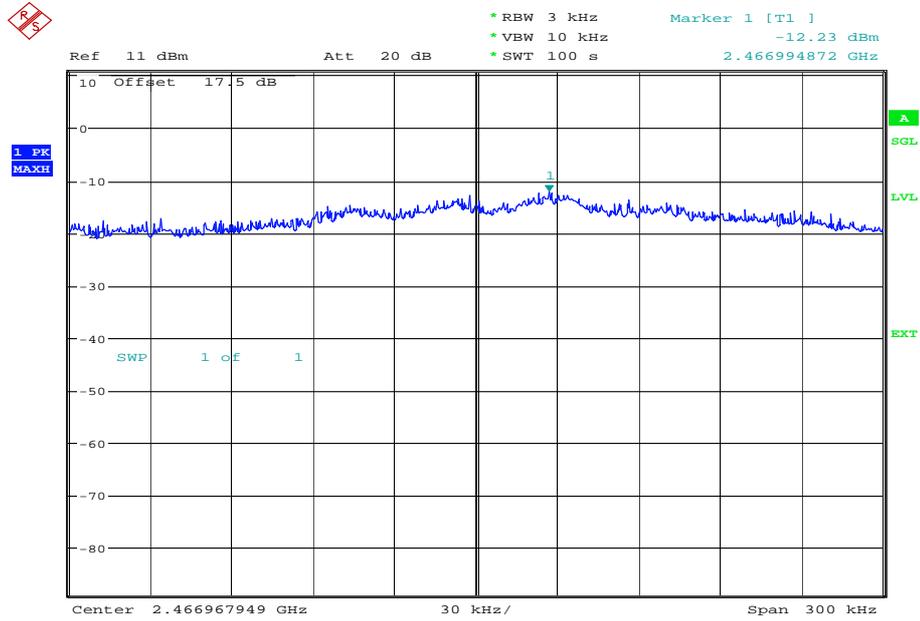


Date: 7.JAN.2014 12:45:53



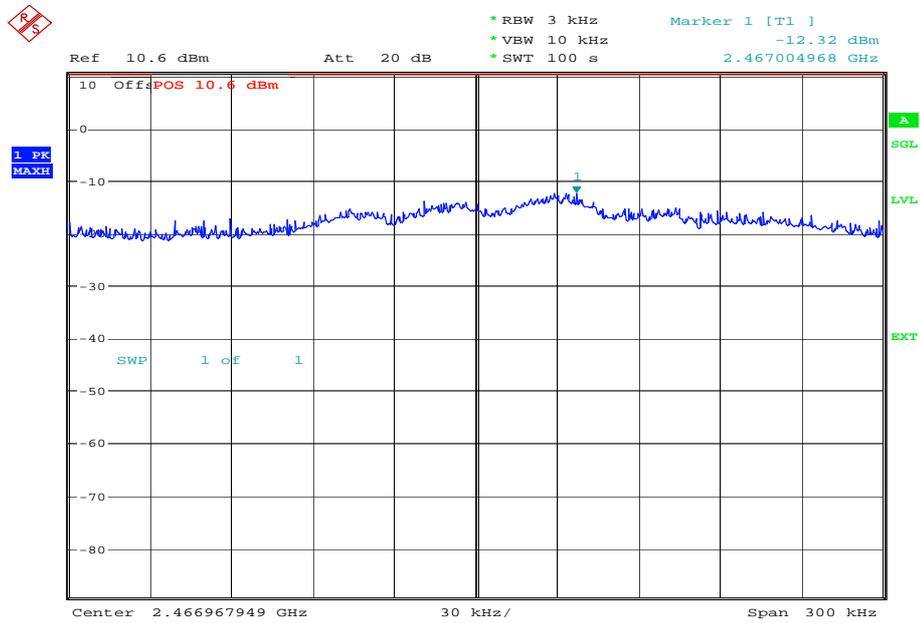
Product Service

39 Mbps



Date: 7.JAN.2014 13:01:45

52 Mbps

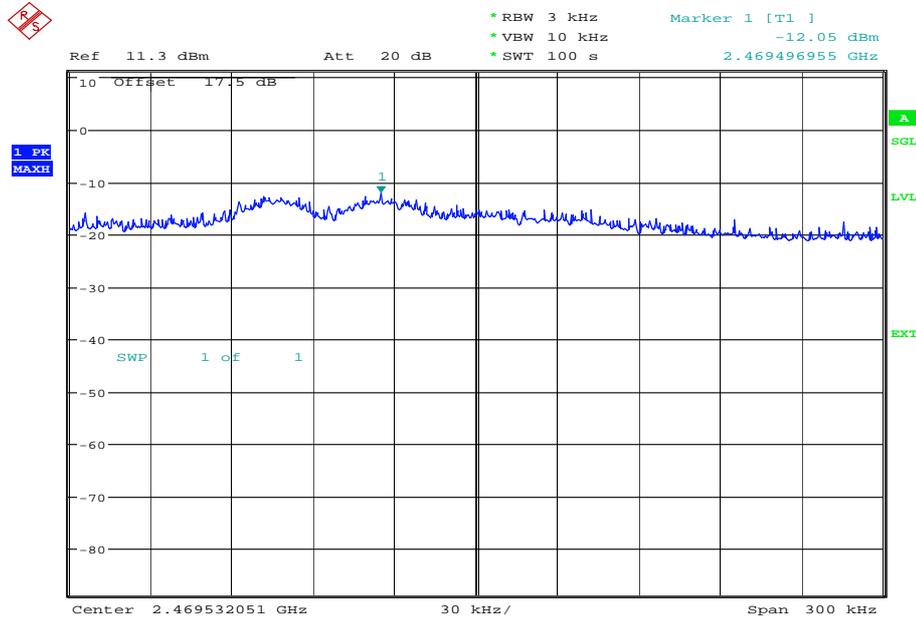


Date: 7.JAN.2014 13:20:54



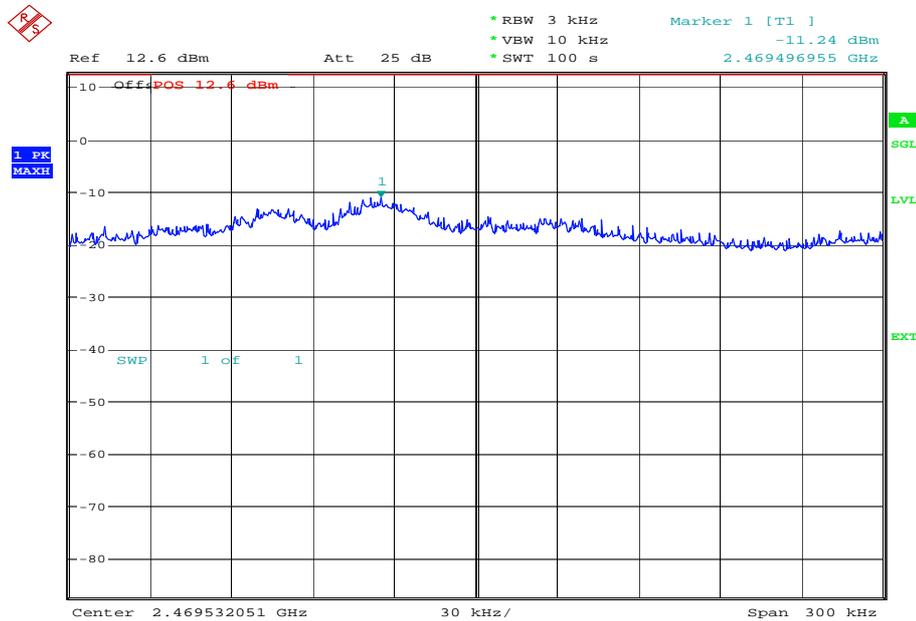
Product Service

**58.5 Mbps**



Date: 7.JAN.2014 14:15:04

**65 Mbps**



Date: 7.JAN.2014 14:31:15

**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

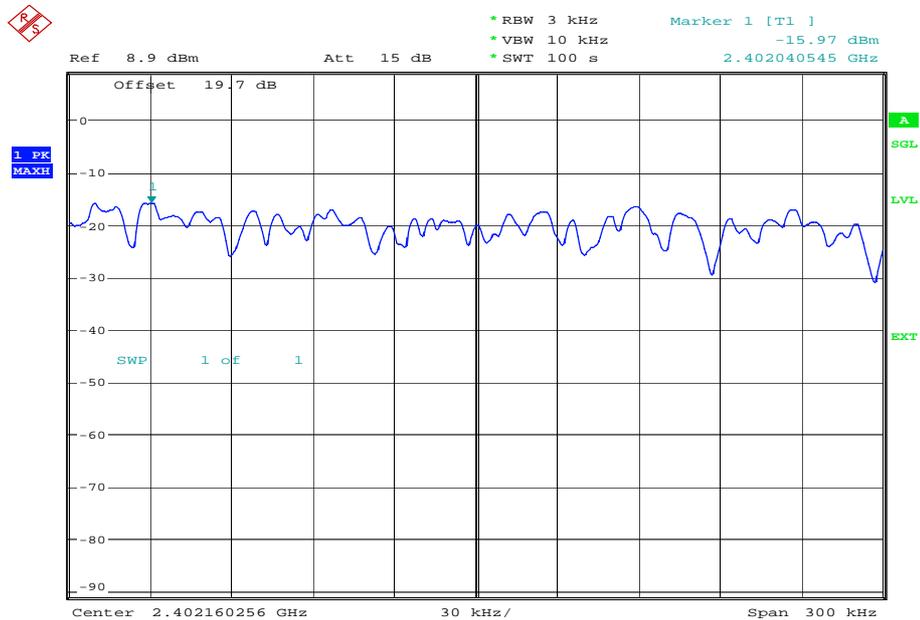
Bluetooth Low Energy

4.0 V DC Supply

Frequency	Packet Type	Power Spectral Density in 3 kHz Bands (dBm)
2402 MHz	37octet/prbs9	-15.97
2440 MHz	37octet/prbs9	-14.38
2480 MHz	37octet/prbs9	-16.48

2402 MHz

37octet/prbs9



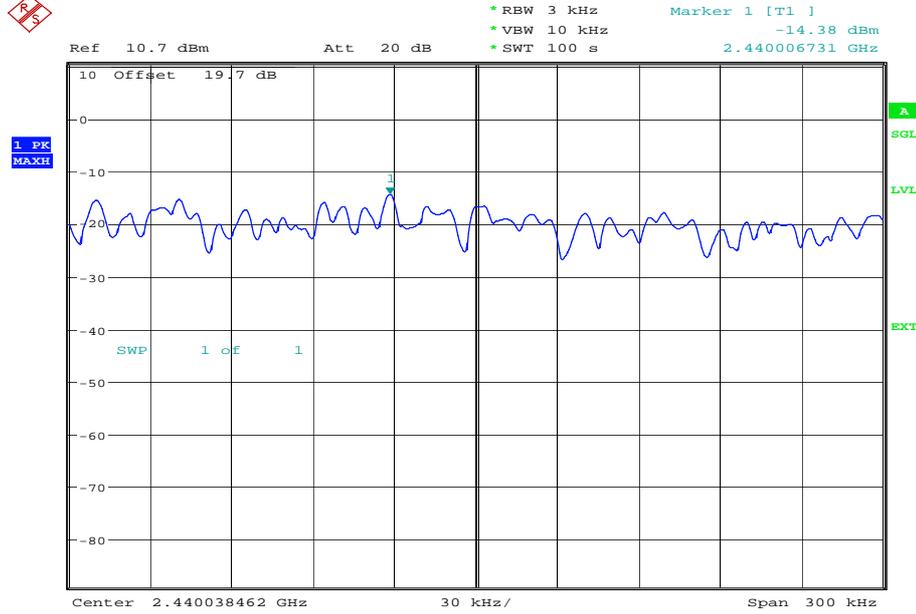
Date: 7.JAN.2014 17:04:24



Product Service

2440 MHz

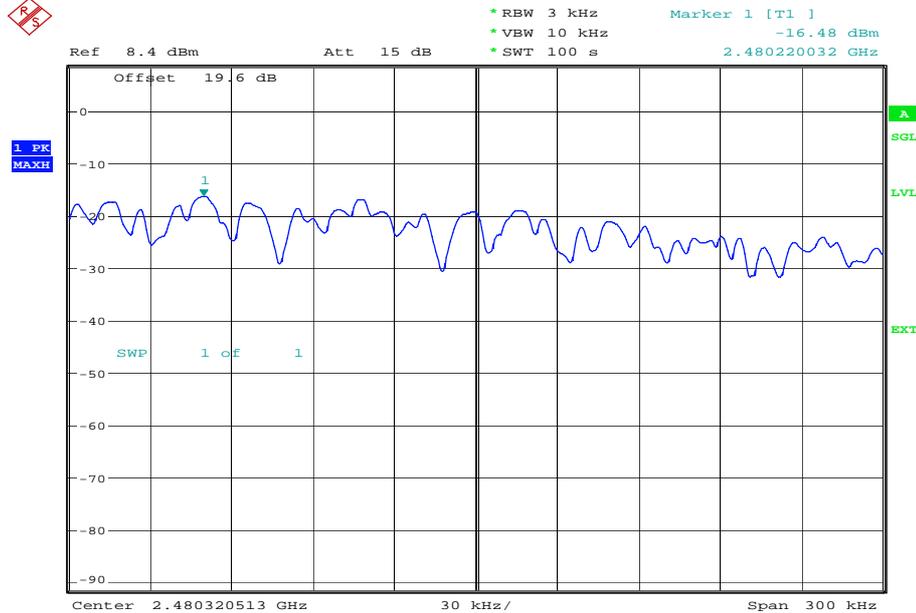
37octet/prbs9



Date: 7.JAN.2014 17:07:39

2480 MHz

37octet/prbs9



Date: 7.JAN.2014 17:17:41

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**

SHL24 S/N: IMEI 004401115003390 - Modification State 0

### **2.6.3 Date of Test**

16 January 2014

### **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	25.0°C
Relative Humidity	39.0%



Product Service

**2.6.7 Test Results**

802.11(b)

4.0 V DC Supply

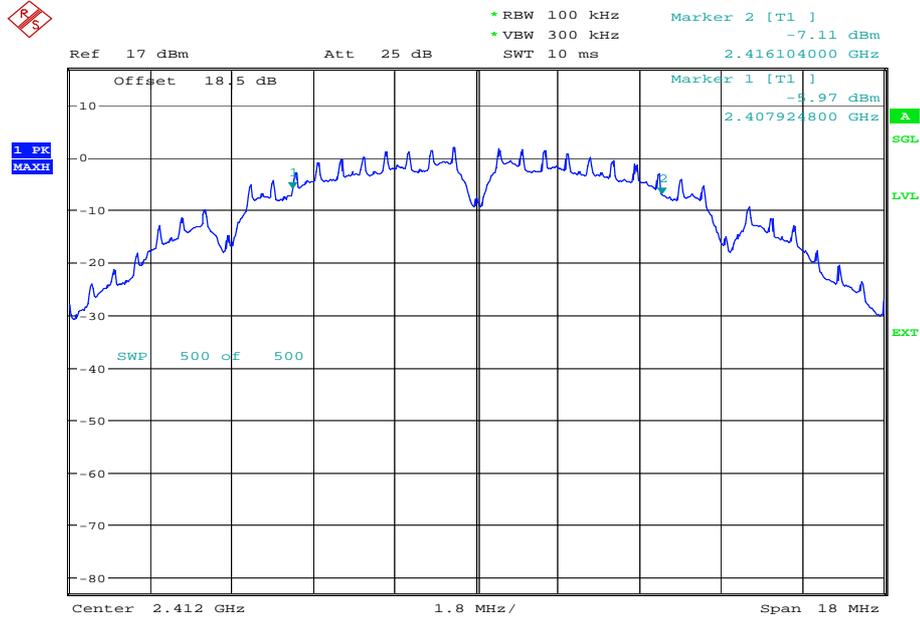
Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412 MHz	1	8179.2
	2	8121.6
	5.5	7833.6
	11	8438.4
2437 MHz	1	8611.2
	2	8928.0
	5.5	8640.0
	11	9072.0
2462 MHz	1	8640.0
	2	8092.8
	5.5	8409.6
	11	9043.2



