
# Report On

FCC Testing of the Sharp SHL22 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B18) multi mode cellular phone with Bluetooth, WLAN, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 15C (Bluetooth)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00192

Document 75920802 Report 14 Issue 1 June 2013

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**REPORT ON**

FCC Testing of the
Sharp SHL22 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B18) multi mode cellular phone with Bluetooth, WLAN, NFC (FeliCa) and GPS
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Document 75920802 Report 14 Issue 1

June 2013

**PREPARED FOR**

Sharp Communication Compliance Ltd
Azure House
Bagshot Road
Bracknell
Berkshire
RG12 7QY

**PREPARED BY**

**Natalie Bennett**
Senior Administrator (Technical)

**APPROVED BY**

**Mark Jenkins**
Authorised Signatory

**DATED** 27 June 2013

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 ound to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler M Russell T Guy

Product Service

**CONTENTS**

Product Service

**SECTION 1**

**REPORT SUMMARY**

FCC Testing of the
Sharp SHL22 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B18) multi mode cellular phone with Bluetooth, WLAN, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 15C (Bluetooth)

## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Sharp SHL22 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B18) multi mode cellular phone with Bluetooth, WLAN, 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) | SHL22 |
| Serial Number(s) | IMEI 004401114764687<br>IMEI 004401114765106 |
| Number of Samples Tested | 2 |
| Test Specification/Issue/Date | FCC CFR 47 Part 15C (2012) |
| Incoming Release<br>Date | Application Form<br>14 May 2013 |
| Disposal<br>Reference Number<br>Date | Held Pending Disposal<br>Not Applicable<br>Not Applicable |
| Order Number<br>Date | 9676<br>30 April 2013 |
| Start of Test | 31 May 2013 |
| Finish of Test | 14 June 2013 |
| Name of Engineer(s) | G Lawler<br>M Russell<br>T Guy |
| Related Document(s) | ANSI C63.10: 2009 |

Product Service

## 1.2 BRIEF SUMMARY OF RESULTS

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

| Section | Spec Clause | Test Description | Result | Comments/Base Standard |
|---|---|---|---|---|
| Bluetooth | | | | |
| 2.1 | 15.207 | AC Line Conducted Emissions | Pass | |
| 2.2 | 15.247 (a)(1) | Frequency Hopping Systems - 20dB Bandwidth and Channel Separation | Pass | |
| 2.3 | 15.247 (a)(1)(iii) | Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels | Pass | |
| 2.4 | 15.247 (b)(3) | Maximum Peak Conducted Output Power | Pass | |
| 2.5 | 15.247 (b)(4) | EIRP Peak Power | Pass | |
| 2.6 | 15.247 (d) | Spurious and Band Edge Emissions | Pass | |

Product Service

## 1.3 APPLICATION FORM

| EQUIPMENT DESCRIPTION | | |
|---|---|---|
| Model Name/Number | SHL22 | |
| Part Number | | |
| FCC ID (if applicable) | APYHRO00192 | |
| Industry Canada ID (if applicable) | | |
| Technical Description (Please provide a brief description of the intended use of the equipment) | Dual-Band CDMA(BC0, BC6) and Quad-Band GSM(GSM850/900MHz, DCS1800MHz, PCS1900MHz) and Dual-band UMTS (FDDI, FDDV) and Tri-Band LTE(B1, B11, B18) Multi Mode Cellular Phone with Bluetooth, W-LAN, NFC/ FeliCa and GPS receiver enabled | |

| **EXTREME TEMPERATURE RANGE** over which the equipment is to be type tested |
|---|
| ☐ -20°C to +55°C |
| ☒ Other (2) |
| ☐ 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** | | | | |
|---|---|---|---|---|
| ☒ Integral | | | | |
| Temporary RF connector provided: | | | ☒ Yes | ☐ No |
| ☐ Antenna connector | | | | |
| ☐ Number of antenna assembly(ies) submitted | | | | |
| Gain of the antenna intended for normal use: | | | | |
| 2 | dBi | for assembly identified as | Bluetooth/WLAN | |
| | dBi | for assembly identified as | | |
| | dBi | for assembly identified as | | |
| | dBi | for assembly identified as | | |
| | dBi | for assembly identified as | | |

| **TRANSMITTER TECHNICAL CHARACTERISTICS** | | |
|---|---|---|
| TRANSMITTER OPERATING FREQUENCY RANGE(S) | | |
| | **FCC and/or Industry Canada** | **EU** |
| **Bluetooth** | 2402 to 2480 MHz | 2402 to 2480 MHz |
| **WLAN** | 2412 to 2462 MHz | 2412 to 2472 MHz |
| **FCC and/or Industry Canada (only)** | | |
| Highest Internally Generated Frequency 1728.0 MHz | | |

Product Service

| SPREAD SPECTRUM PARAMETERS | |
|---|---|
| ☒ **Bluetooth** | Version: 4.0 |
| FHSS: Channel ☒ 79 Other | EDR ☒ Yes ☐ No |
| **Medium Access Protocol (Customer Declaration)** | |
| "We have implemented Bluetooth protocol which satisfies the medium access protocol requirement of EN 300 328". | |

☒ **WLAN**

IEEE 802.11(b) – DSSS ☒

IEEE 802.11(g) – OFDM ☒

IEEE 802.11(n) – OFDM ☒

Supported Spatial Streams

| | 2.4 GHz | 5GHz |
|---|---|---|
| Transmitter (Tx) | 1 | 1 |
| Receiver (Rx) | 1 | 1 |

GI (Guard Interval) ☒ 800 ns ☐ 400 ns

Band Width ☒ 20 MHz ☐ 40 MHz

**Medium Access Protocol (Customer Declaration)**

"We have implemented IEEE 802.11 (b/g/n) protocol which satisfies the medium access protocol requirement of EN 300 328".

☐ **Other Technology**

☐ Direct Sequence ☐ Frequency Hopping ☐ Combined ☐ Other

| | | |
|---|---|---|
| DSSS | Chip Sequence Length | bit |
| | Spectrum Width | MHz |
| FHSS | Total Number of Hops | |
| | Dwell Time | ms |
| | Bandwidth Per Hop | MHz |
| | Maximum Separation of Hops | MHz for ETSI EN 300 328 |
| Other | | |

**Medium Access Protocol (Customer Declaration)**

"We have implemented a protocol which satisfies the medium access protocol requirement of EN 300 328".

Product Service

| TRANSMITTER POWER CHARACTERSITICS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **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 | | | | | ☒ | Yes | ☐ | No |
| Intermittent duty | | | | | ☐ | Yes | ☐ | No |
| If intermittent state DUTY CYCLE | | | | | | | | |
| Transmitter ON | seconds | | Transmitter OFF | | minutes | | | |
| Is continuous operation possible for testing purposes? | | | | | ☒ | Yes | ☐ | No |
| Is transmitter output power variable: | | | | | ☒ | Yes | ☐ | No |
| State during the test: | | | | | | | | |
| Transmitter duty cycle | Tx on | Seconds | Tx Off | Seconds | | | | |
| Duty cycle (Tx on /(Tx on +Tx off)) | | % | | | | | | |
| ☐ Continuously variable | | | ☐ 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 | | | | | ☒ | Yes | ☐ | No |
| Intermittent duty | | | | | ☐ | Yes | ☐ | No |
| If intermittent state DUTY CYCLE | | | | | | | | |
| Transmitter ON | seconds | | Transmitter OFF | | minutes | | | |
| Is continuous operation possible for testing purposes? | | | | | ☒ | Yes | ☐ | No |
| Is transmitter output power variable: | | | | | ☒ | Yes | ☐ | No |
| State during the test: | | | | | | | | |
| Transmitter duty cycle | Tx on | Seconds | Tx Off | Seconds | | | | |
| Duty cycle (Tx on /(Tx on +Tx off)) | | % | | | | | | |
| ☐ Continuously variable | | | ☐ Stepped | | | | | |
| dB per step | | | | | | | | |

Product Service

| TRANSMITTER POWER SOURCE (3) | | | | | |
|---|---|---|---|---|---|
| ☒ Common power source for transmitter and receiver | | | | | |
| ☐ AC mains | | State voltage | | | |
| AC supply frequency | (Hz) | VAC | | Max Current | Hz |
| ☐ Single phase | | | ☐ Three phase | | |
| And / Or | | | | | |
| ☐ External DC supply | | | | | |
| Nominal voltage | | | Max Current | | A |
| Extreme upper voltage | | | Extreme lower voltage | | |
| Battery | | | | | |
| ☐ Nickel Cadmium | | | | | |
| ☐ Lead acid (Vehicle regulated) | | | | | |
| ☐ Alkaline | | | | | |
| ☒ Lithium | | | | | |
| ☐ Other Details : | | | | | |
| 4.0 Volts nominal. | | | | | |
| End point voltage as quoted by equipment manufacturer | | | 3.8 | V | |

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

| AUTOMATIC EQUIPMENT SWITCH OFF | | |
|---|---|---|
| If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated. | | |
| ☒ Applies | 3.4 | V cut-off voltage |
| ☐ Does not apply | | |

Product Service

| RECEIVER POWER SOURCE (4) | | | | | |
|---|---|---|---|---|---|
| ☐ AC mains | | State voltage | | | |
| AC supply frequency | (Hz) | VAC | | Max Current | Hz |
| ☐ Single phase | | | ☐ Three phase | | |
| And / Or | | | | | |
| ☐ External DC supply | | | | | |
| Nominal voltage | | | Max Current | | A |
| Extreme upper voltage | | | Extreme lower voltage | | |
| Battery | | | | | |
| ☐ Nickel Cadmium | | | | | |
| ☐ Lead acid (Vehicle regulated) | | | | | |
| ☐ Alkaline | | | | | |
| ☐ Lithium | | | | | |
| ☐ 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. |
| ☐ Applies V cut-off voltage |
| ☐ 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: Hachiro Hidaka

Position held: Ass. Manager Date: 14th May, 2013

## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp SHL22 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B18) multi mode cellular phone with Bluetooth, WLAN, 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 Accreditation
90987 Octagon House, Fareham Test Laboratory

## 1.6 DEVIATIONS FROM THE STANDARD

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

## 1.7 MODIFICATION RECORD

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

Product Service

**SECTION 2**

**TEST DETAILS**

FCC Testing of the
Sharp SHL22 Dual-band CDMA (BC0, BC6) & Quad-band GSM
(GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE
(B1, B11, B18) multi mode cellular phone with Bluetooth, WLAN, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 15C (Bluetooth)

## 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

SHL22 S/N: IMEI 004401114764687 - Modification State 0

### 2.1.3 Date of Test

10 June 2013

### 2.1.4 Test Equipment Used

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

### 2.1.5 Test Procedure

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

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

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

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

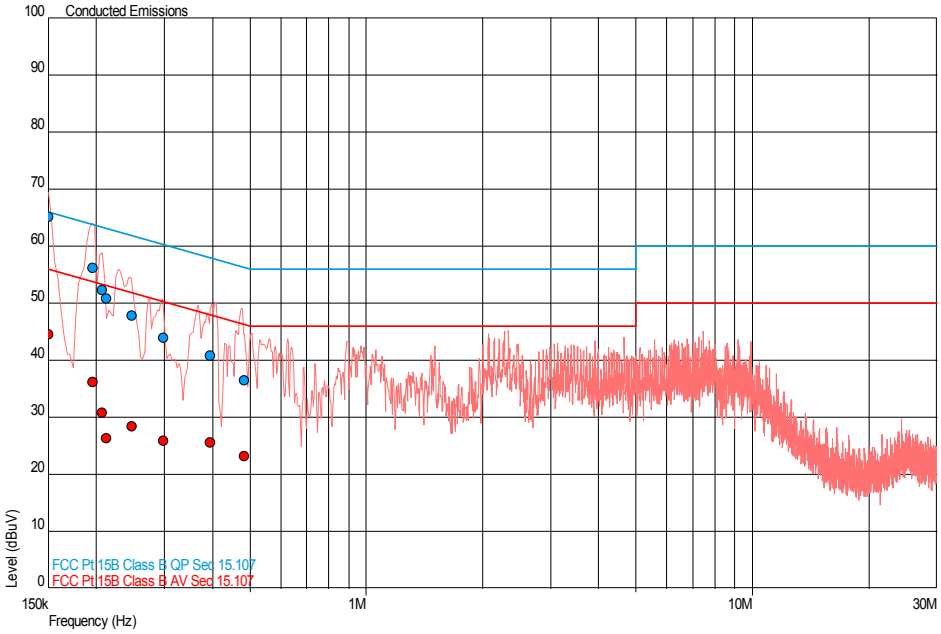
### 2.1.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 20.9°C |
| Relative Humidity | 35.0% |