Product Service

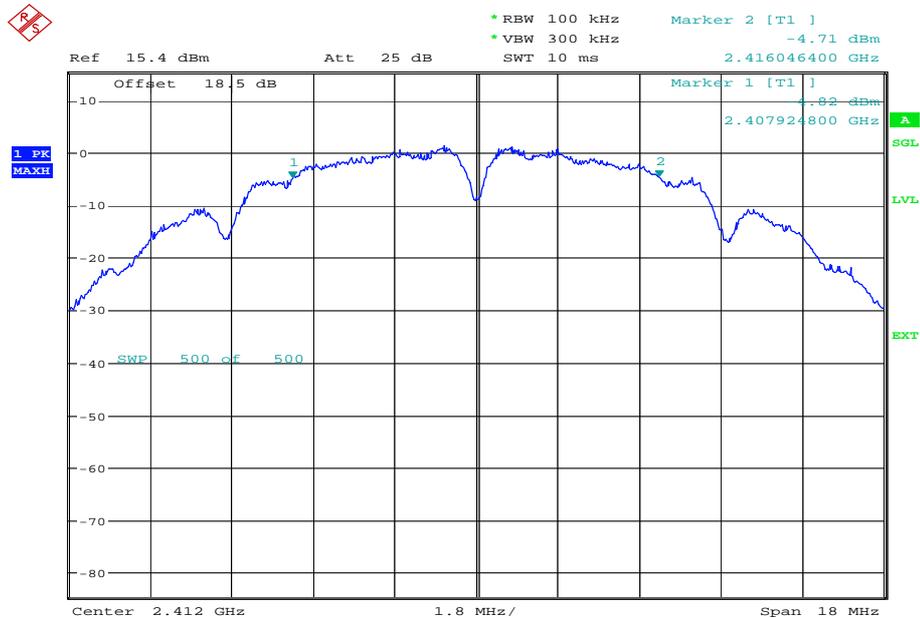
2412 MHz

1 Mbps



Date: 16.JAN.2014 18:23:47

2 Mbps

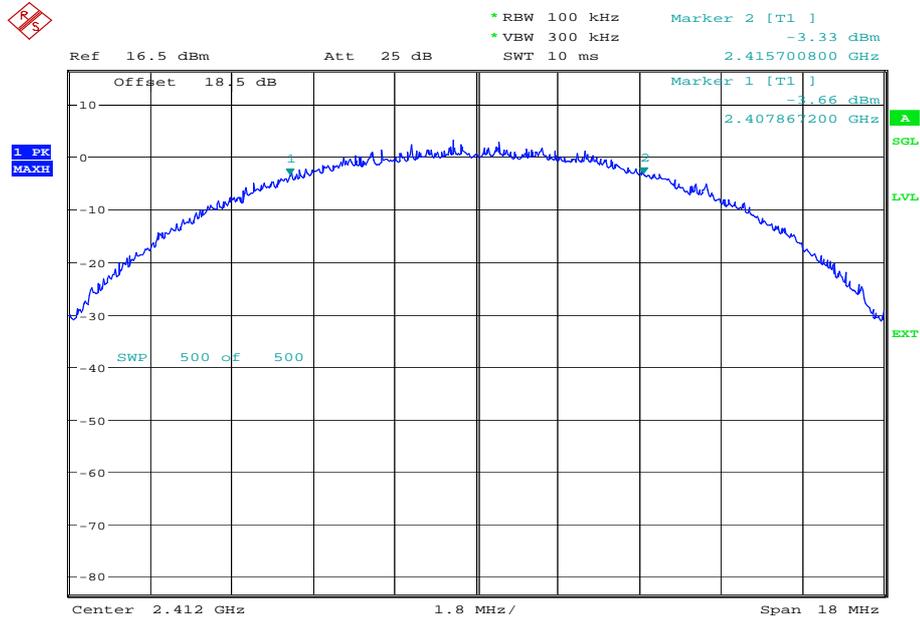


Date: 16.JAN.2014 18:30:20



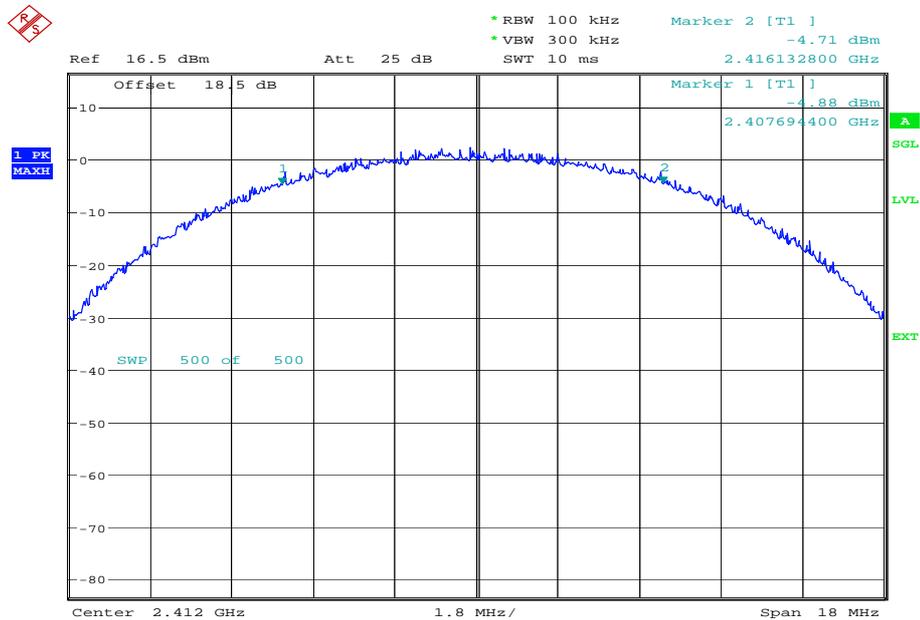
Product Service

5.5 Mbps



Date: 16.JAN.2014 18:39:06

11 Mbps



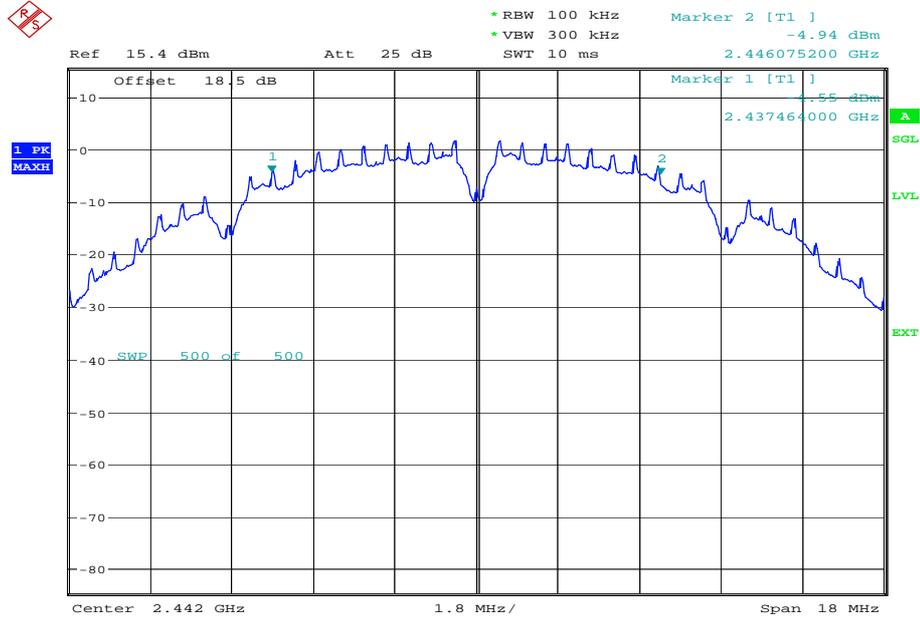
Date: 16.JAN.2014 18:44:07



Product Service

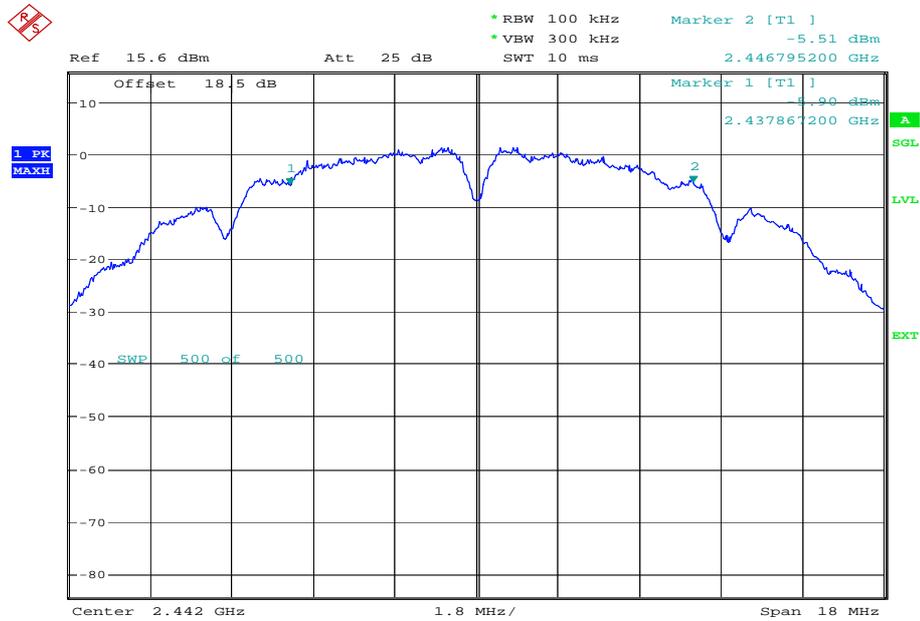
2437 MHz

1 Mbps



Date: 16.JAN.2014 18:26:06

2 Mbps

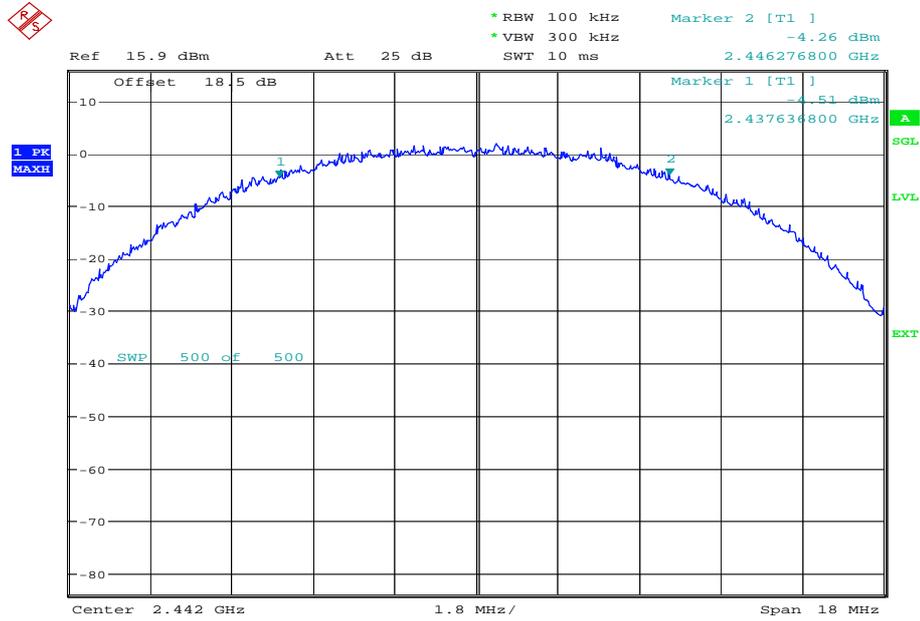


Date: 16.JAN.2014 18:32:00



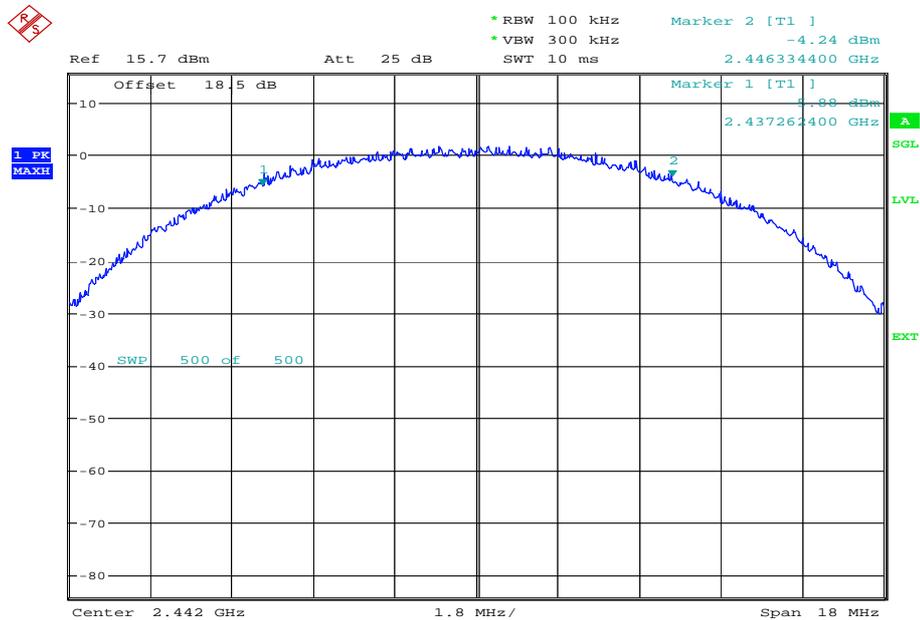
Product Service

5.5 Mbps



Date: 16.JAN.2014 18:40:34

11 Mbps



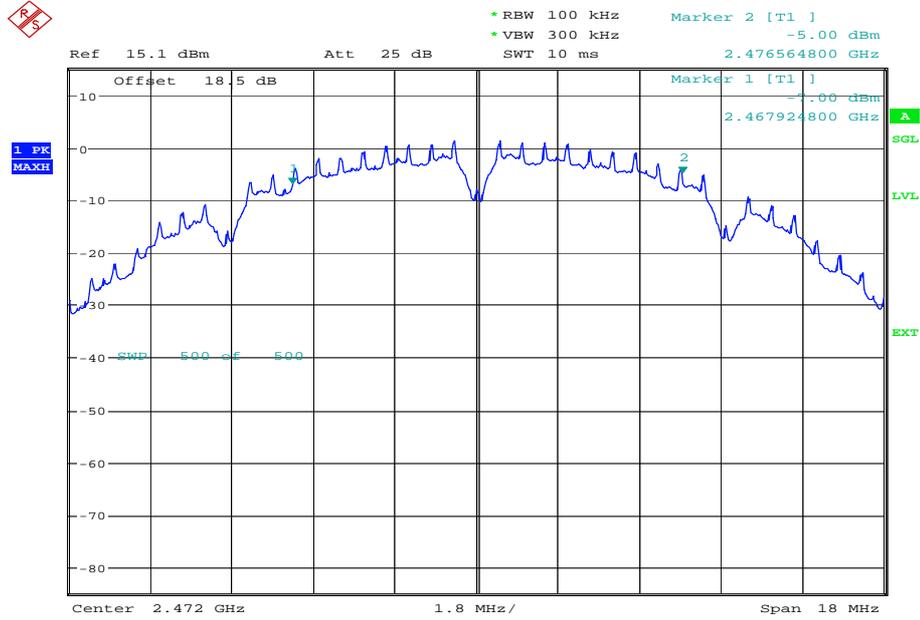
Date: 16.JAN.2014 18:45:45



Product Service

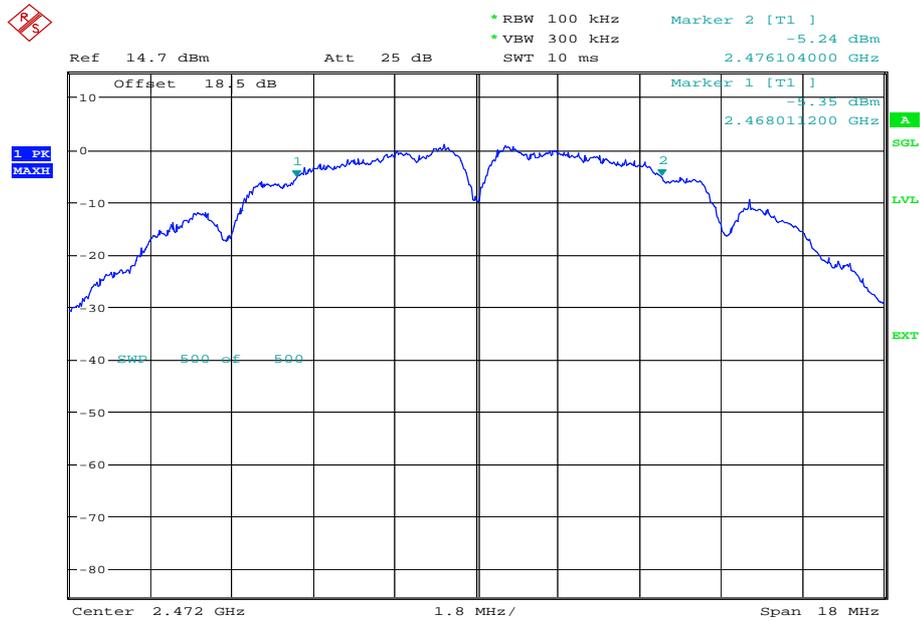
2462 MHz

1 Mbps



Date: 16.JAN.2014 18:28:06

2 Mbps

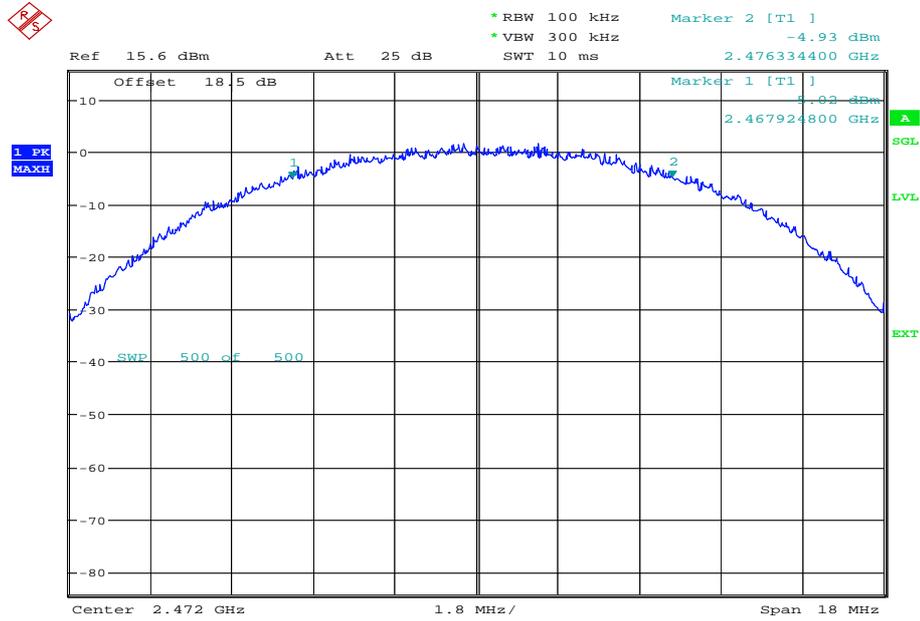


Date: 16.JAN.2014 18:33:45

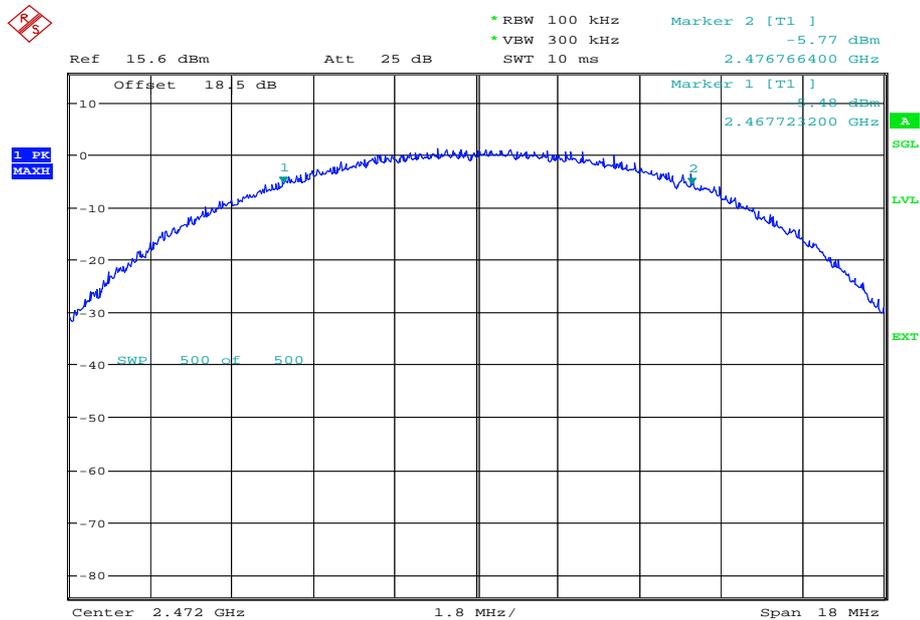


Product Service

5.5 Mbps



11 Mbps



Limit Clause

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



Product Service

802.11(g)

4.0 V DC Supply

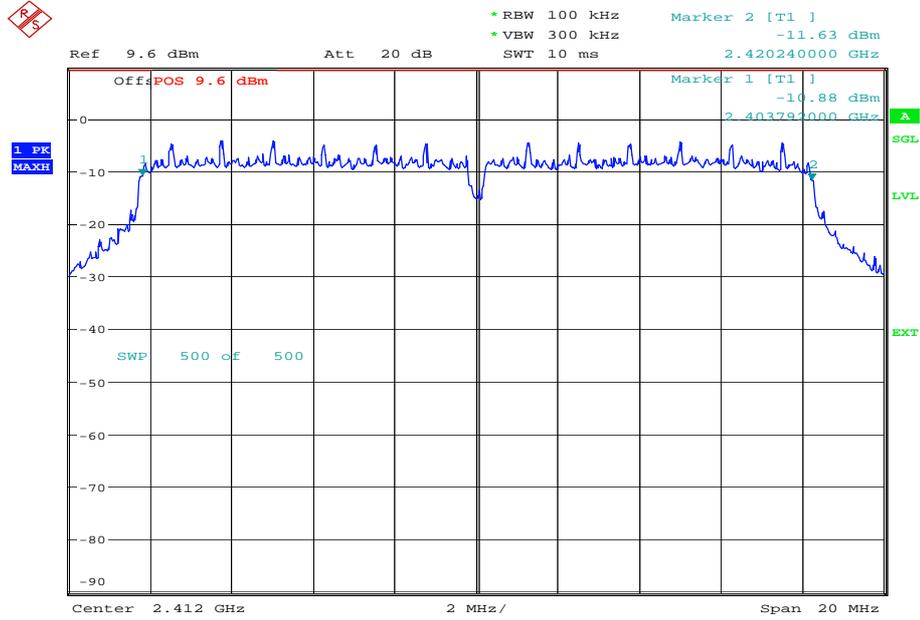
Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412 MHz	6	16448
	9	16448
	12	16512
	18	16512
	24	16608
	36	16576
	48	16608
	54	16640
2437 MHz	6	16448
	9	16416
	12	16480
	18	16480
	24	16512
	36	16512
	48	16544
	54	16544
2462 MHz	6	16416
	9	16416
	12	16512
	18	16512
	24	16544
	36	16544
	48	16576
	54	16544