Product Service

### 2.1.7 Test Results

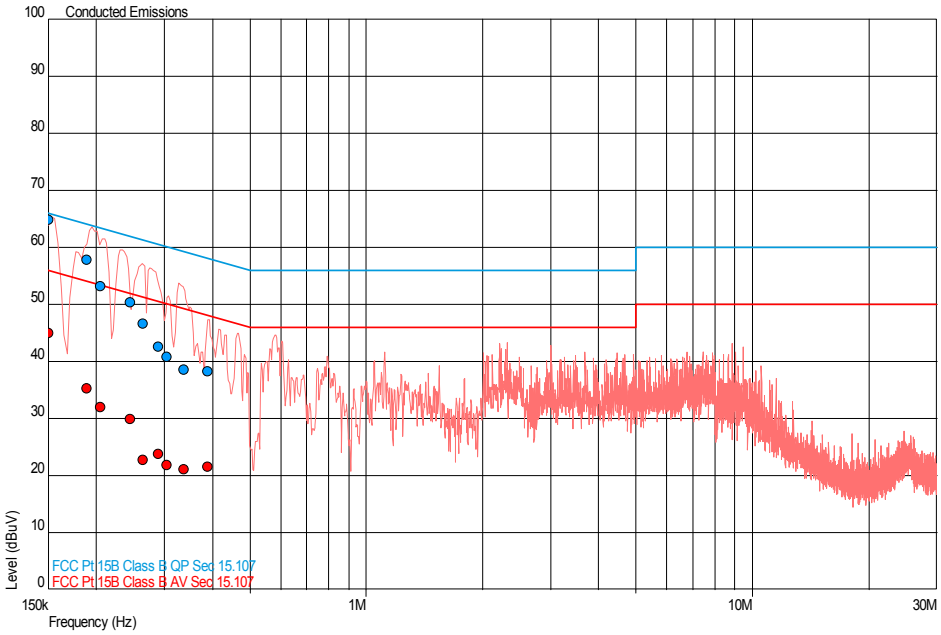
Live Line




| Frequency (MHz) | QP Level (dBµV) | QP Limit (dBµV) | QP Margin (dBµV) | AV Level (dBµV) | AV Limit (dBµV) | AV Margin (dBµV) |
|---|---|---|---|---|---|---|
| 0.150 | 65.2 | 66.0 | -0.8 | 44.6 | 56.0 | -11.4 |
| 0.196 | 56.3 | 63.8 | -7.5 | 36.2 | 53.8 | -17.6 |
| 0.207 | 52.3 | 63.3 | -11.1 | 30.8 | 53.3 | -22.5 |
| 0.213 | 50.8 | 63.1 | -12.3 | 26.3 | 53.1 | -26.8 |
| 0.247 | 47.9 | 61.9 | -14.0 | 28.4 | 51.9 | -23.5 |
| 0.299 | 43.9 | 60.3 | -16.4 | 25.9 | 50.3 | -24.3 |
| 0.394 | 40.9 | 58.0 | -17.1 | 25.7 | 48.0 | -22.3 |
| 0.483 | 36.5 | 56.3 | -19.8 | 23.2 | 46.3 | -23.0 |

Product Service

Neutral Line




| Frequency (MHz) | QP Level (dBµV) | QP Limit (dBµV) | QP Margin (dBµV) | AV Level (dBµV) | AV Limit (dBµV) | AV Margin (dBµV) |
|---|---|---|---|---|---|---|
| 0.150 | 64.8 | 66.0 | -1.2 | 45.0 | 56.0 | -11.0 |
| 0.189 | 57.9 | 64.1 | -6.2 | 35.3 | 54.1 | -18.7 |
| 0.205 | 53.2 | 63.4 | -10.2 | 32.0 | 53.4 | -21.4 |
| 0.245 | 50.3 | 61.9 | -11.6 | 29.9 | 51.9 | -22.1 |
| 0.264 | 46.7 | 61.3 | -14.6 | 22.7 | 51.3 | -28.6 |
| 0.289 | 42.7 | 60.5 | -17.9 | 23.7 | 50.5 | -26.8 |
| 0.305 | 40.8 | 60.1 | -19.3 | 21.9 | 50.1 | -28.2 |
| 0.337 | 38.6 | 59.3 | -20.6 | 21.1 | 49.3 | -28.2 |
| 0.389 | 38.3 | 58.1 | -19.8 | 21.5 | 48.1 | -26.5 |

## 2.2 FREQUENCY HOPPING SYSTEMS - 20dB BANDWIDTH AND CHANNEL SEPARATION

### 2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)

### 2.2.2 Equipment Under Test and Modification State

SHL22 S/N: IMEI 004401114765106 - Modification State 0

### 2.2.3 Date of Test

31 May 2013

### 2.2.4 Test Equipment Used

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

### 2.2.5 Test Procedure

The EUT was transmitted at maximum power via a cable to the 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 -20dBc points of the displayed spectrum.

The EUT was transmitted at maximum power into a Spectrum Analyser. The trace was set to Max Hold to store several adjacent channels on screen. Using the marker delta function, the markers were positioned to show the separation between adjacent channels.

### 2.2.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 24.0°C |
| Relative Humidity | 43.2% |

Product Service

### 2.2.7 Test Results

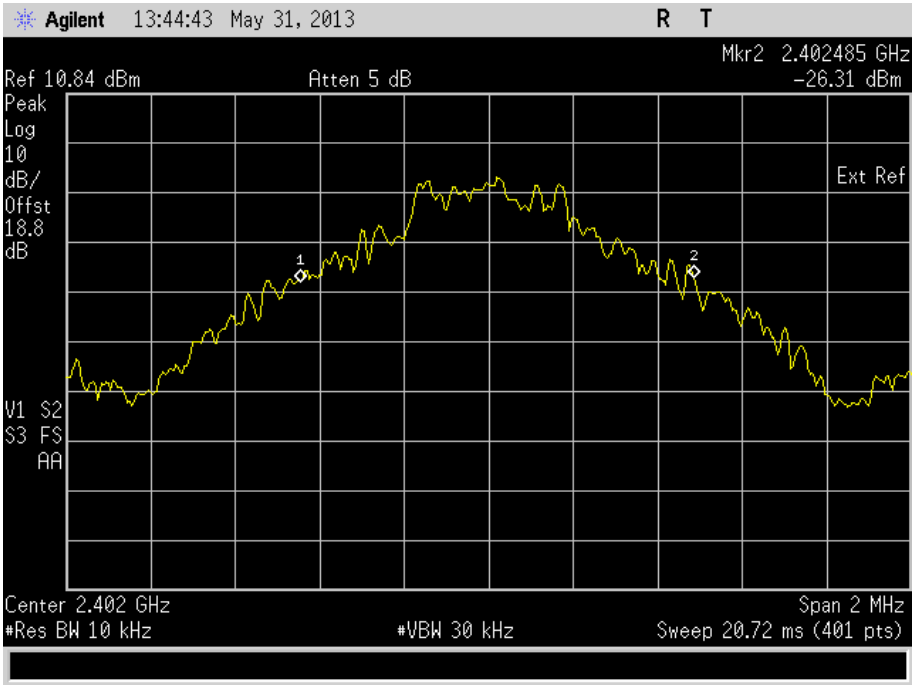
4.0 V DC Supply

20dB Bandwidth

2402 MHz

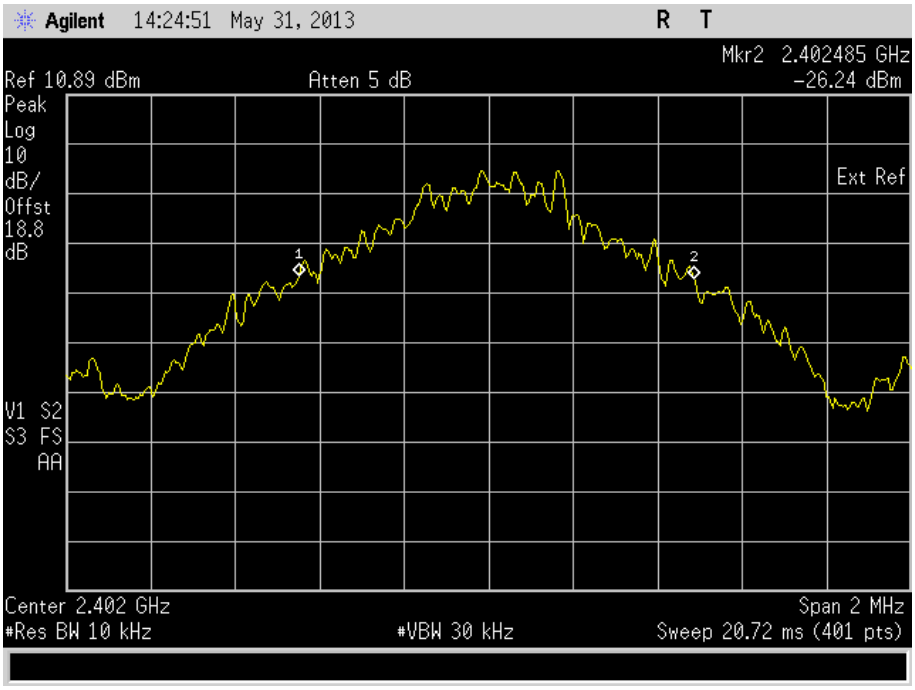
| Data Rate (Mbps) | 20dB Bandwidth (kHz) |
|---|---|
| DH1 | 930 |
| DH3 | 935 |
| DH5 (worst) | 930 |

DH1

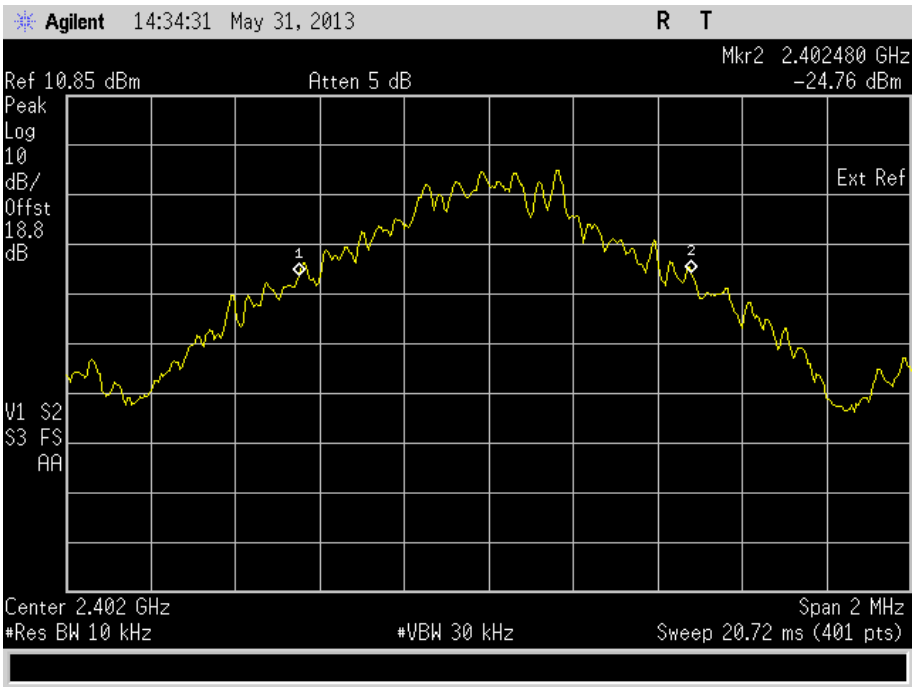


Product Service

DH3




DH5 (worst)