Product Service

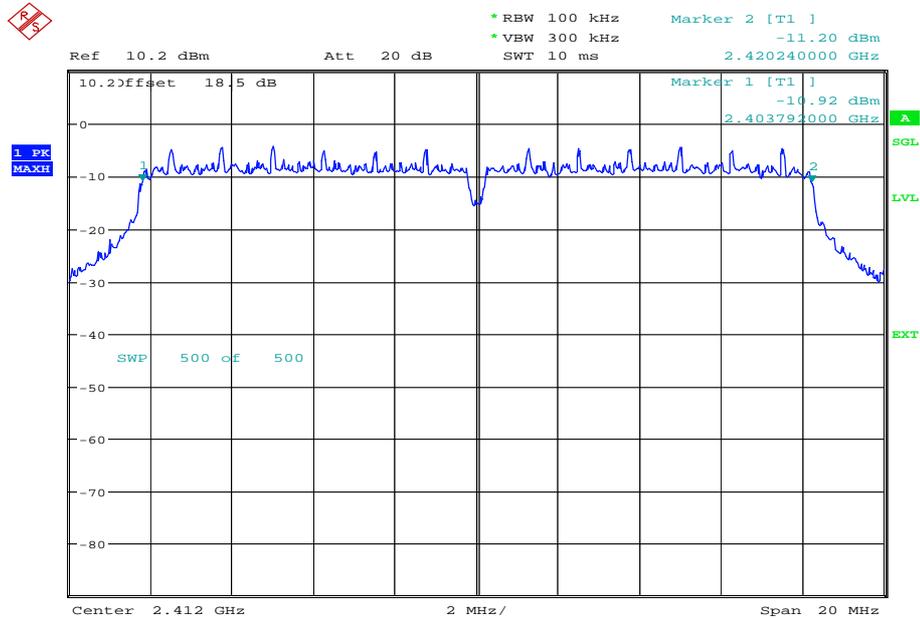
2412 MHz

6 Mbps



Date: 16.JAN.2014 18:49:37

9 Mbps

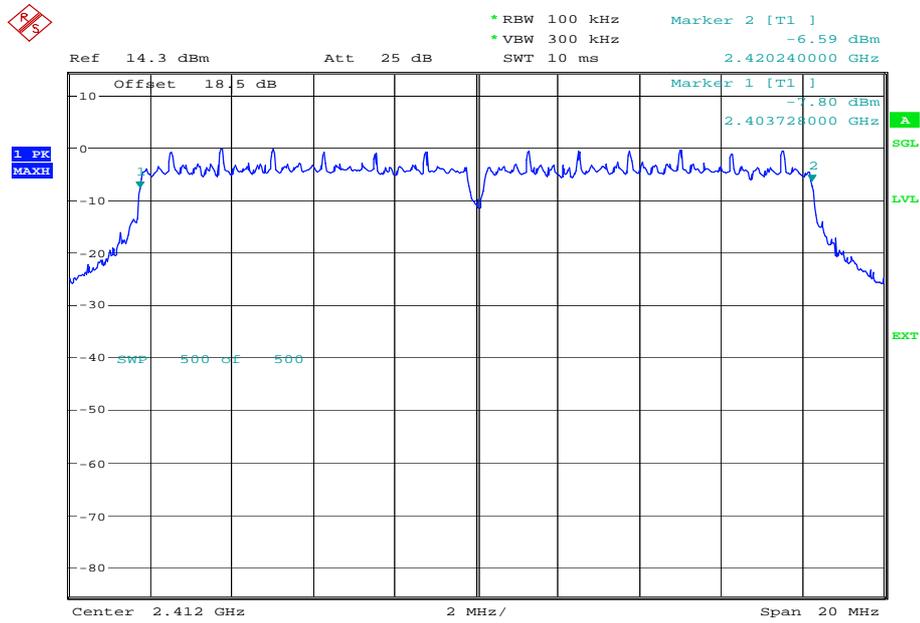


Date: 16.JAN.2014 18:56:06

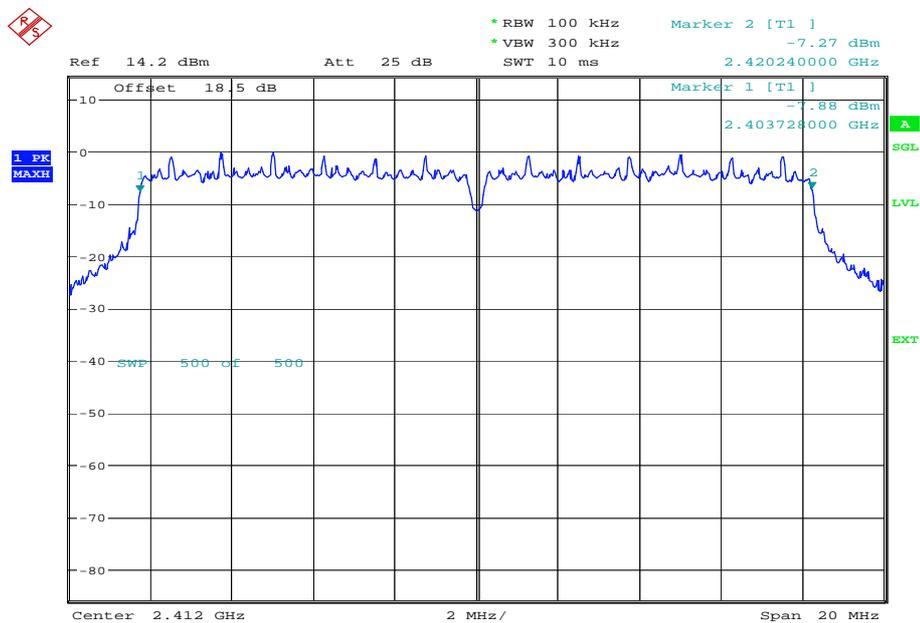


Product Service

12 Mbps



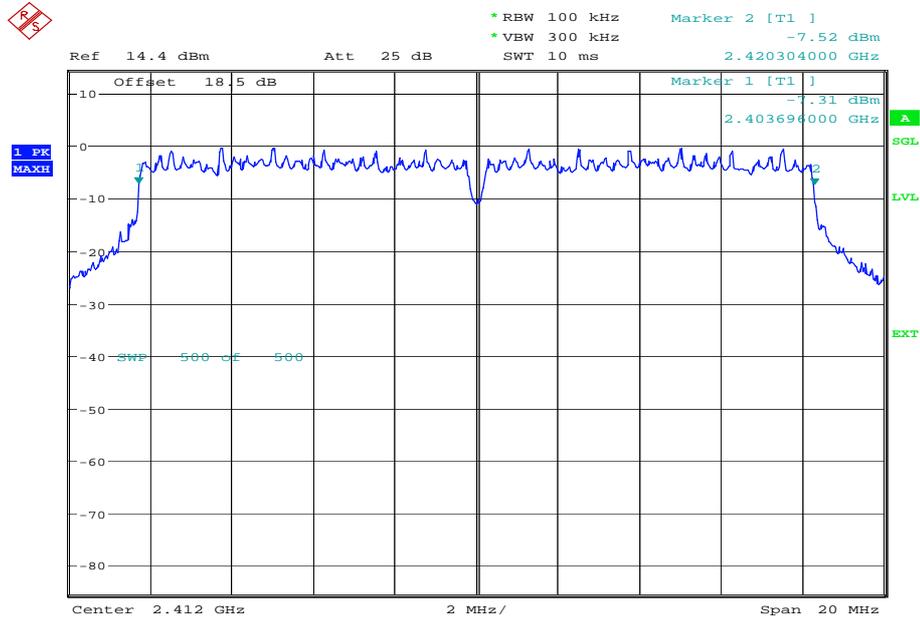
18 Mbps





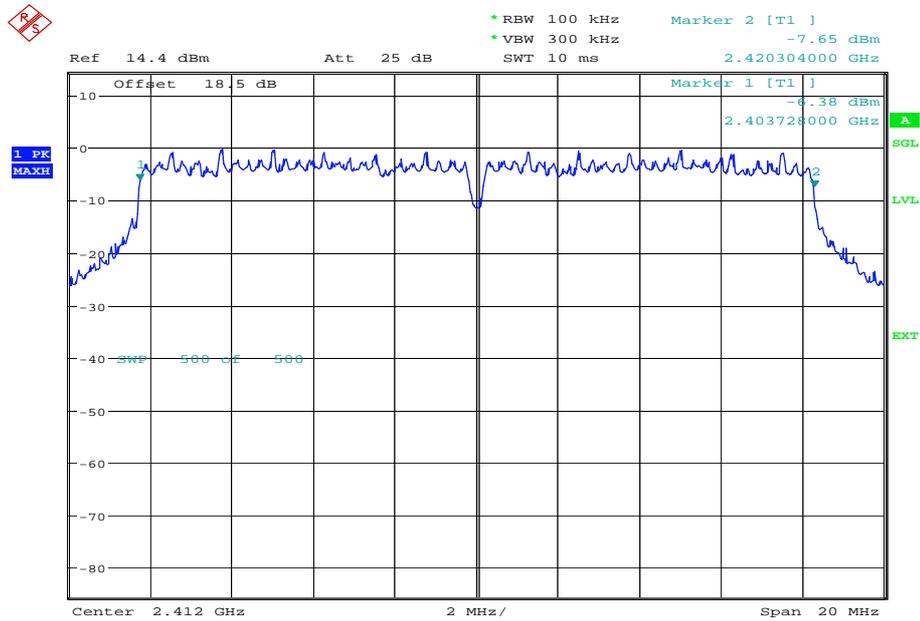
Product Service

24 Mbps



Date: 16.JAN.2014 19:19:13

36 Mbps

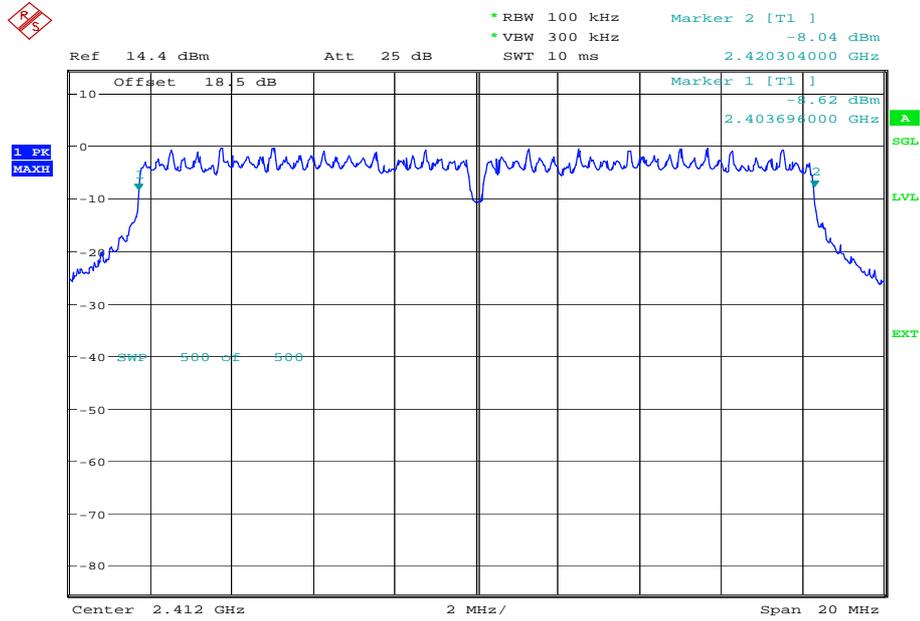


Date: 16.JAN.2014 19:25:03



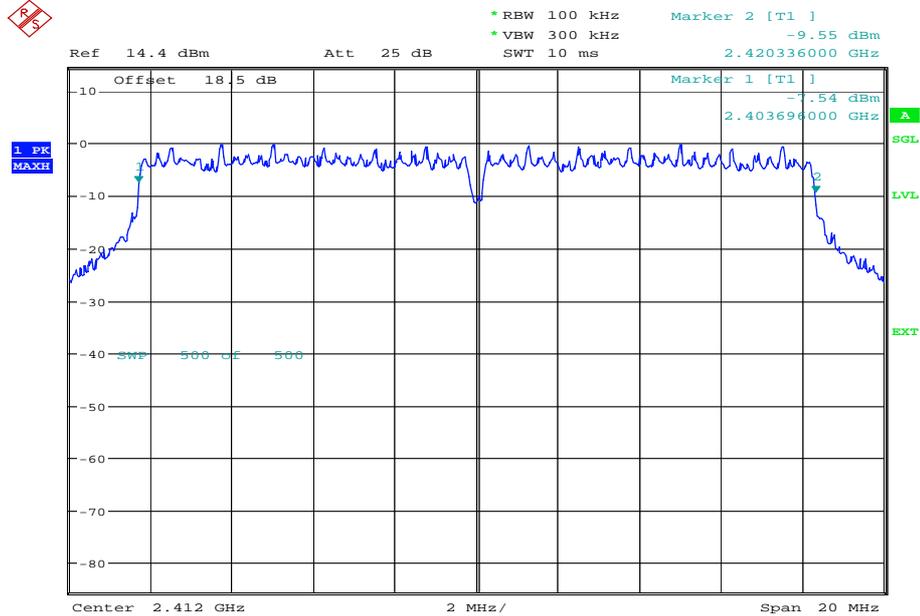
Product Service

48 Mbps



Date: 16.JAN.2014 19:34:03

54 Mbps



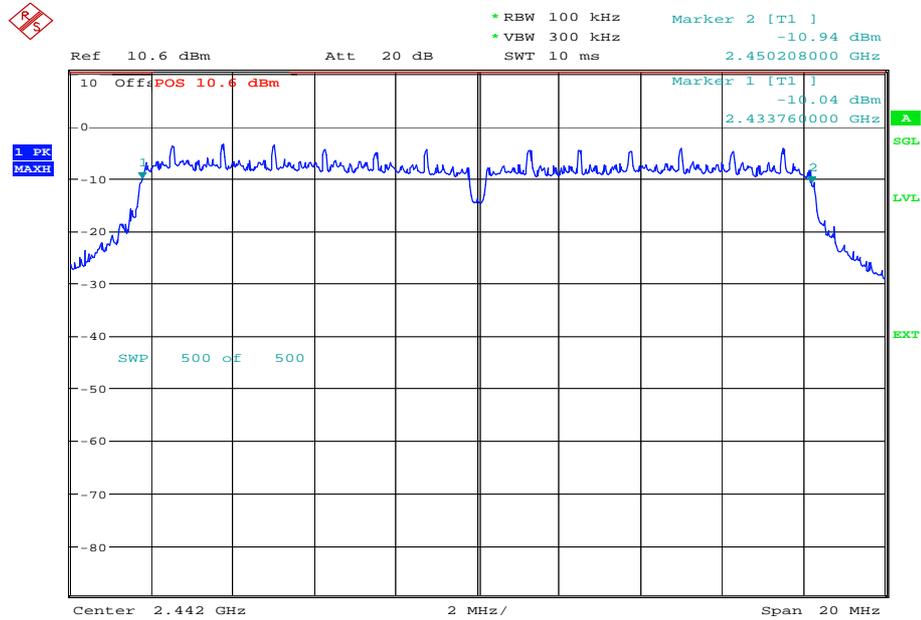
Date: 16.JAN.2014 19:39:13



Product Service

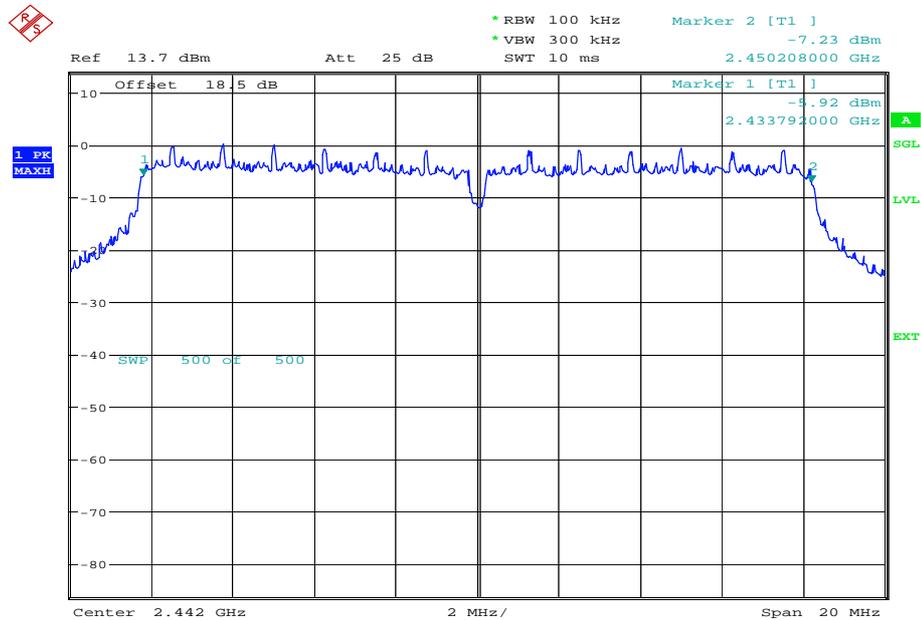
2437 MHz

6 Mbps



Date: 16.JAN.2014 18:52:59

9 Mbps



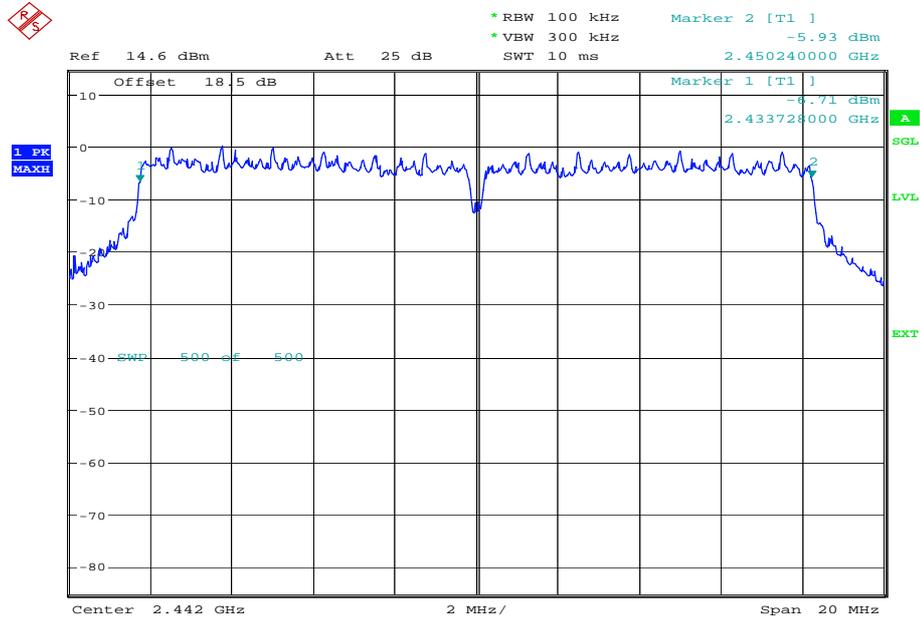
Date: 16.JAN.2014 18:57:35





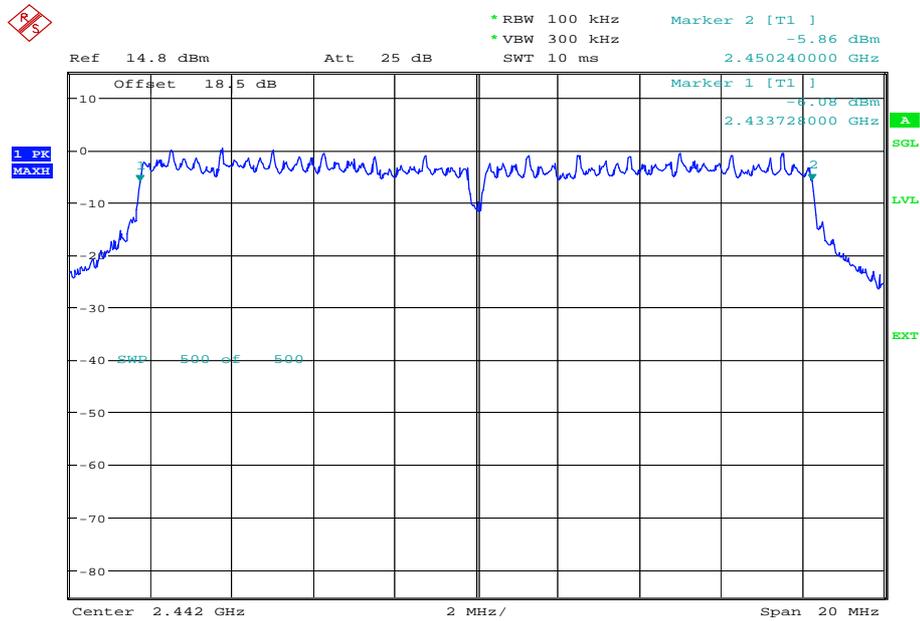
Product Service

24 Mbps



Date: 16.JAN.2014 19:20:43

36 Mbps

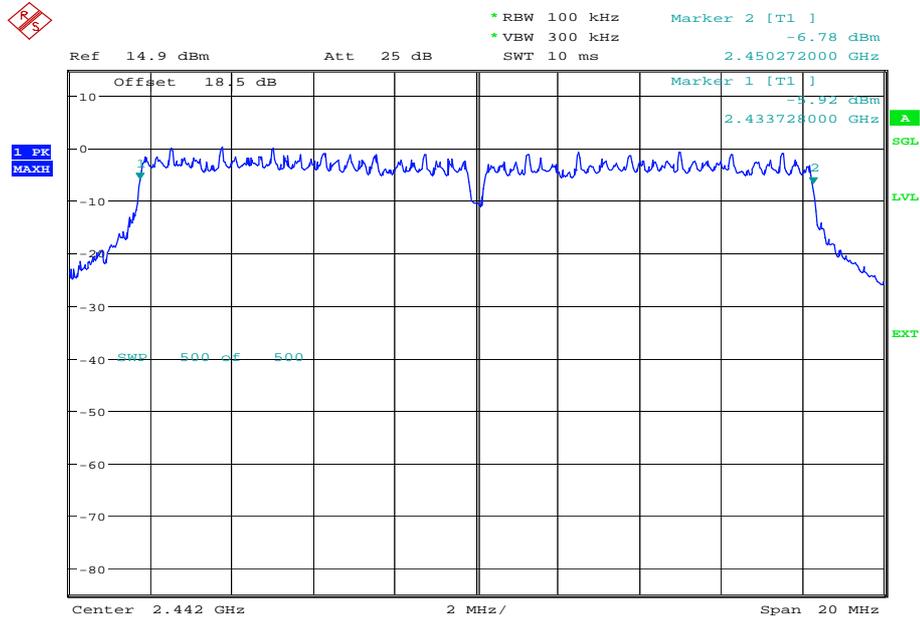


Date: 16.JAN.2014 19:29:52

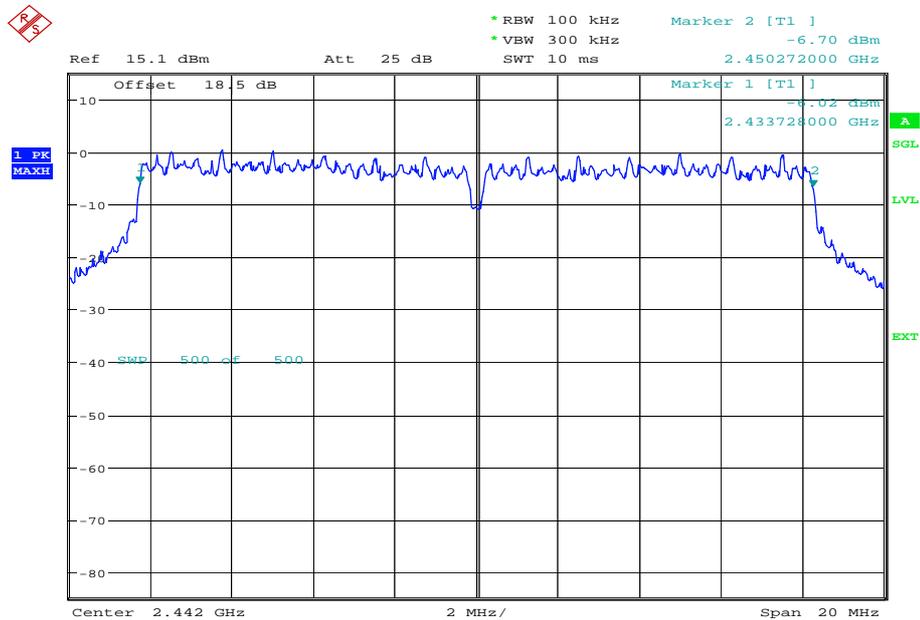


Product Service

48 Mbps



54 Mbps

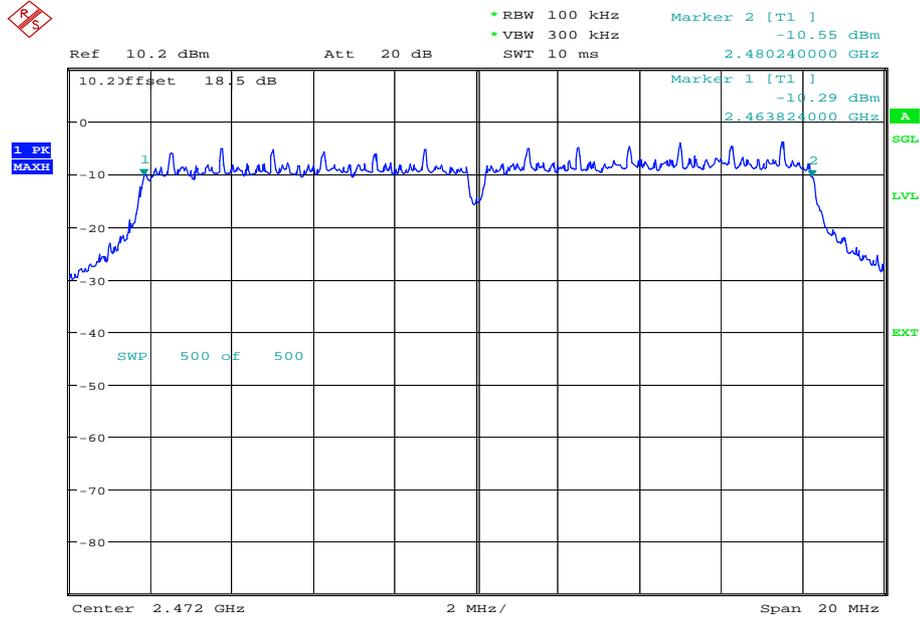




Product Service

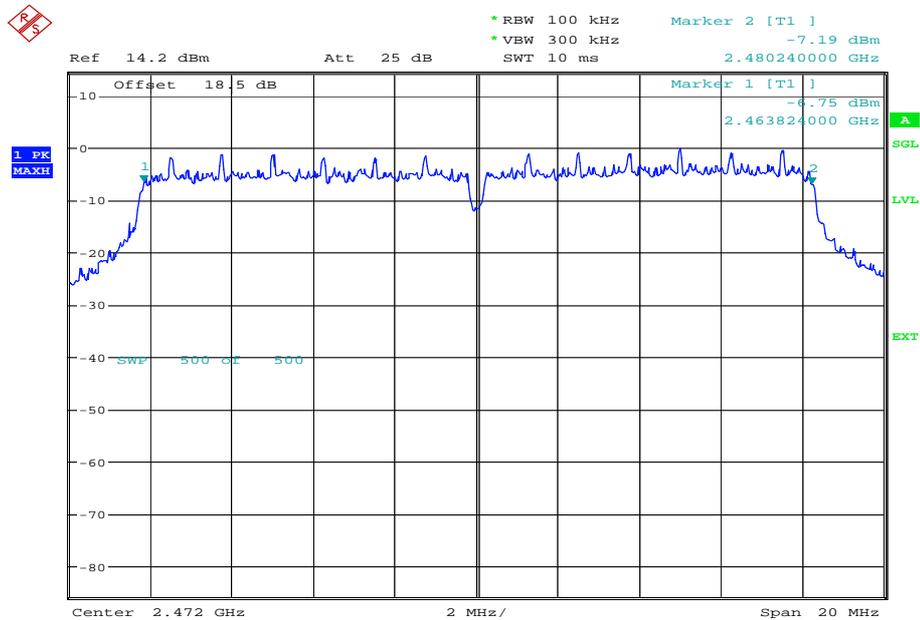
2462 MHz

6 Mbps



Date: 16.JAN.2014 18:54:12

9 Mbps

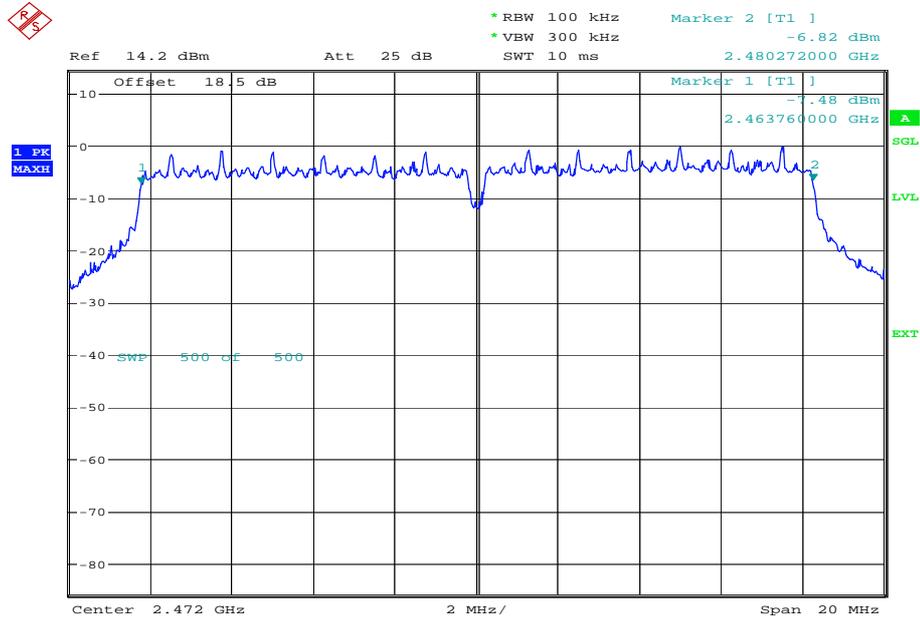


Date: 16.JAN.2014 18:58:59



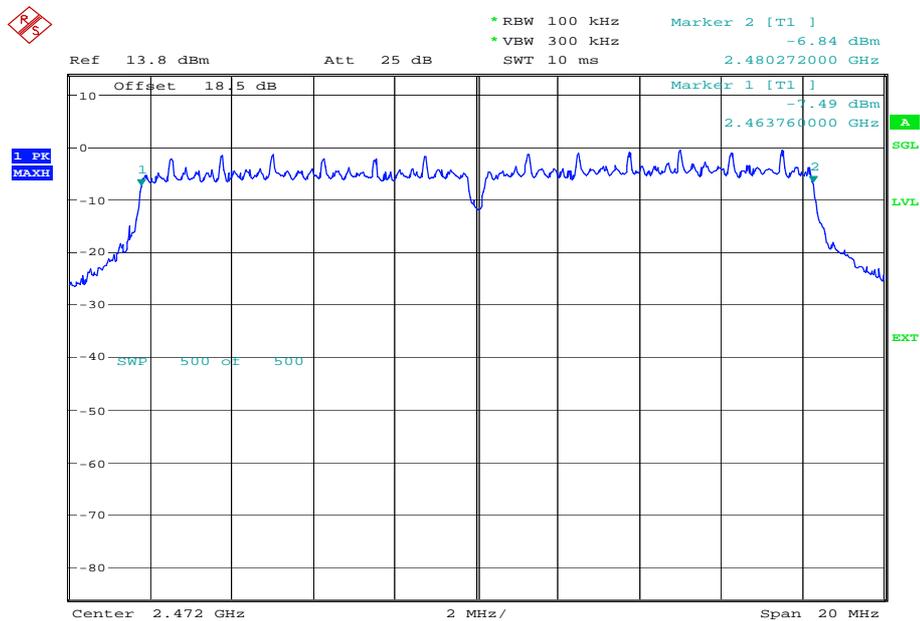
Product Service

12 Mbps



Date: 16.JAN.2014 19:09:21

18 Mbps

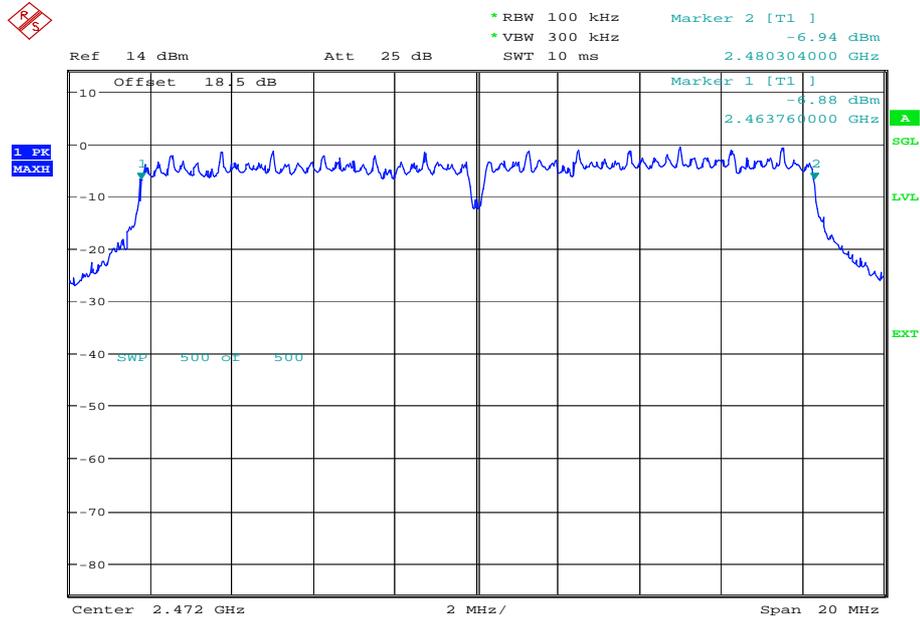


Date: 16.JAN.2014 19:14:43