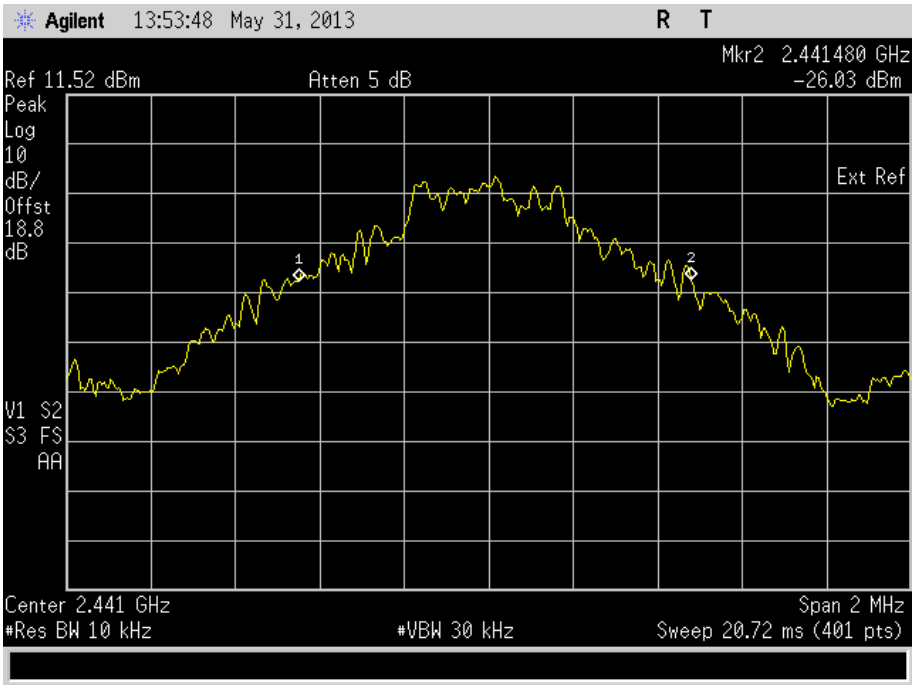


Product Service

2441 MHz

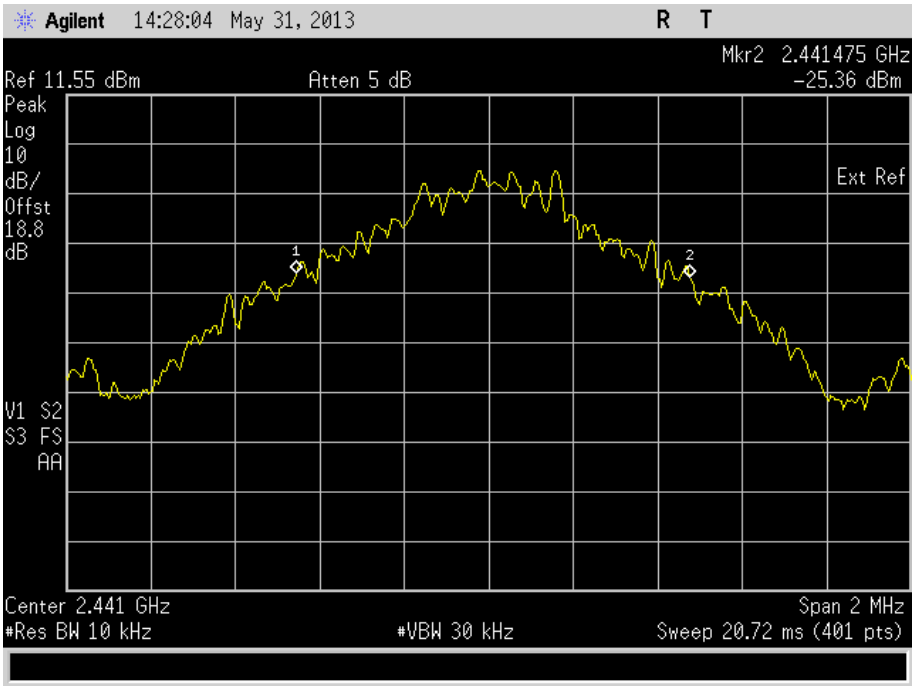
| Data Rate (Mbps) | 20dB Bandwidth (kHz) |
|---|---|
| DH1 | 930 |
| DH3 | 930 |
| DH5 (worst) | 930 |

DH1

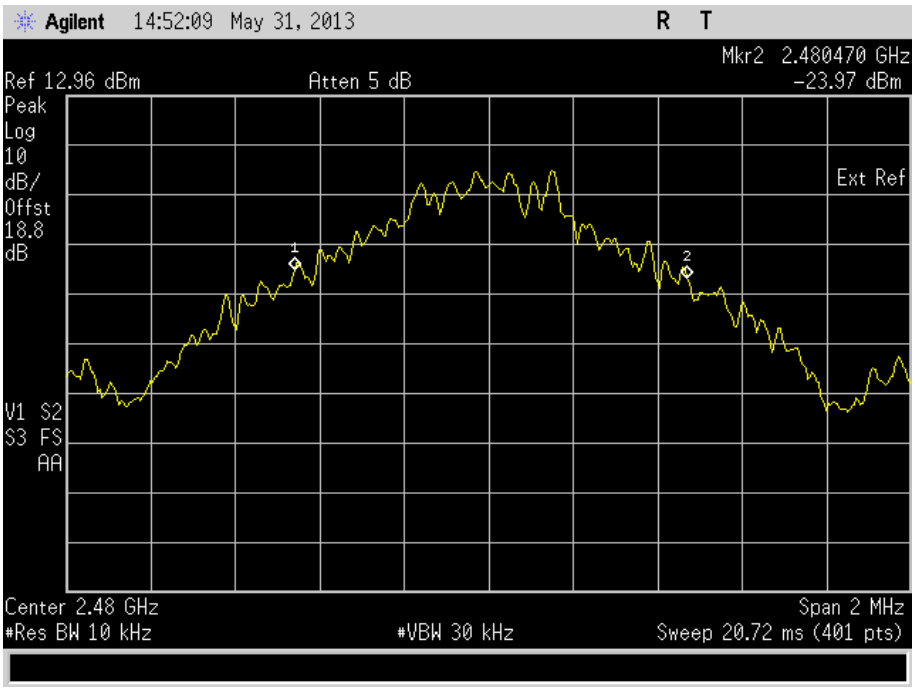


Product Service

DH3




DH5 (worst)

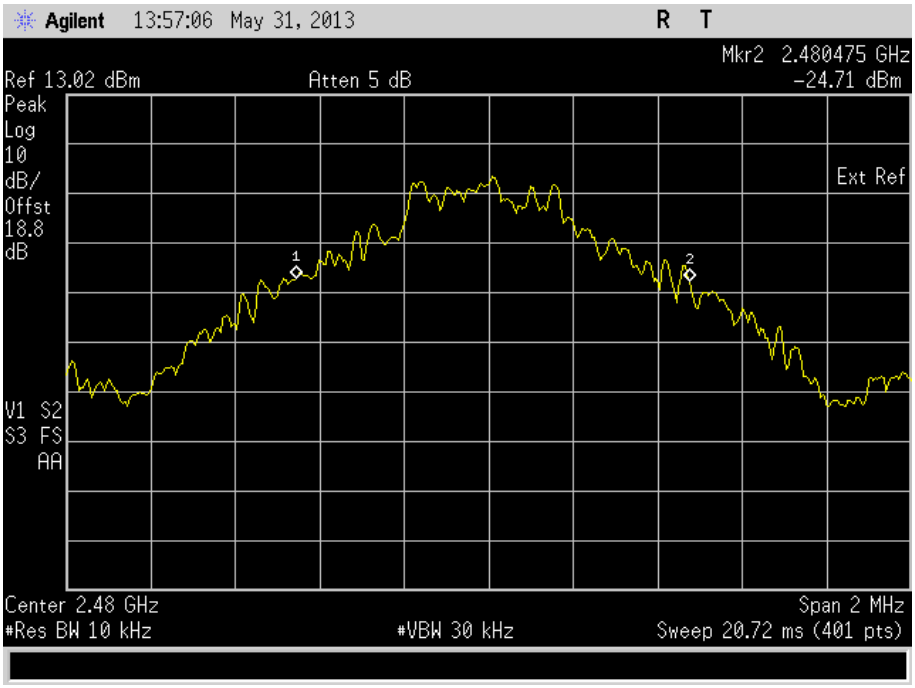


Product Service

2480 MHz

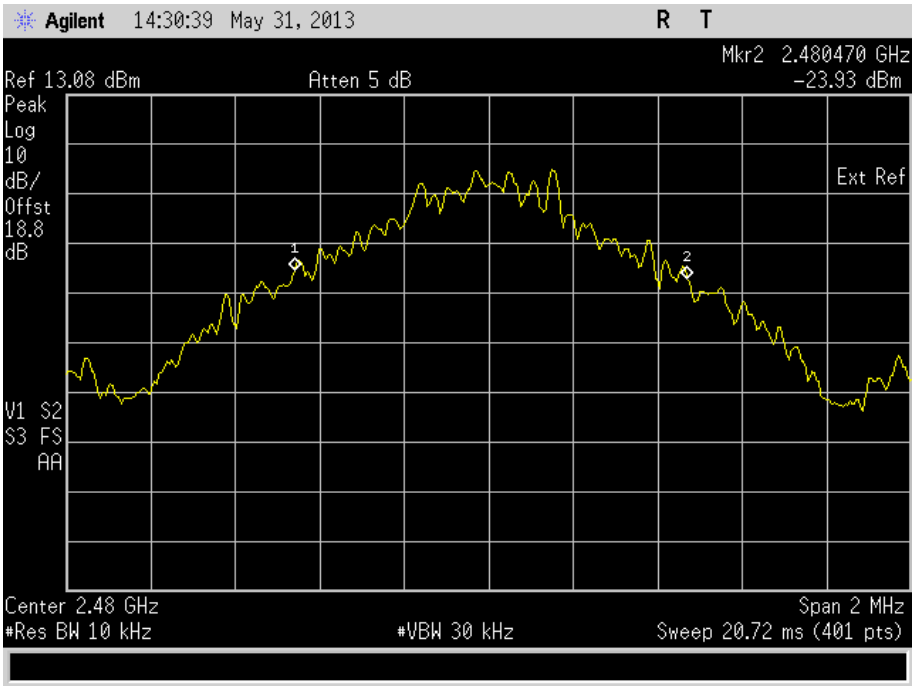
| Data Rate (Mbps) | 20dB Bandwidth (kHz) |
|---|---|
| DH1 | 930 |
| DH3 | 930 |
| DH5 (worst) | 930 |