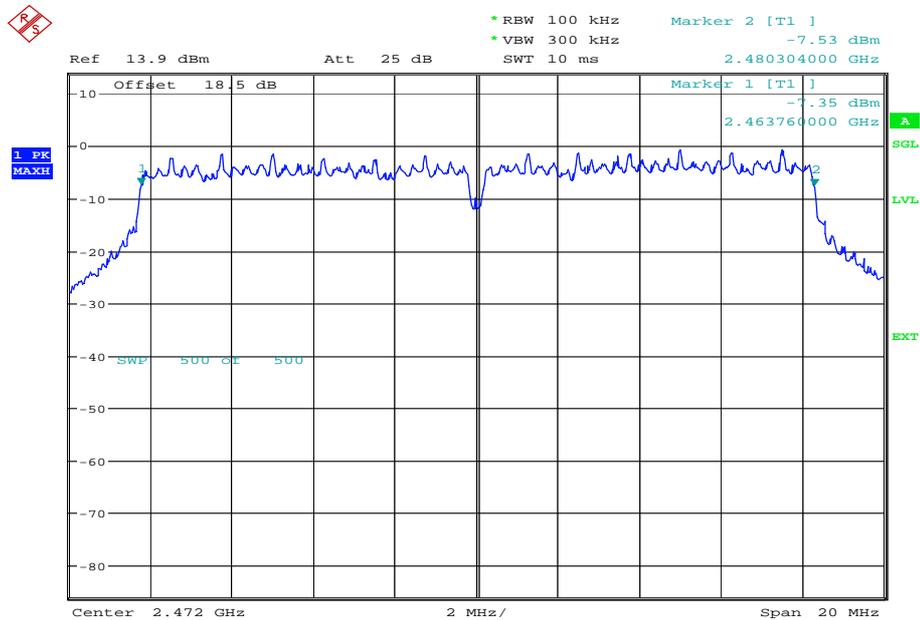


Product Service

24 Mbps



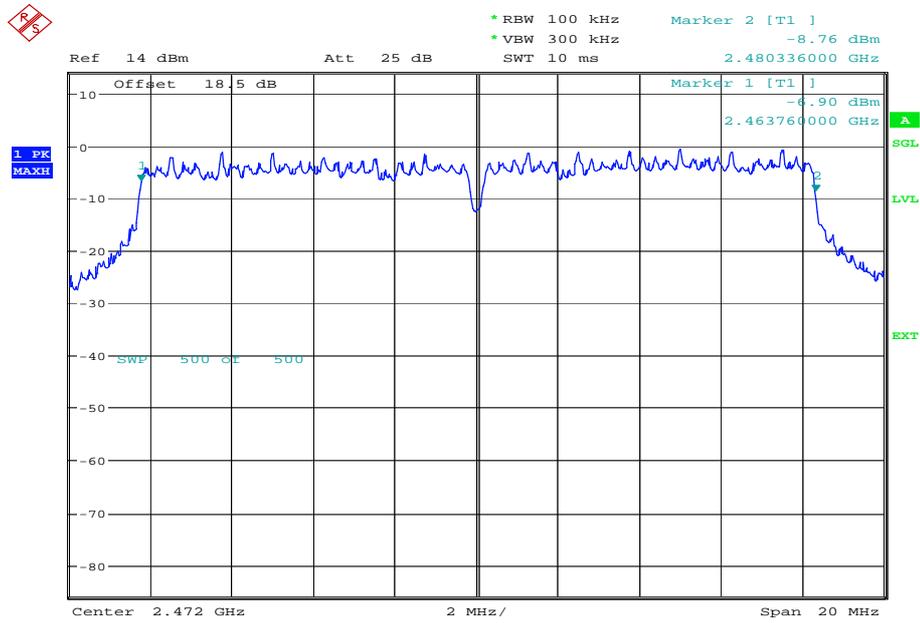
36 Mbps





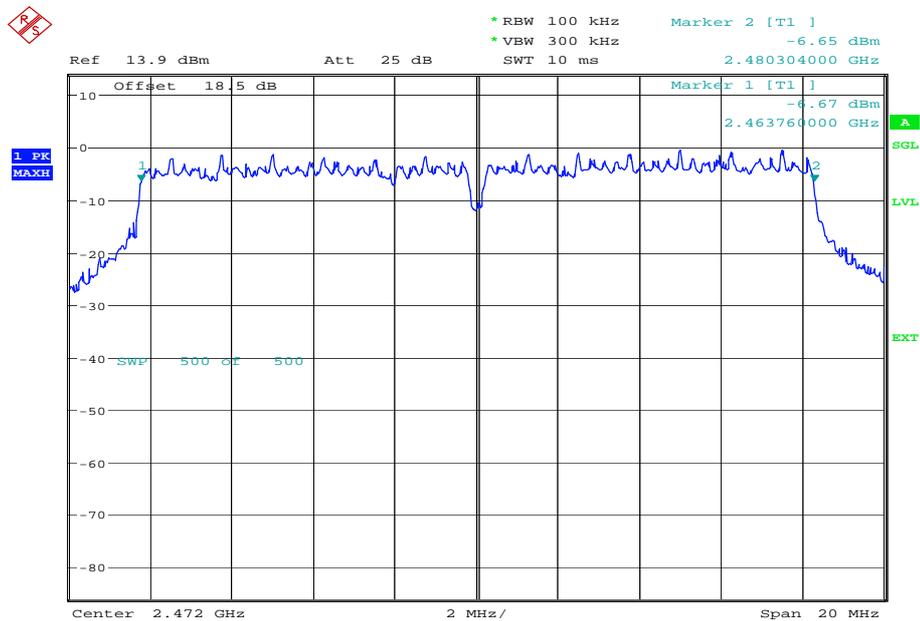
Product Service

### 48 Mbps



Date: 16.JAN.2014 19:37:24

### 54 Mbps



Date: 16.JAN.2014 19:43:19

### Limit Clause

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



Product Service

802.11(n)

4.0 V DC Supply

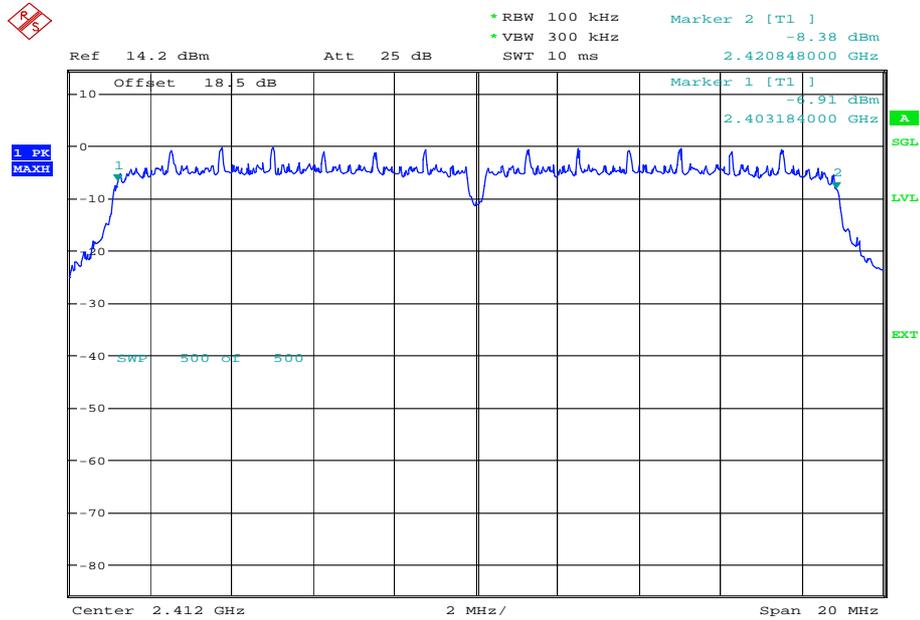
Frequency (MHz)	Data Rate (Mbps)	6dB Bandwidth (kHz)
2412 MHz	6.5	17664
	13	17696
	19.5	17728
	26	17760
	39	17792
	52	17824
	58.5	17824
	65	17792
2437 MHz	6.5	17664
	13	17696
	19.5	17664
	26	17760
	39	17760
	52	17824
	58.5	17856
	65	17792
2462 MHz	6.5	17632
	13	17696
	19.5	17664
	26	17792
	39	17760
	52	17760
	58.5	17792
	65	17792



Product Service

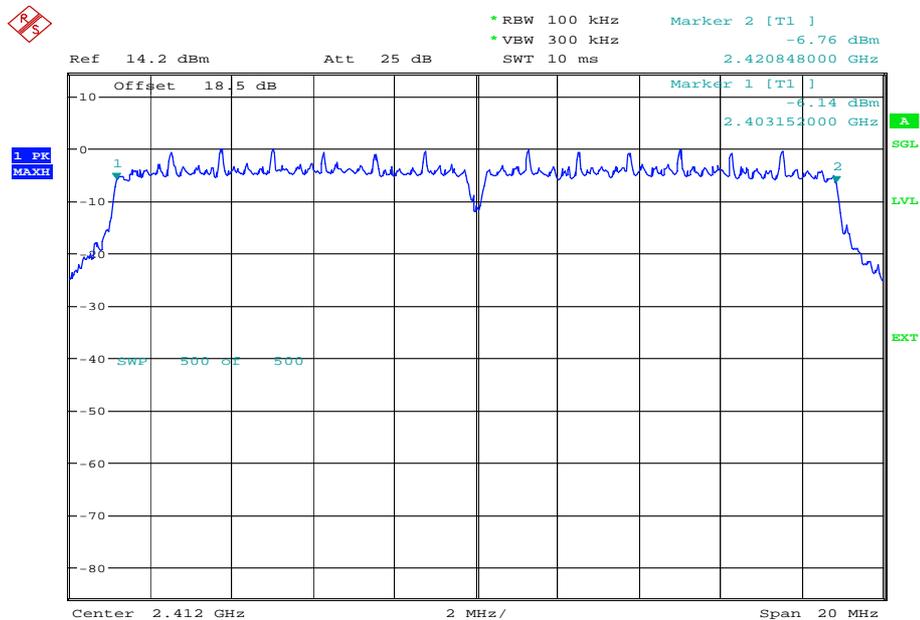
2412 MHz

6.5 Mbps



Date: 16.JAN.2014 19:47:14

13 Mbps

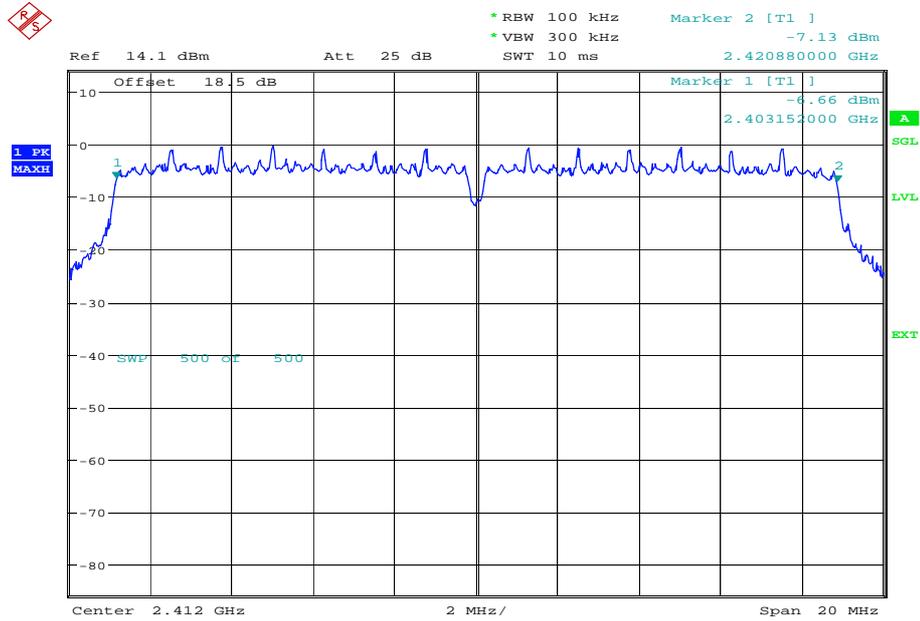


Date: 16.JAN.2014 19:52:10



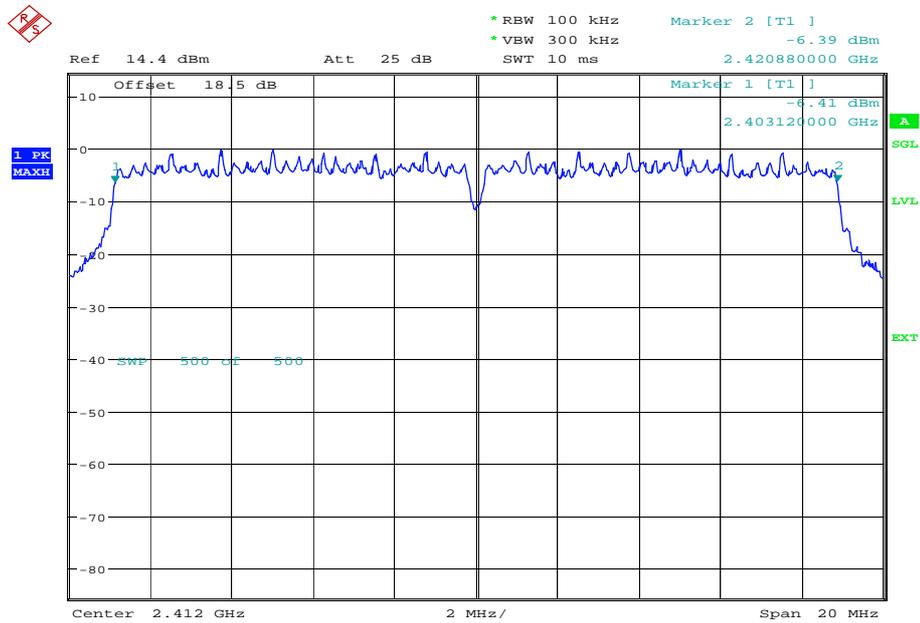
Product Service

19.5 Mbps



Date: 16.JAN.2014 20:02:40

26 Mbps

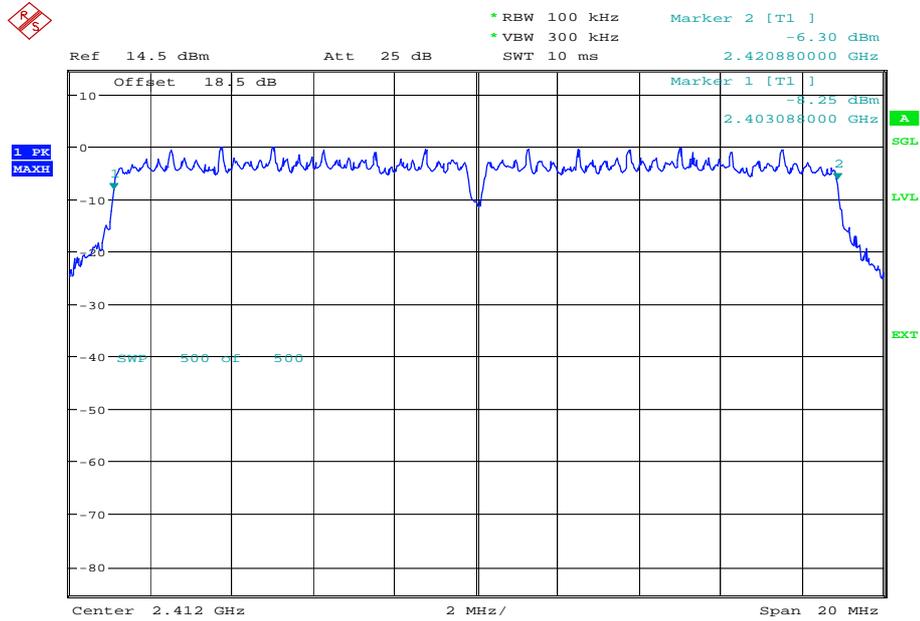


Date: 16.JAN.2014 20:07:27



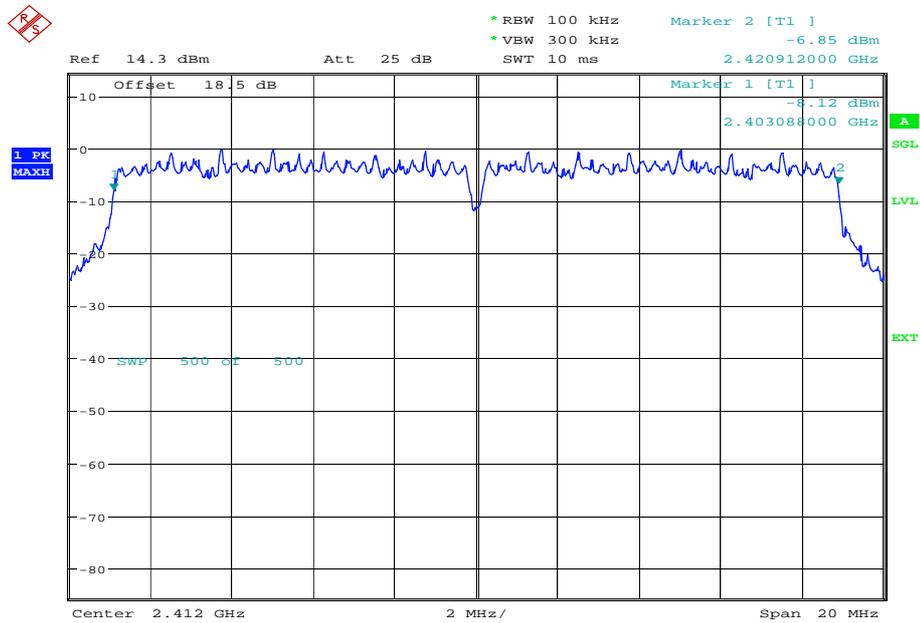
Product Service

39 Mbps



Date: 16.JAN.2014 20:12:09

52 Mbps

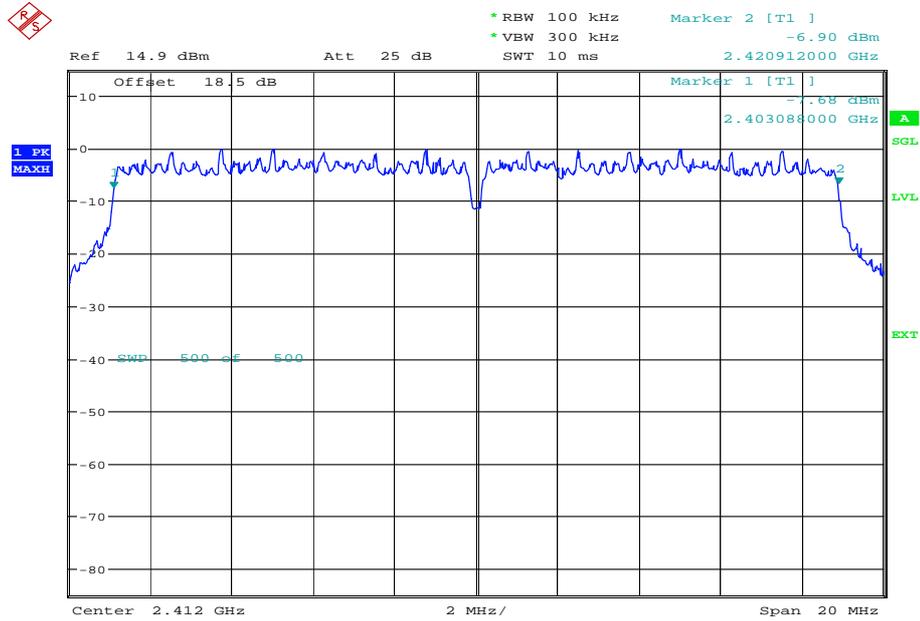


Date: 16.JAN.2014 20:16:54



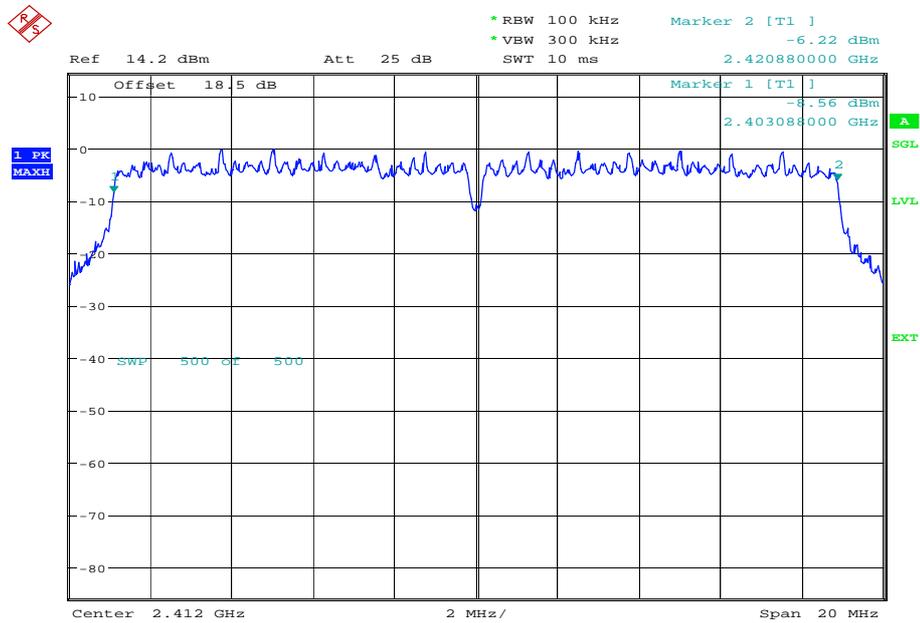
Product Service

### 58.5 Mbps



Date: 16.JAN.2014 20:21:30

### 65 Mbps



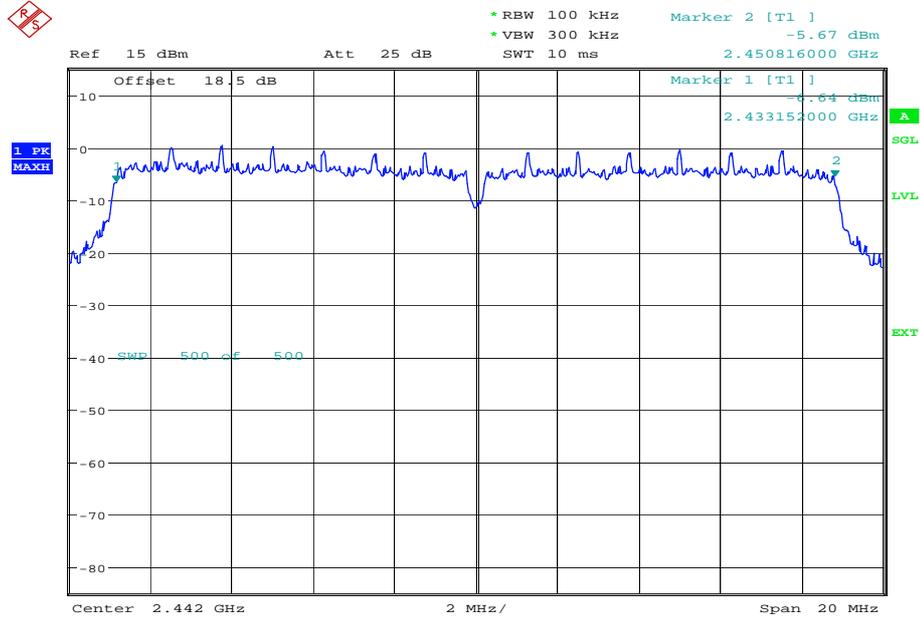
Date: 16.JAN.2014 20:27:21



Product Service

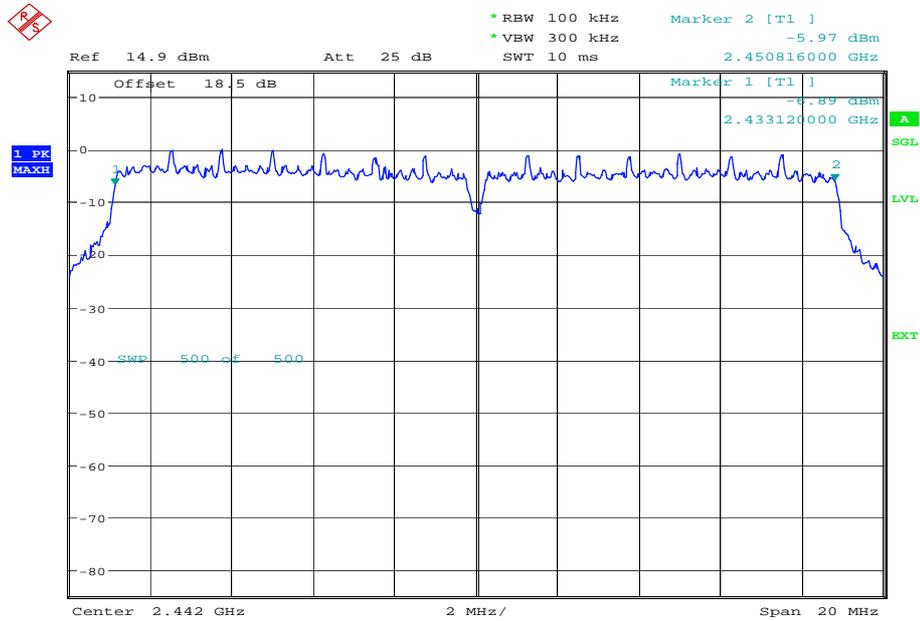
2437 MHz

6.5 Mbps



Date: 16.JAN.2014 19:49:09

13 Mbps

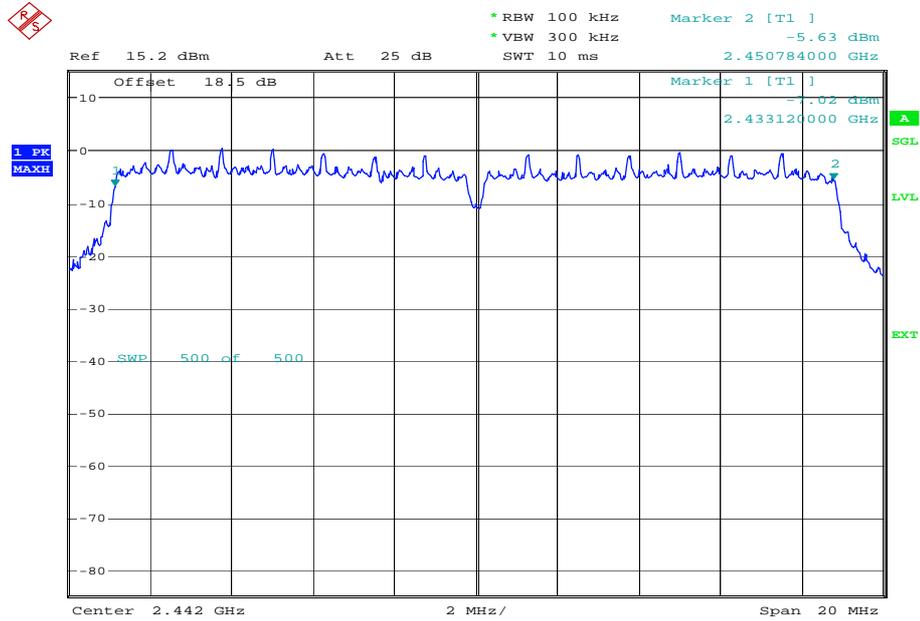


Date: 16.JAN.2014 19:57:37

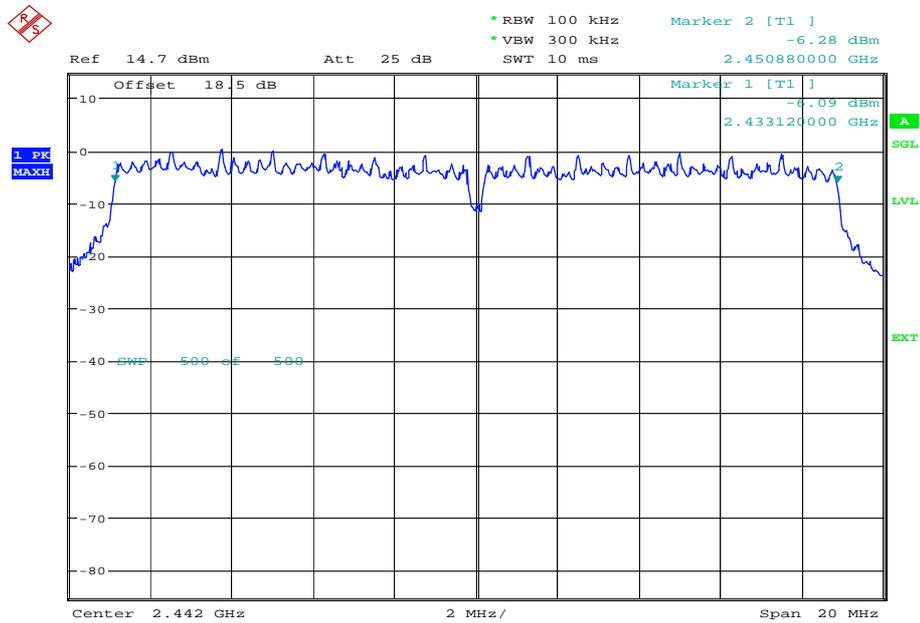


Product Service

### 19.5 Mbps



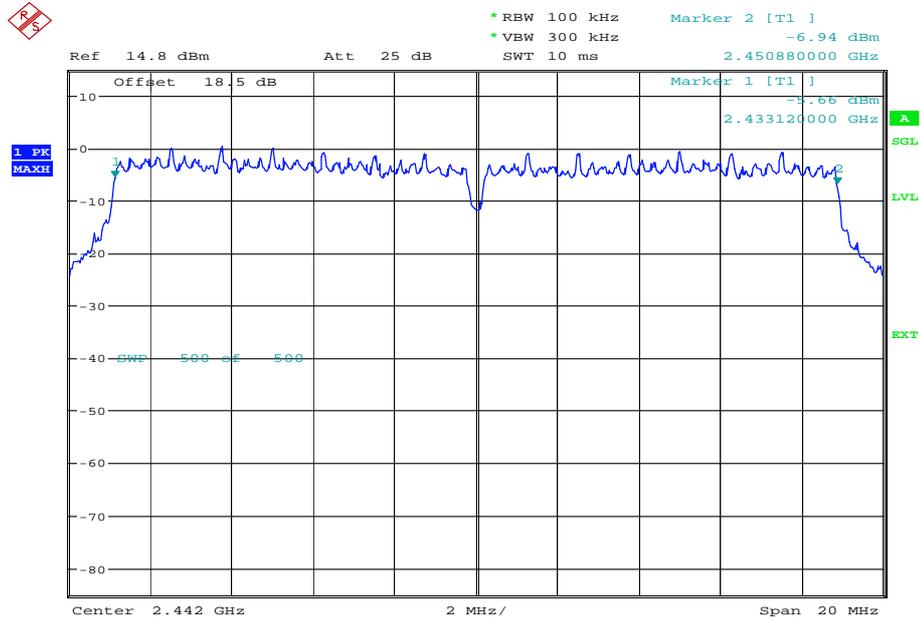
### 26 Mbps





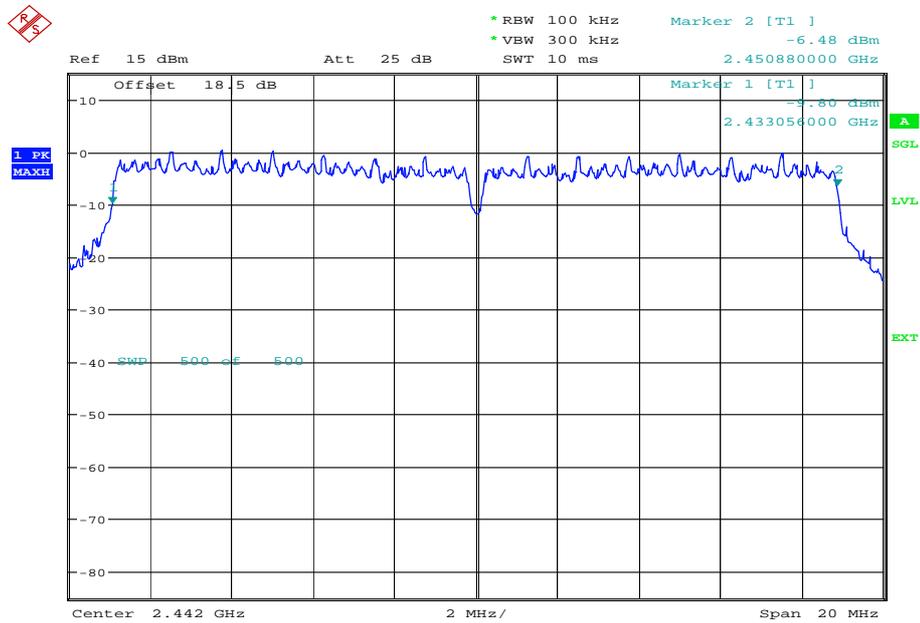
Product Service

39 Mbps



Date: 16.JAN.2014 20:13:21

52 Mbps

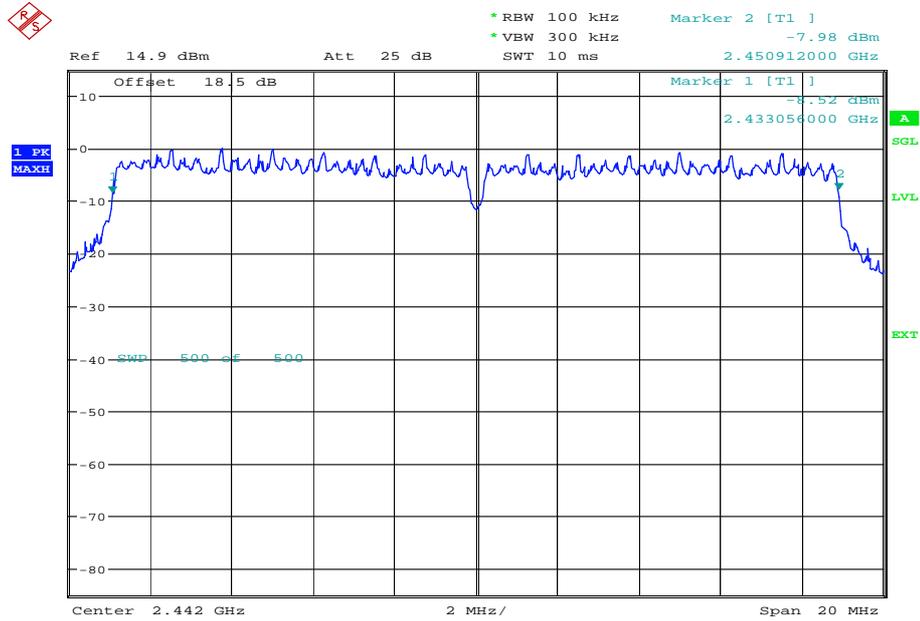


Date: 16.JAN.2014 20:18:06



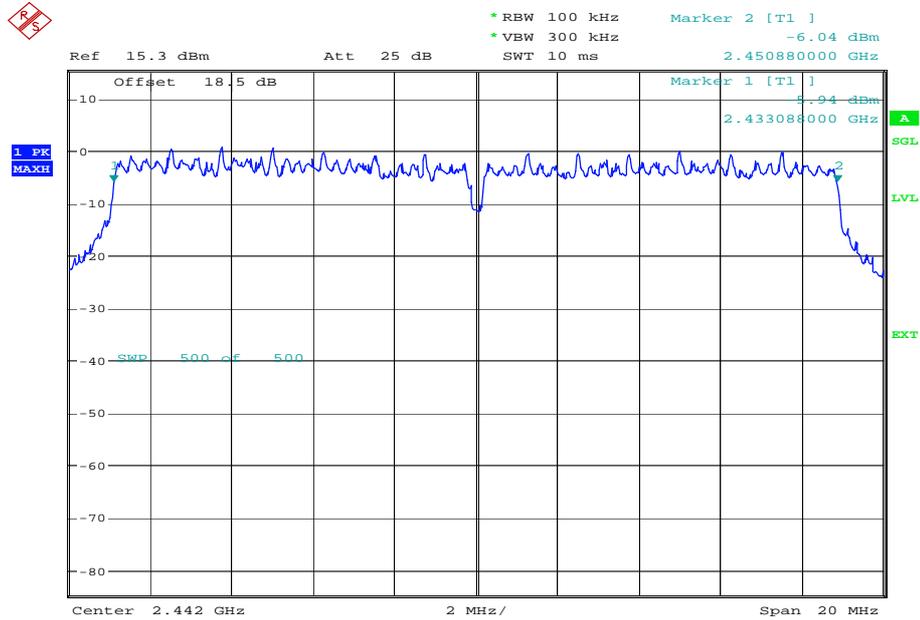
Product Service

58.5 Mbps



Date: 16.JAN.2014 20:23:07

65 Mbps



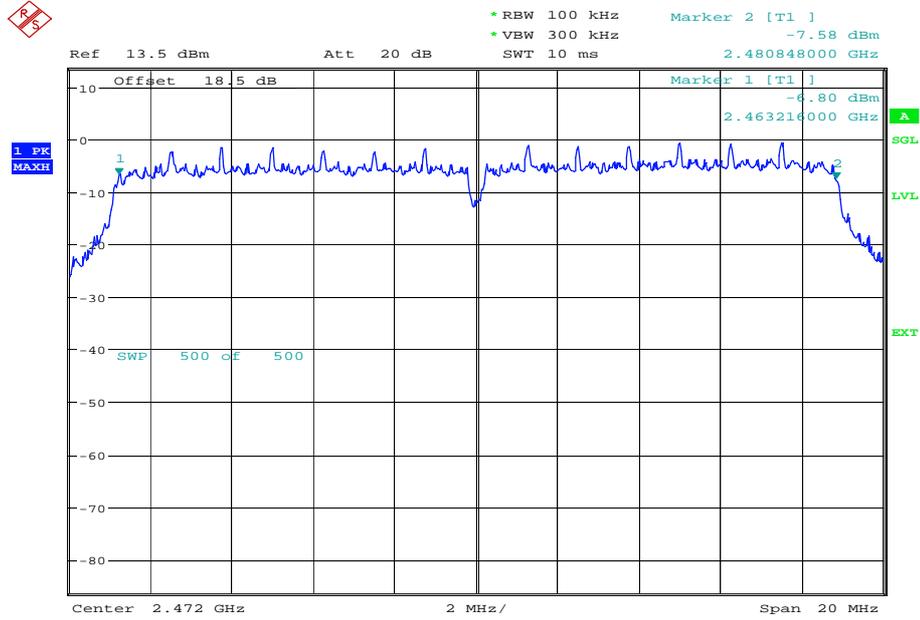
Date: 16.JAN.2014 20:28:28



Product Service

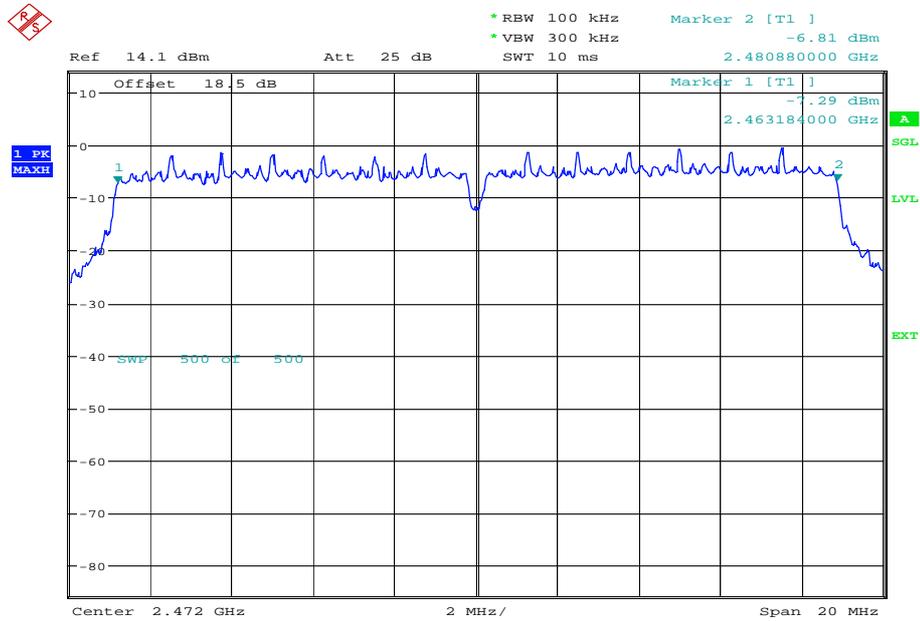
2462 MHz

6.5 Mbps



Date: 16.JAN.2014 19:50:30

13 Mbps

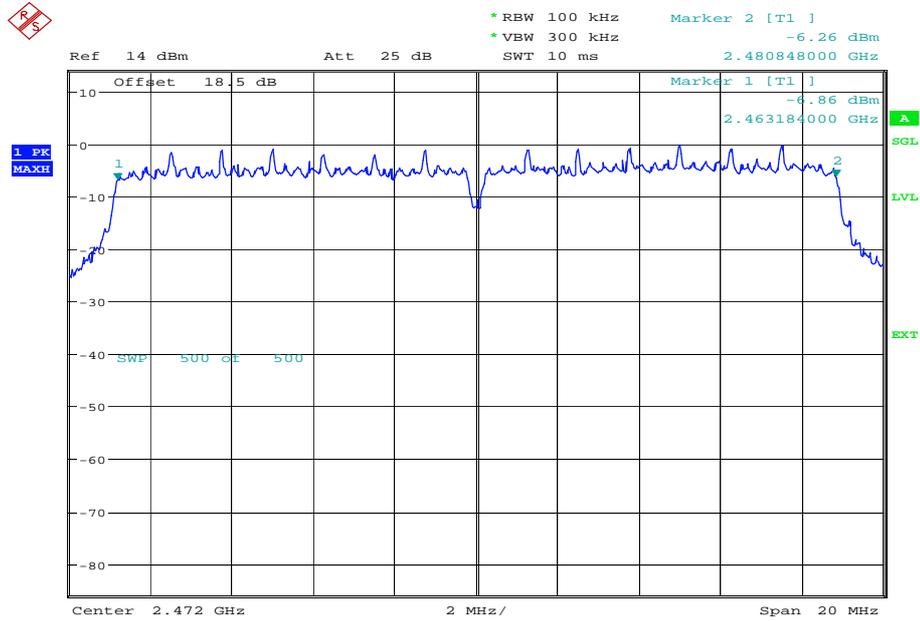


Date: 16.JAN.2014 20:00:31



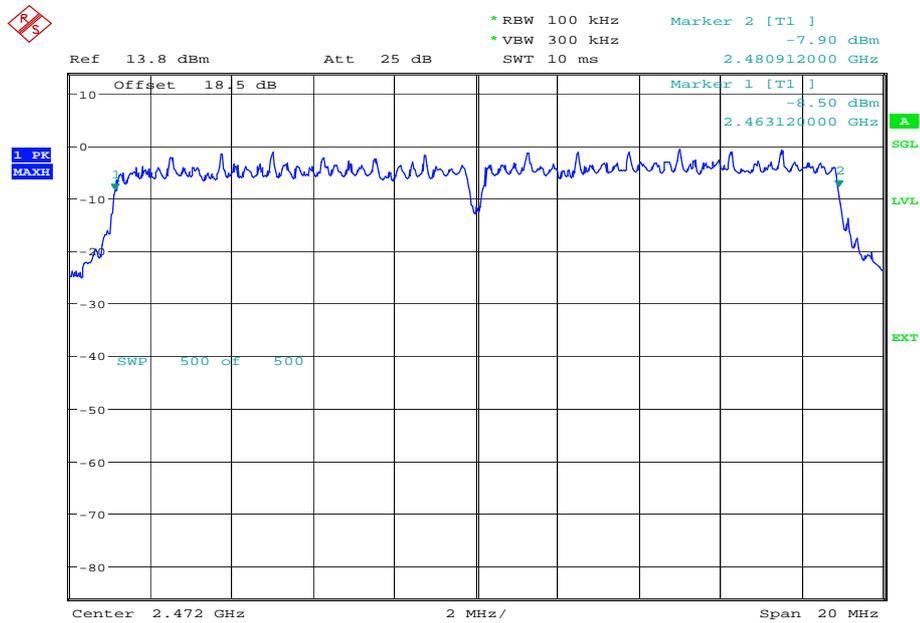
Product Service

19.5 Mbps



Date: 16.JAN.2014 20:05:42

26 Mbps

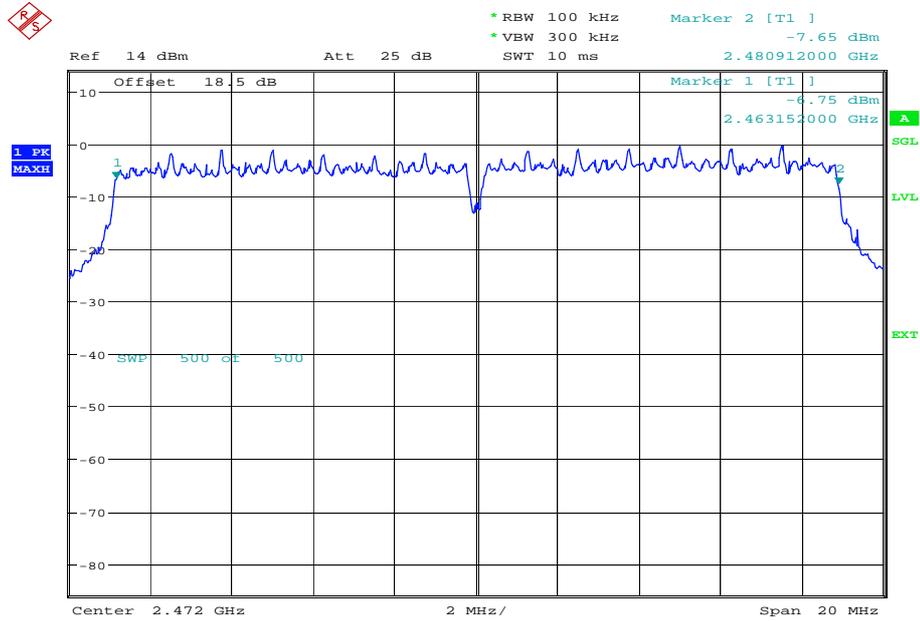


Date: 16.JAN.2014 20:10:29



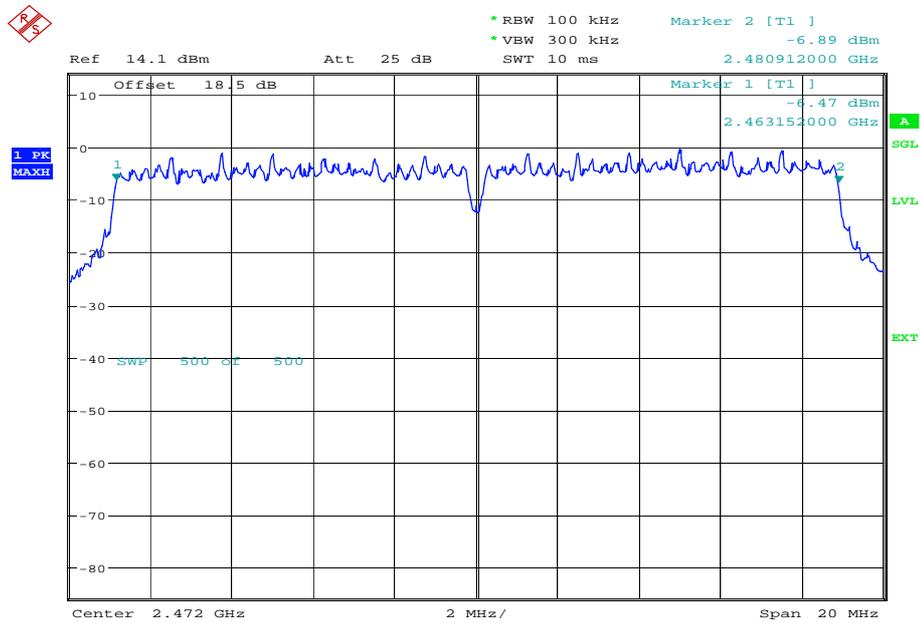
Product Service

39 Mbps



Date: 16.JAN.2014 20:14:35

52 Mbps

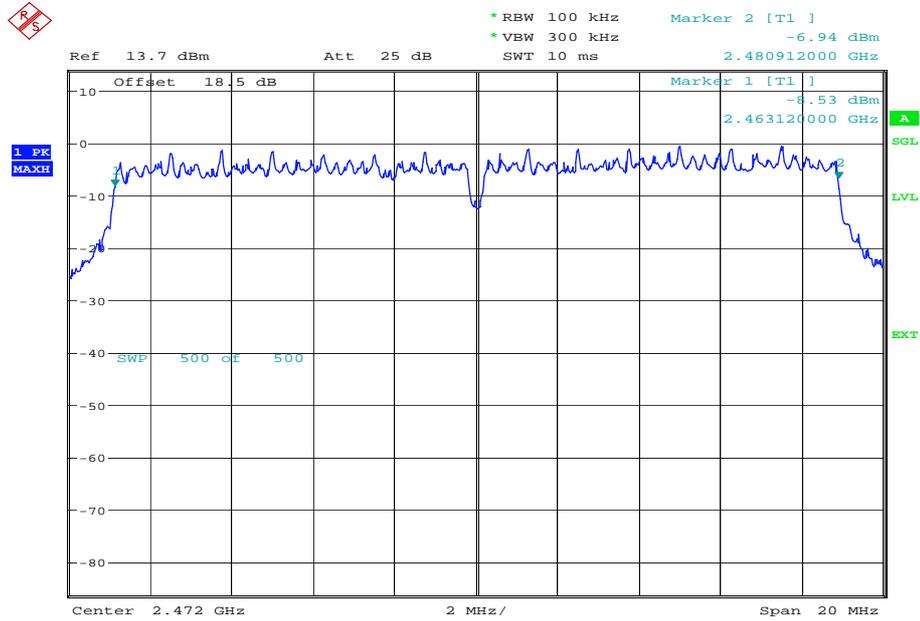


Date: 16.JAN.2014 20:19:18



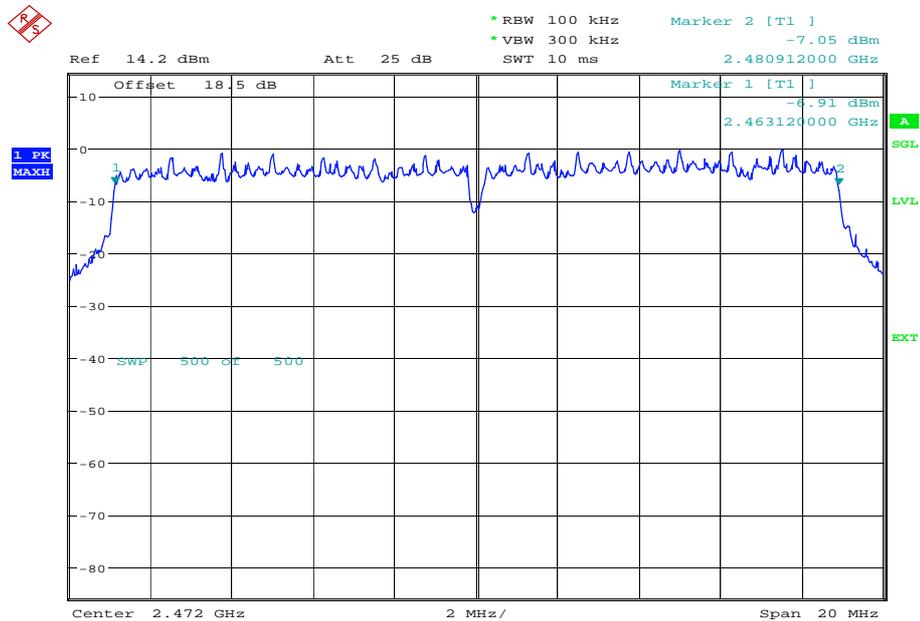
Product Service

58.5 Mbps



Date: 16.JAN.2014 20:25:18

65 Mbps



Date: 16.JAN.2014 20:30:04

Limit Clause

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



Product Service

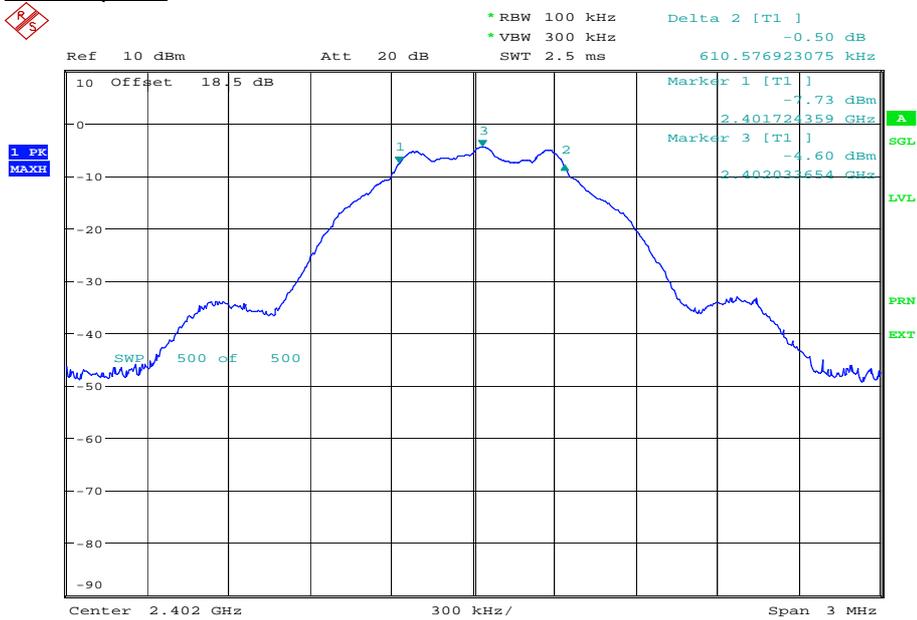
Bluetooth Low Energy

4.0 V DC Supply