DH1

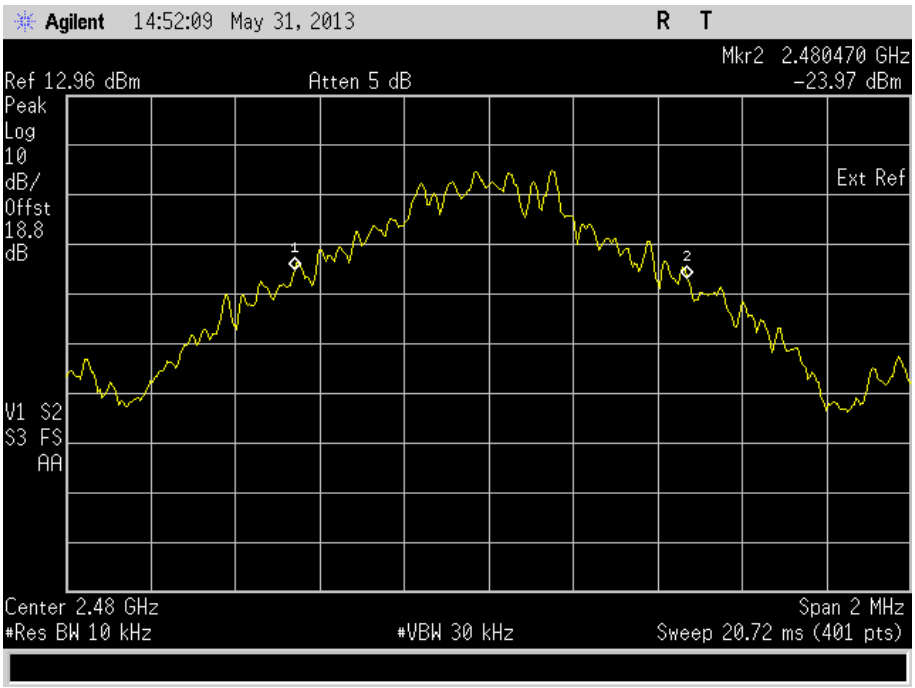


Product Service

DH3




DH5 (worst)



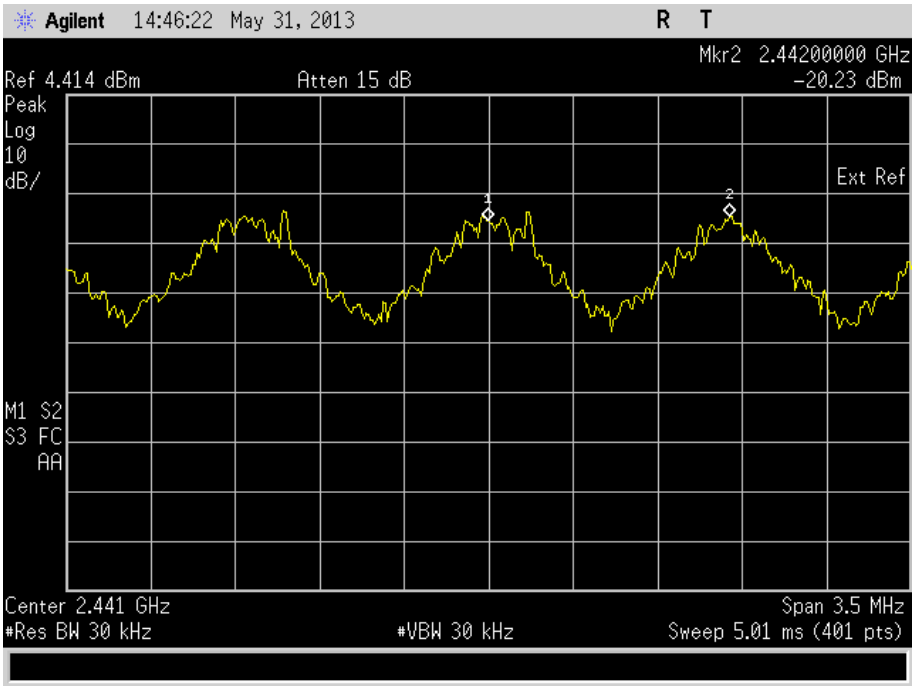

Limit Clause

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

Product Service

Channel Separation

Channel Separation: 1 MHz




Limit Clause

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W.

The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Product Service

## 2.3 FREQUENCY HOPPING SYSTEMS - CHANNEL DWELL TIME AND NUMBER OF HOPPING CHANNELS

### 2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)(iii)

### 2.3.2 Equipment Under Test and Modification State

SHL22 S/N: IMEI 004401114765106 - Modification State 0

### 2.3.3 Date of Test

31 May 2013

### 2.3.4 Test Equipment Used

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

### 2.3.5 Test Procedure

DH1

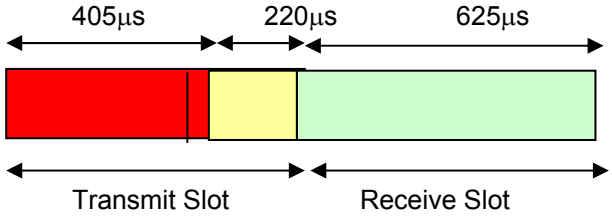
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second.

The DH1 data rate operates on a Transmit on 1 timeslot and Receive on 1 timeslot basis. Thus, in 1 second, there are 800 Transmit timeslots and 800 Receive timeslots.

Thus:

$$1 \text{ Timeslot} = \frac{1}{1600} = 625\mu s$$

In 1 transmit timeslot, the transmit on time is only 405μs. 220μs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH1 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle

So, with 800 Tx and 800 Rx timelsots, the transmitter is on for 800 x 405μs = 0.324 seconds.

$$\therefore \quad \frac{\text{Total Tx Time On}}{\text{No of Channels}} = \frac{0.324}{80} = 4.05\text{ms}$$

So, in 32 seconds, the transmitter dwell time per channel is:

32 x 4.05ms = 0.1296 seconds

DH3

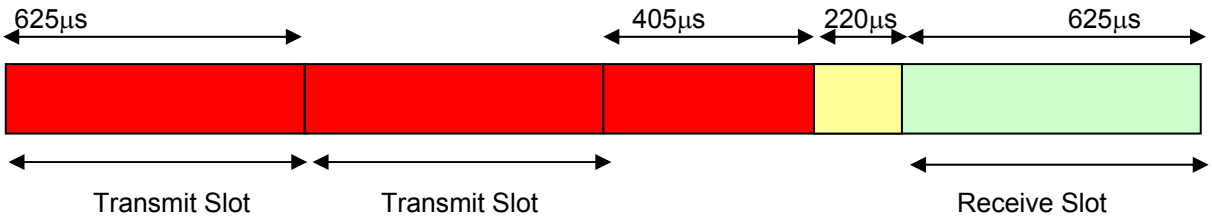
With data rate DH3, the data payload is higher and can use up to 3 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 3 slots, (ie. no receive slot in-between the 3 transmit slots). The 220μs off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 3 transmit timeslots. 2 are 625μs long and the final slot is transmitting for 405μs.

The DH3 data rate operates on a Transmit on 3 timeslots and Receives on 1 timeslot basis, (assuming maximum data payload). The frequency-hopping rate is the same. Thus, in 1 second, there are 1200 Transmit timeslots and 400 Receive timeslots.

Thus:

$$1\text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

The first 2 Transmit timeslots are transmitting for the complete 625μs. In the third transmit slot, the transmit on time is only 405μs. 220μs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



Product Service

DH3 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle, (Maximum Payload)

Thus, the transmitter for one complete transmit and receive cycle would be on for:

Tx (2 x 625μs) + (1 x 405μs) = 1.655ms

So:

800 x 625μs = 0.5 seconds
400 x 405μs = 0.162 seconds

Thus: 0.5 + 0.162 = 0.662 seconds

$$\therefore \quad \frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.662}{80} = 8.275\text{ms}$$

So, in 32 seconds, the transmitter dwell time per channel is:

32 x 8.275ms = 0.2648 seconds

DH5

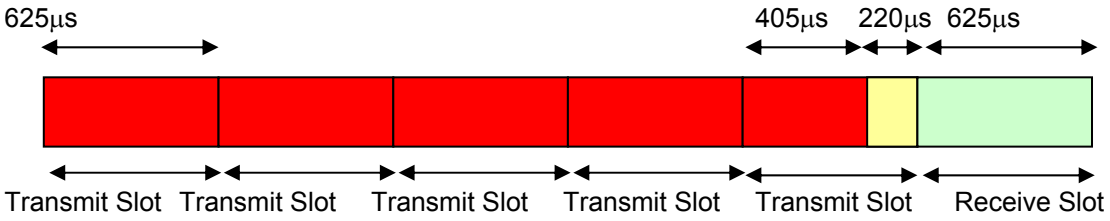
With data rate DH5, the data payload is higher and can use up to 5 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 5 slots, (ie. no receive slot in-between the 5 transmit slots). The 220μs off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 5 transmit timeslots. 4 are 625μs long and the final slot is transmitting for 405μs.

The DH5 data rate operates on a Transmit on 5 timeslots and Receives on 1 timeslot basis, (assuming maximum data payload). The frequency-hopping rate is the same. Thus, in 1 second, there are 1333.3 Transmit timeslots and 266.7 Receive timeslots.

Thus:

$$1\text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

The first 4 Transmit timeslots are transmitting for the complete 625μs. In the fifth transmit slot, the transmit on time is only 405μs. 220μs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH5 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle, (Maximum Payload)

Thus, the transmitter for one complete transmit and receive cycle would be on for:

Tx (2 x 625μs) + (1 x 405μs) = 2.905ms

So:

1066.7 x 625μs = 0.666 seconds
266.7 x 405μs = 0.108 seconds

Thus: 0.666 + 0.108 = 0.774 seconds

$\therefore$ $\frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.774}{80} = 9.675\text{ms}$

So, in 32 seconds, the transmitter dwell time per channel is:

32 x 9.675ms = 0.31 seconds

### 2.3.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 24.0°C |
| Relative Humidity | 43.2% |

Product Service

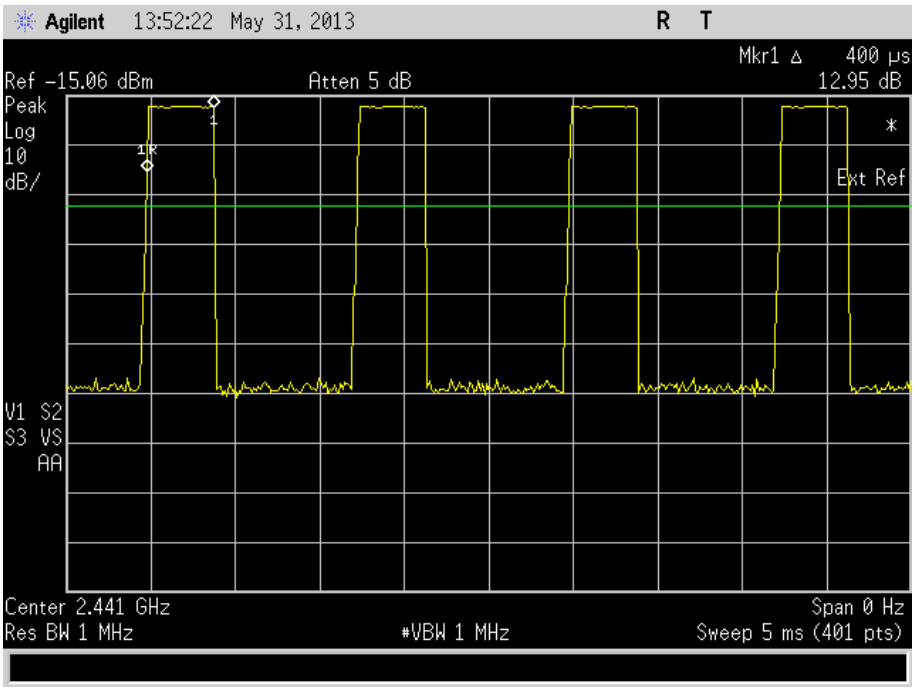
### 2.3.7 Test Results

4.0 V DC Supply

Channel Dwell Time

DH1

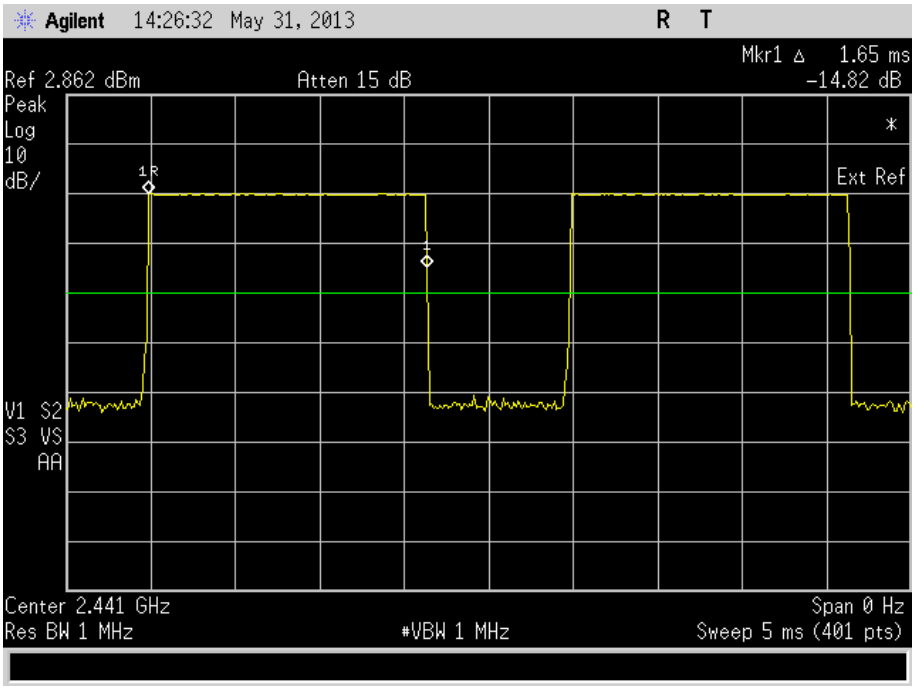
0.40 ms



Product Service

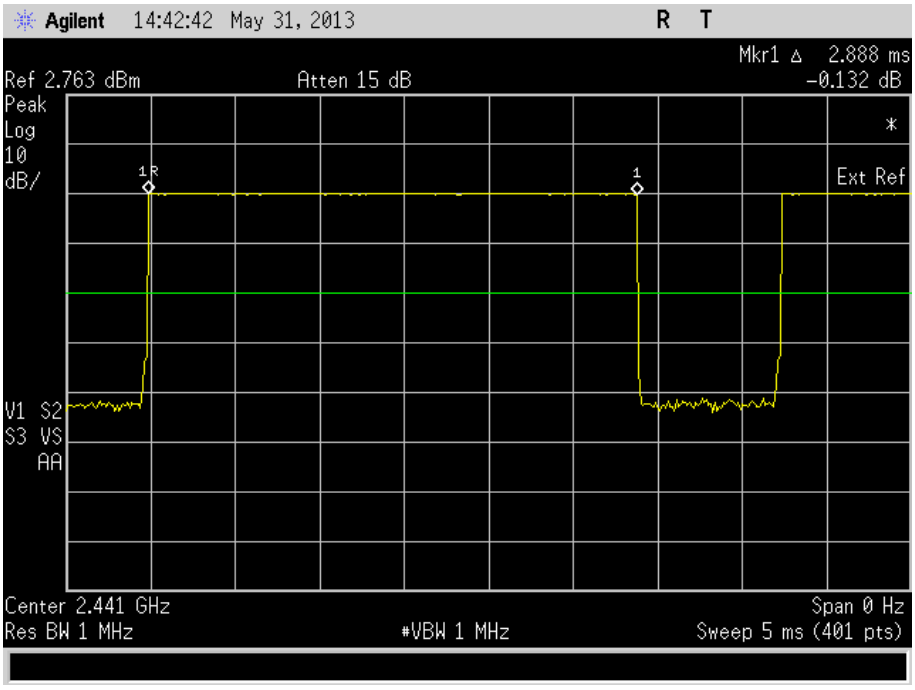
DH3

1.65 ms




DH5

2.89 ms



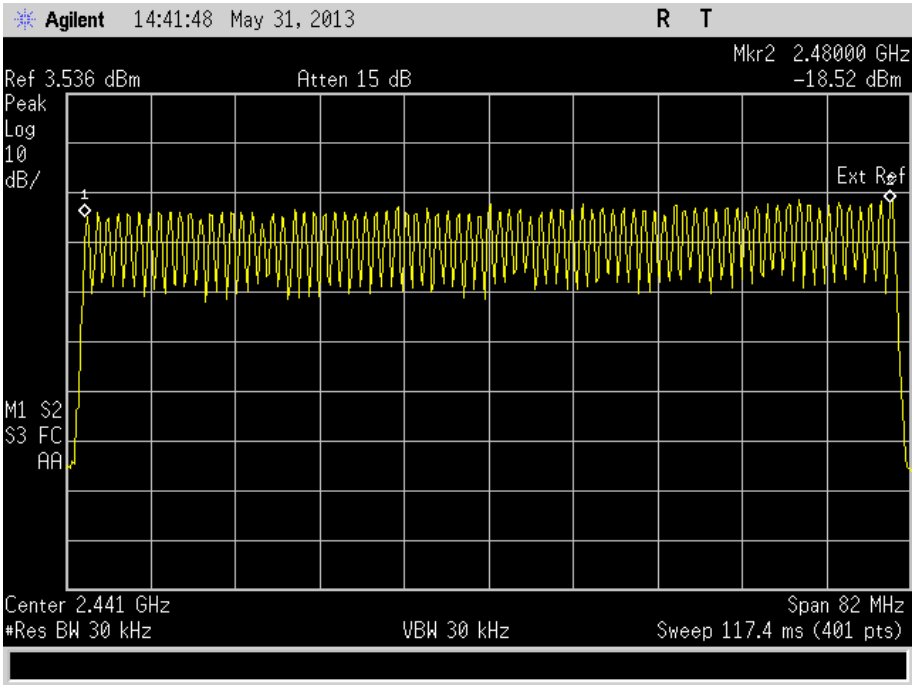
Product Service

Limit

Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

Number of Hopping Channels

79 Channels




Limit

≥ 15 channels

## 2.4 MAXIMUM PEAK CONDUCTED OUTPUT POWER

### 2.4.1 Specification Reference

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

### 2.4.2 Equipment Under Test and Modification State

SHL22 S/N: IMEI 004401114765106 - Modification State 0

### 2.4.3 Date of Test

31 May 2013

### 2.4.4 Test Equipment Used

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

### 2.4.5 Test Procedure

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

### 2.4.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 24.0°C |
| Relative Humidity | 43.2% |

Product Service

### 2.4.7 Test Results

4.0 V DC Supply

| Packet Type | Maximum Peak Conducted Output Power | | | | | |
|---|---|---|---|---|---|---|
| | dBm | | | mW | | |
| | 2402 MHz | 2441 MHz | 2480 MHz | 2402 MHz | 2441 MHz | 2480 MHz |
| DH1 | 1.59 | 2.42 | 4.42 | 1.44 | 1.74 | 2.77 |
| DH3 | 1.83 | 2.42 | 4.37 | 1.52 | 1.74 | 2.74 |
| DH5 (worst) | 1.75 | 2.48 | 4.38 | 1.49 | 1.77 | 2.74 |

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.

## 2.5 EIRP PEAK POWER

### 2.5.1 Specification Reference

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

### 2.5.2 Equipment Under Test and Modification State

SHL22 S/N: IMEI 004401114764687 - Modification State 0

### 2.5.3 Date of Test

2 June 2013

### 2.5.4 Test Equipment Used

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

### 2.5.5 Test Procedure

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

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

A calculation was then performed to obtain the final figure.

### 2.5.6 Environmental Conditions

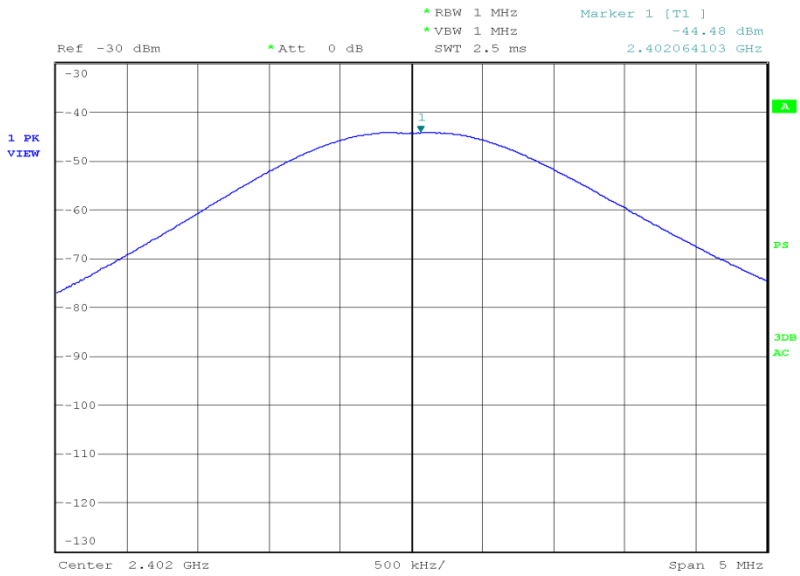
| | |
|---|---|
| Ambient Temperature | 22.8 - 23.0°C |
| Relative Humidity | 42.1 - 43.1% |

Product Service

### 2.5.7 Test Results

2402 MHz

| EIRP (dBm) | EIRP (mW) |
|---|---|
| -2.50 | 0.56 |

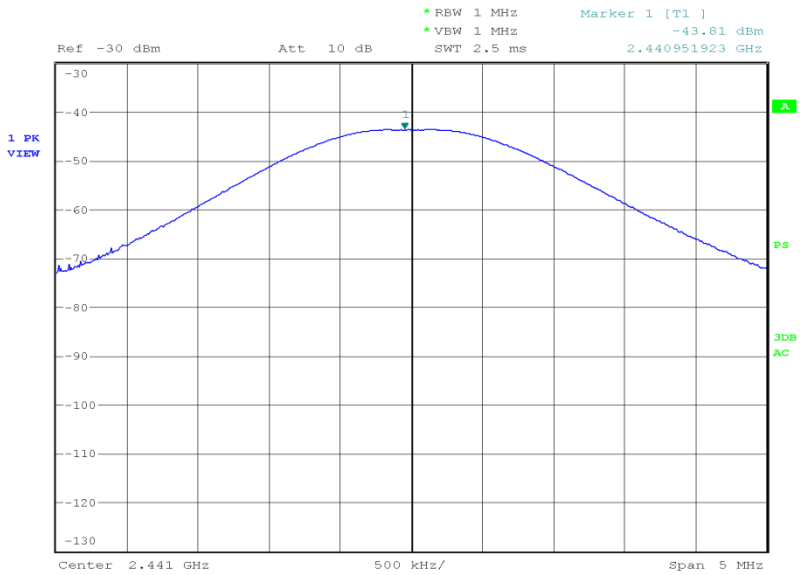



Date: 2.JUN.2013 16:18:37

Product Service

2441 MHz

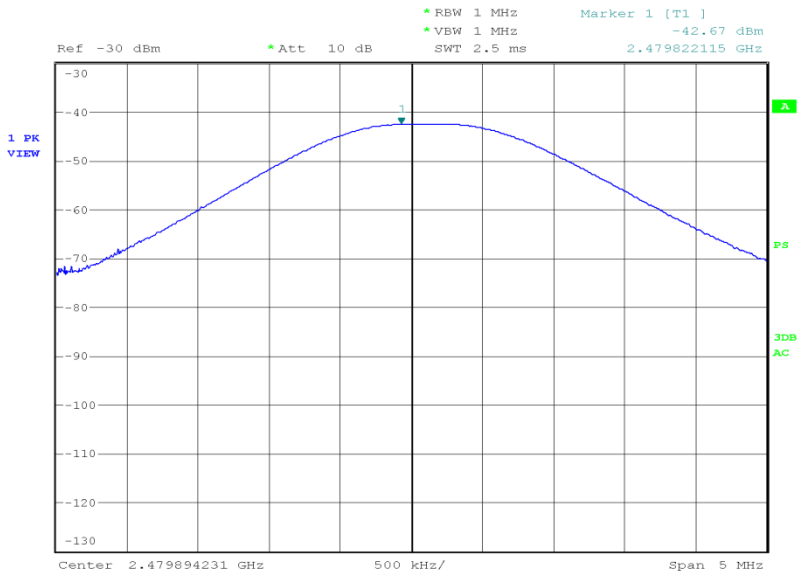
| EIRP (dBm) | EIRP (mW) |
|---|---|
| -2.97 | 0.50 |