Frequency (MHz)	Packet Type	6dB Bandwidth (kHz)
2402 MHz	37octet/prbs9	610.577
2440 MHz	37octet/prbs9	610.577
2480 MHz	37octet/prbs9	620.192

2402 MHz

37octet/prbs9



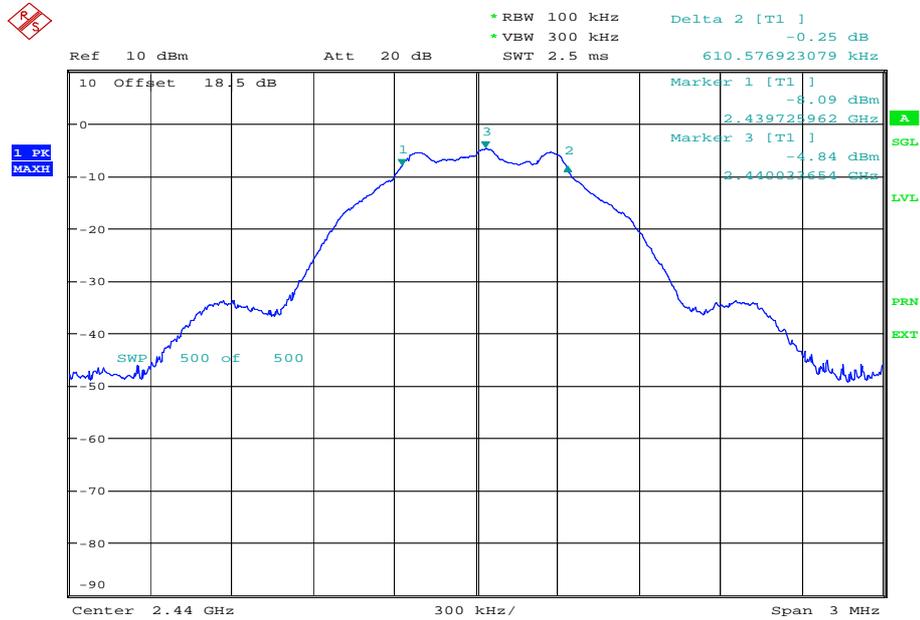
Date: 16.JAN.2014 18:00:44



Product Service

2440 MHz

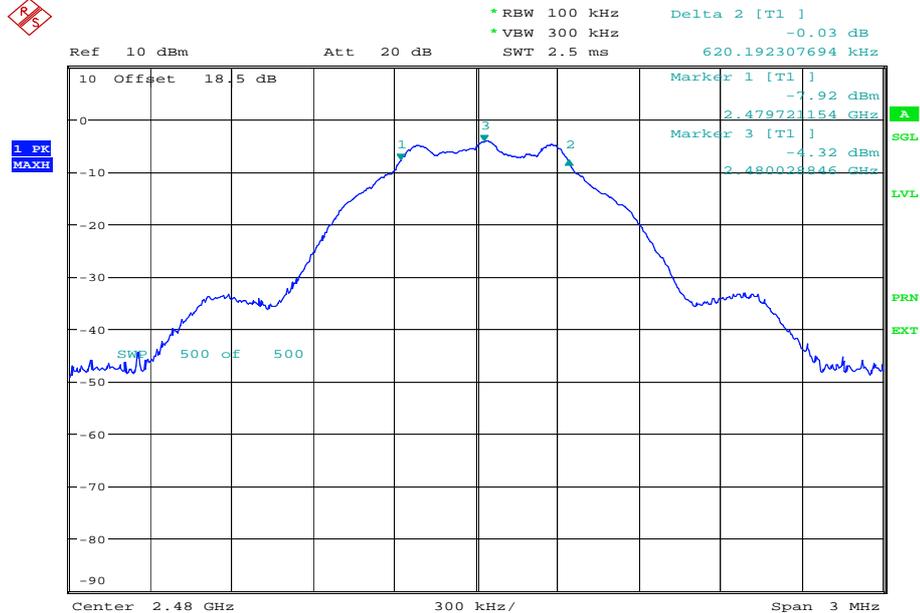
37octet/prbs9



Date: 16.JAN.2014 18:02:51

2480 MHz

37octet/prbs9



Date: 16.JAN.2014 18:04:19

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
<b>Section 2.1– AC Line Conducted Emissions</b>					
Amplifier (18GHz-26.5GHz)	Avantek	AMT-26177-33	236	12	TU
LISN (1 Phase)	Chase	MN 2050	336	12	28-Mar-2014
Screened Room (5)	Rainford	Rainford	1545	36	25-Jan-2014
Transient Limiter	Hewlett Packard	11947A	2377	12	13-Feb-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
<b>Section 2.2 - Maximum Peak Conducted Output Power</b>					
Power Supply Unit	Farnell	LT-30-2	41	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	24-Jan-2014
Digital Multimeter	Fluke	75 Series II	2360	12	30-Apr-2014
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	15-Nov-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Power Divider (N) 1W	Weinschel	1506A	3344	12	28-Jun-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	18-Sep-2014
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	18-Sep-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
<b>Section 2.3 - EIRP Peak Power</b>					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	3-Apr-2014
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	17-Jul-2014
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	10-Sep-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.4- Spurious and Band Edge Emissions</b>					
Power Supply Unit	Farnell	LT-30-2	41	-	O/P Mon
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	3-Apr-2014
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Jan-2014
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	7-Nov-2014
Pre-Amplifier	Phase One	PS04-0086	1533	12	19-Dec-2014
Pre-Amplifier	Phase One	PS04-0087	1534	12	30-Sep-2014
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Digital Multimeter	Fluke	75 Series II	2360	12	30-Apr-2014
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	15-Nov-2014
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	1-Feb-2014