Date: 2.JUN.2013 15:44:38

2480 MHz

| EIRP (dBm) | EIRP (mW) |
|---|---|
| -3.25 | 0.47 |




Date: 2.JUN.2013 15:51:09

Limit

| EIRP (dBm) | EIRP (mW) |
|---|---|
| 36.0 | 4000 |

## 2.6 SPURIOUS AND BAND EDGE EMISSIONS

### 2.6.1 Specification Reference

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

### 2.6.2 Equipment Under Test and Modification State

SHL22 S/N: IMEI 004401114764687 - Modification State 0

### 2.6.3 Date of Test

1 June 2013, 2 June 2013, 7 June 2013, 13 June 2013 & 14 June 2013

### 2.6.4 Test Equipment Used

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

### 2.6.5 Test Procedure

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 shown a -20 dBc limit line on the trace. The measurement path loss in each relevant frequency band was measured and entered a s a reference level offset.

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

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

### 2.6.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 20.4 - 23.0°C |
| Relative Humidity | 36.8 - 51.7% |

Product Service

### 2.6.7 Test Results

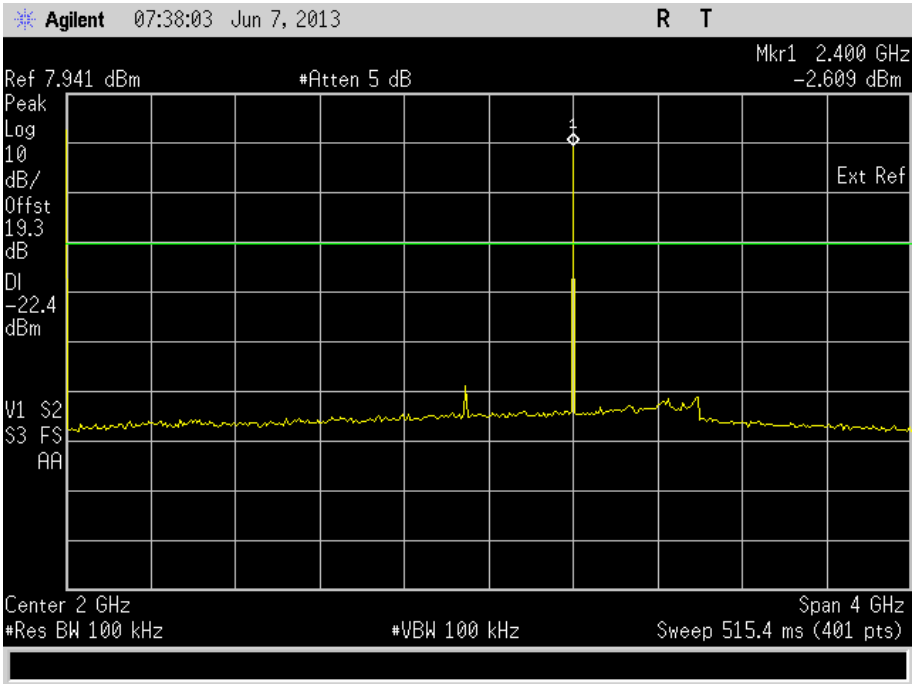
4.0 V DC Supply

Spurious Conducted Emissions

DH5

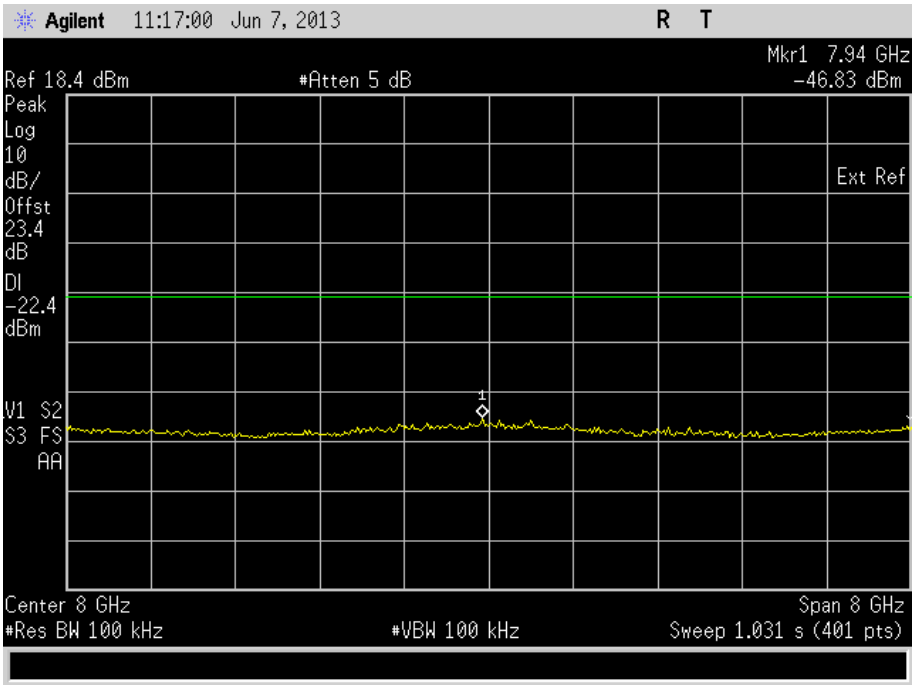
2402 MHz

9 kHz to 4 GHz

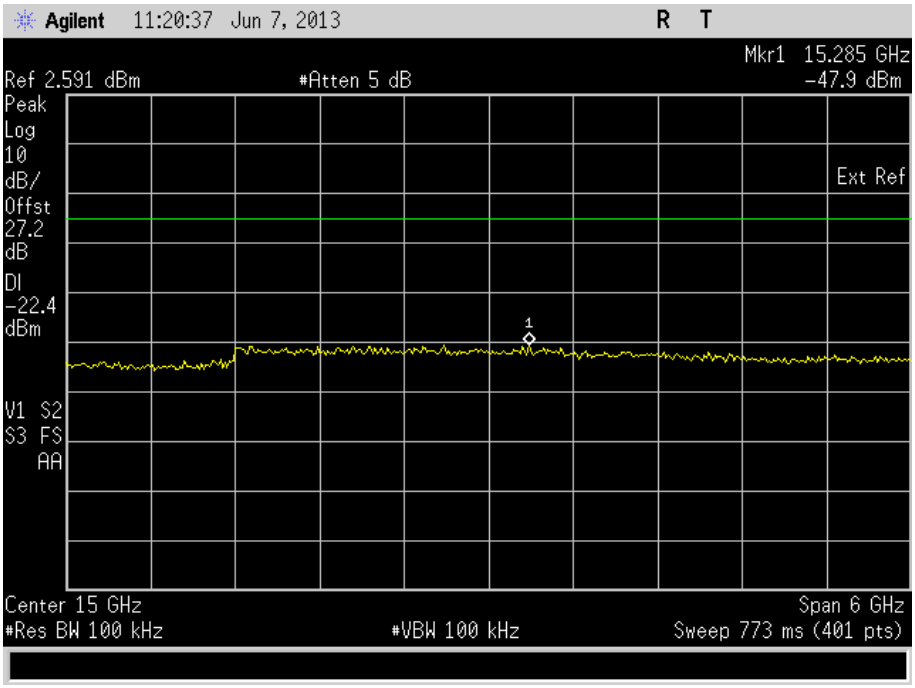


Product Service

4 GHz to 12 GHz

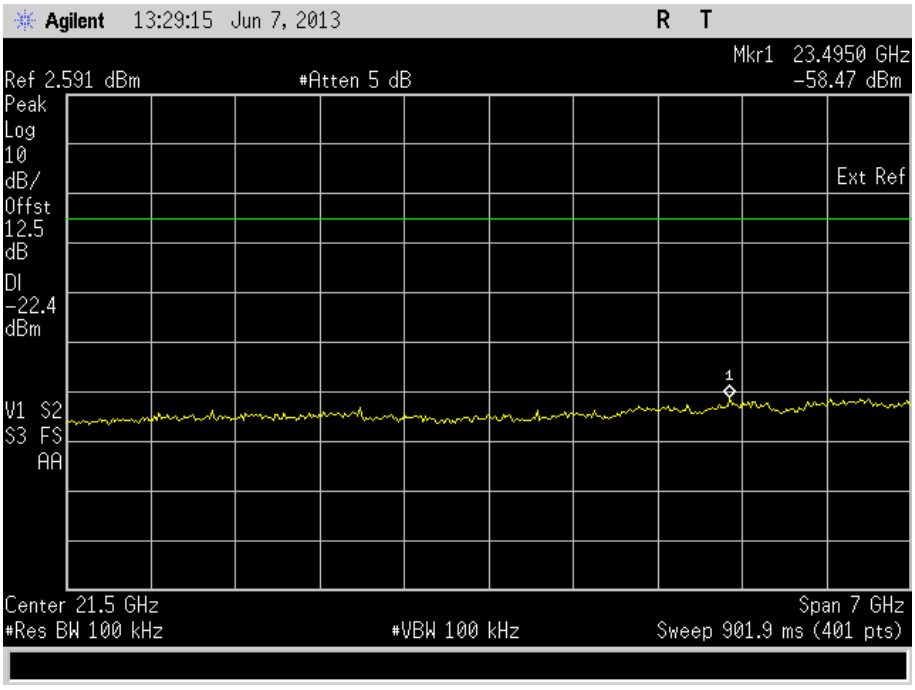



12 GHz to 18 GHz



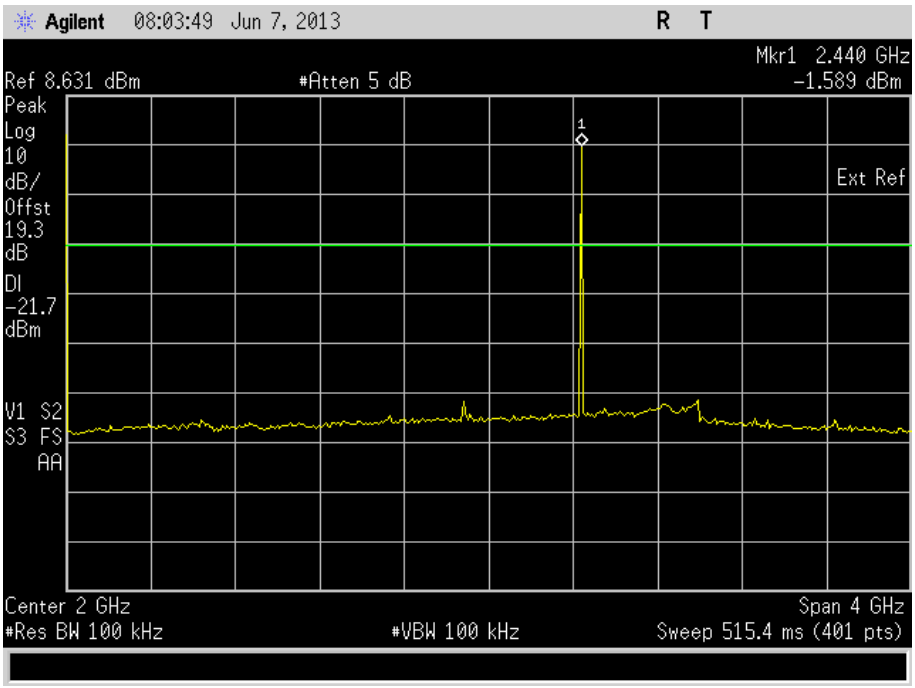
Product Service

18 GHz to 25 GHz



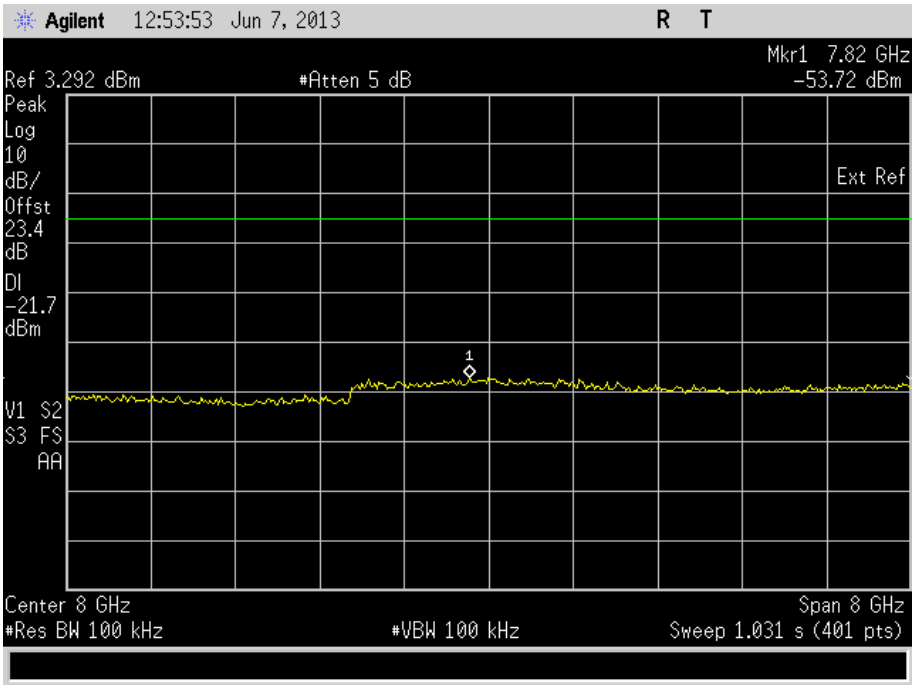

2441 MHz

9 kHz to 4 GHz

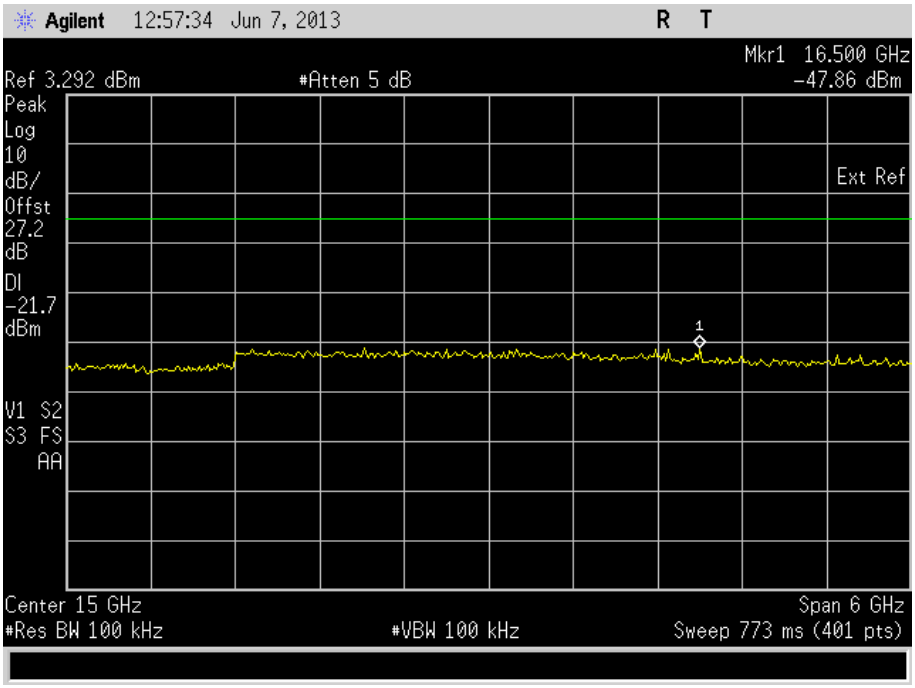


Product Service

4 GHz to 12 GHz

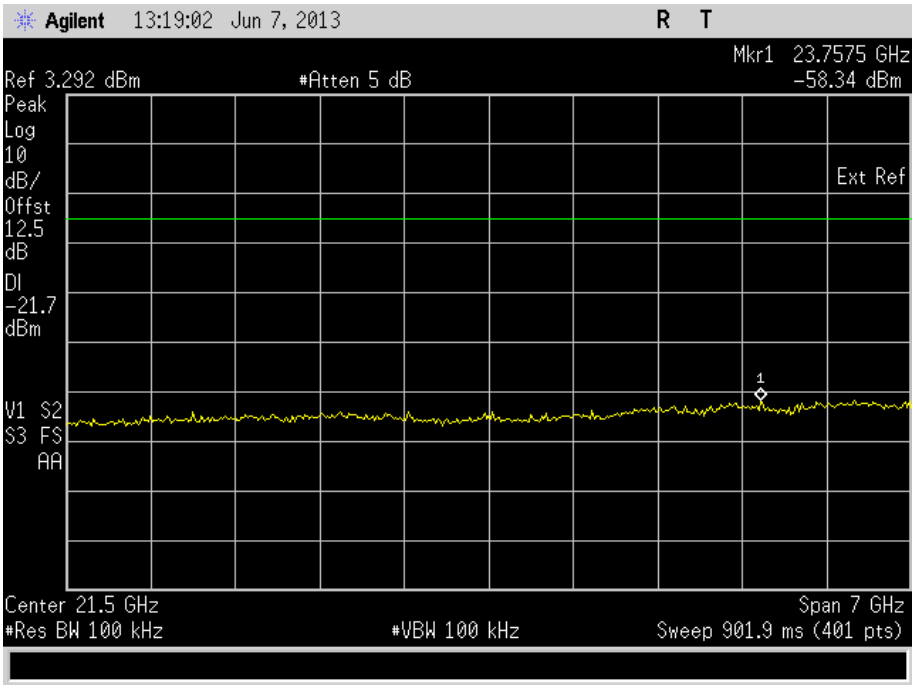



12 GHz to 18 GHz



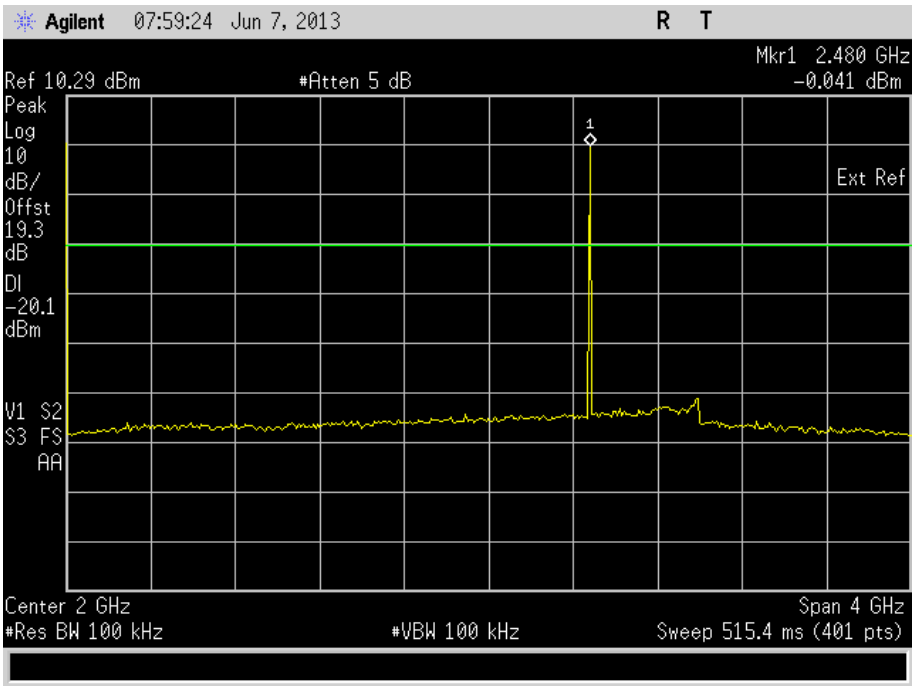
Product Service

18 GHz to 25 GHz



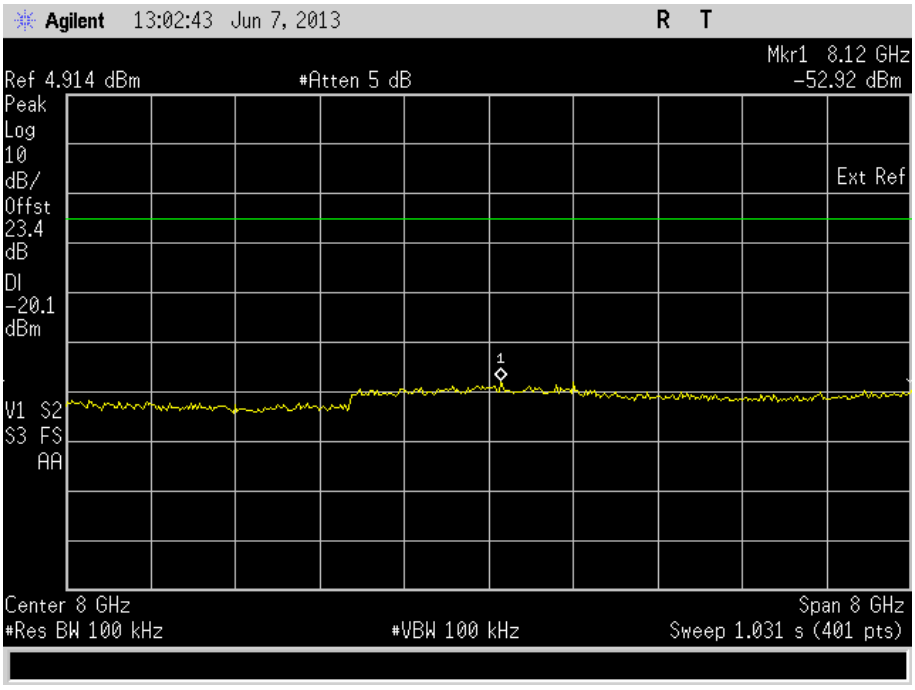

2480 MHz

9 kHz to 4 GHz

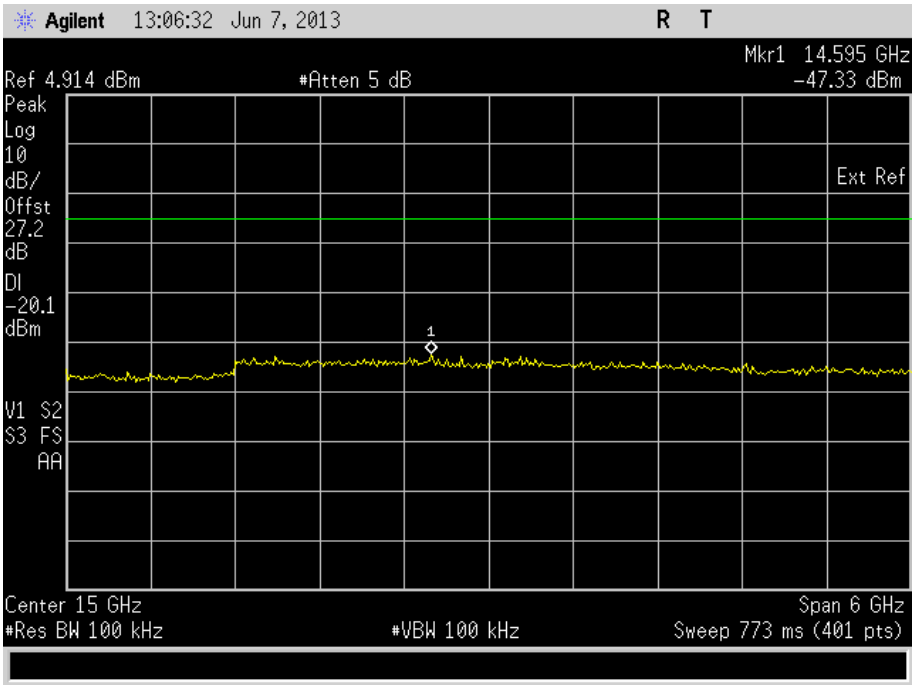


Product Service

4 GHz to 12 GHz

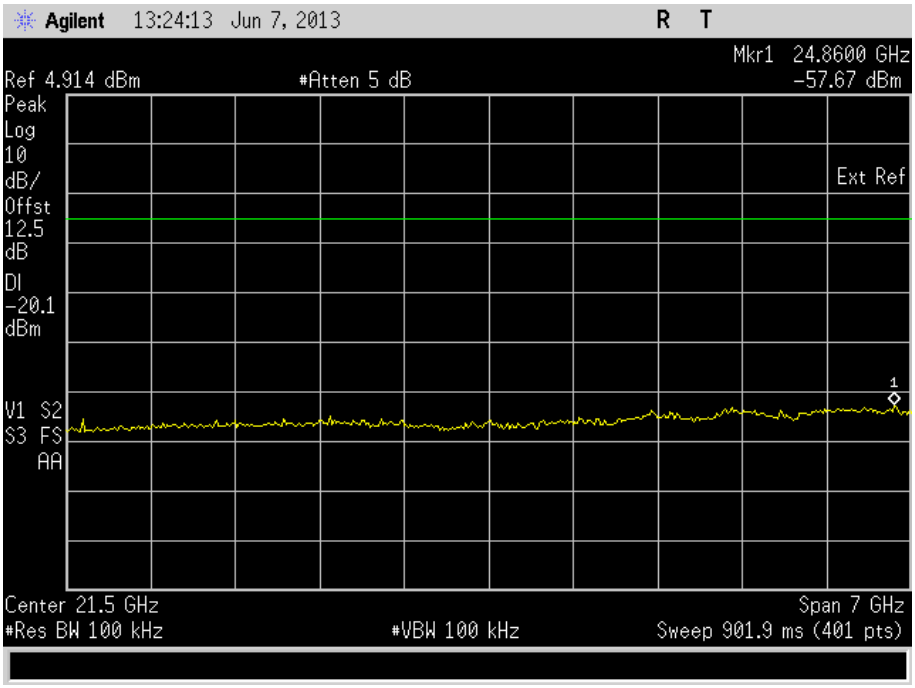



12 GHz to 18 GHz



Product Service

18 GHz to 25 GHz




Limit Clause

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

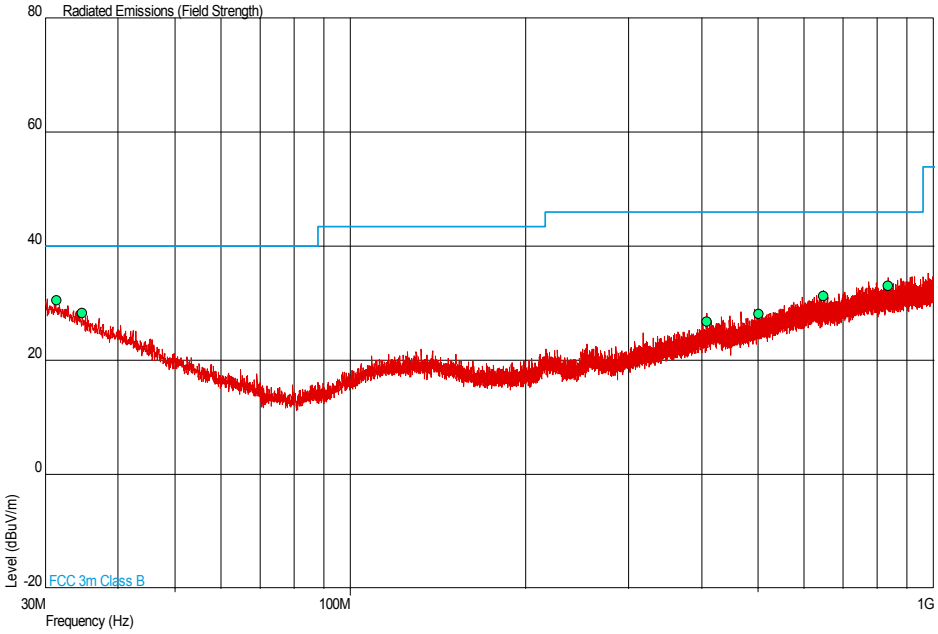