Filter (Hi Pass)	Lorch	9HP7-7000-SR	2833	12	1-Feb-2014
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	12-Sep-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
High Pass Filter (3GHz)	RLC Electronics	F-100-3000-5-R	3349	12	30-May-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3694	12	5-Nov-2014
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3695	12	16-Oct-2014
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	25-Jan-2014
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4105	12	5-Nov-2014
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	1-Oct-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
<b>Section 2.5 - Power Spectral Density</b>					
Power Supply Unit	Farnell	LT-30-2	41	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	24-Jan-2014
Digital Multimeter	Fluke	75 Series II	2360	12	30-Apr-2014
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	15-Nov-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Power Divider (N) 1W	Weinschel	1506A	3344	12	28-Jun-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	18-Sep-2014
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	18-Sep-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
<b>Section 2.6- 6dB Bandwidth</b>					
Power Supply Unit	Farnell	LT-30-2	41	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	24-Jan-2014
Digital Multimeter	Fluke	75 Series II	2360	12	30-Apr-2014
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	15-Nov-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Power Divider	Weinschel	1506A	3345	12	23-May-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	18-Sep-2014
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	18-Sep-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014

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	$\pm 212.114$ kHz
EIRP Peak Power	30MHz to 1GHz: $\pm 5.1$ dB 1GHz to 40GHz: $\pm 6.3$ dB
Maximum Peak Conducted Output Power	$\pm 0.70$ dB
Spurious and Band Edge Emissions	30MHz to 1GHz: $\pm 5.1$ dB 1GHz to 40GHz: $\pm 6.3$ dB
Power Spectral Density	$\pm 3.0$ dB
AC Line Conducted Emissions	$\pm 3.2$ 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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TÜV SÜD Product Service

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