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.

Product Service

Spurious Radiated Emissions

2402 MHz

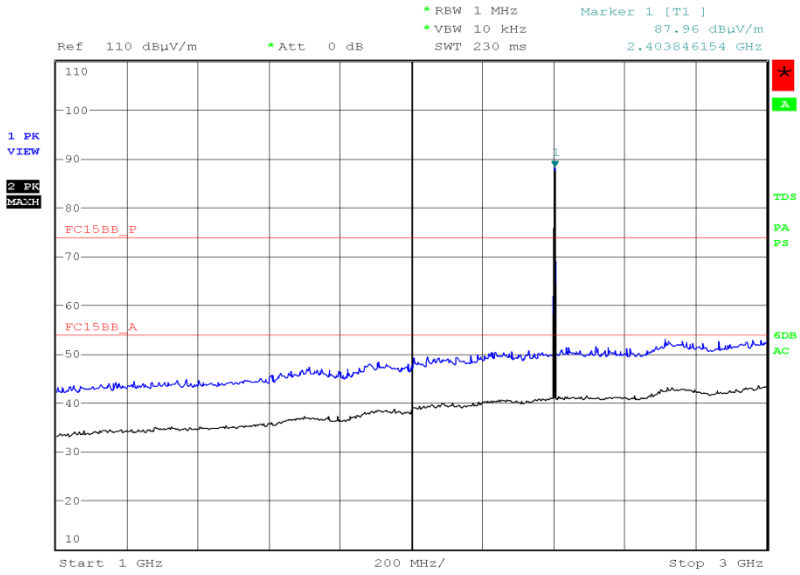
30 MHz to 1 GHz




| Frequency (MHz) | QP Level (dBµV/m) | QP Level (µV/m) | QP Limit (dBµV/m) | QP Limit (µV/m) | QP Margin (dBµV/m) | QP Margin (µV/m) | Angle (Deg) | Height (m) | Polarity | |
|---|---|---|---|---|---|---|---|---|---|---|
| 31.407 | 30.6 | 33.9 | 40.0 | 100 | -9.4 | 66.1 | 0 | 1.00 | Vertical | |
| 34.753 | 28.3 | 26.0 | 40.0 | 100 | -11.7 | 74.0 | 0 | 1.00 | Horizontal | |
| 408.446 | 26.8 | 21.9 | 46.0 | 200 | -19.2 | 178.1 | 0 | 1.00 | Horizontal | |
| 502.299 | 28.1 | 25.4 | 46.0 | 200 | -17.9 | 174.6 | 0 | 1.00 | Horizontal | |
| 647.163 | 31.3 | 36.7 | 46.0 | 200 | -14.7 | 163.3 | 0 | 1.00 | Horizontal | |
| 835.682 | 33.1 | 45.2 | 46.0 | 200 | -12.9 | 154.8 | 0 | 1.00 | Vertical | |

Product Service

## 1 GHz to 3 GHz

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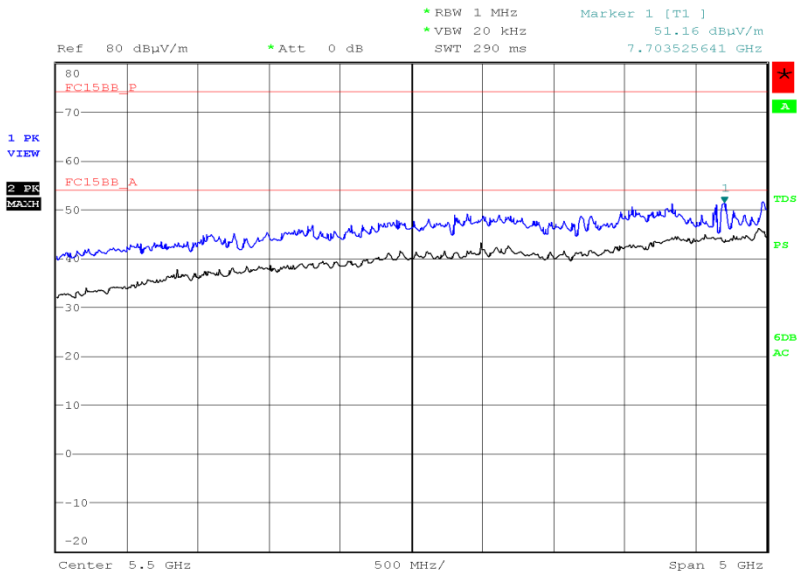
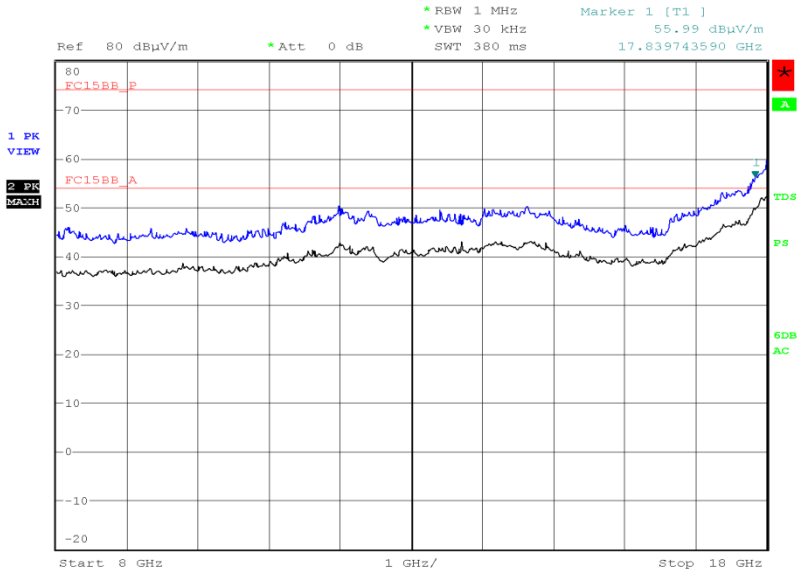
## 3 GHz to 8 GHz




Date: 13.JUN.2013 02:41:57

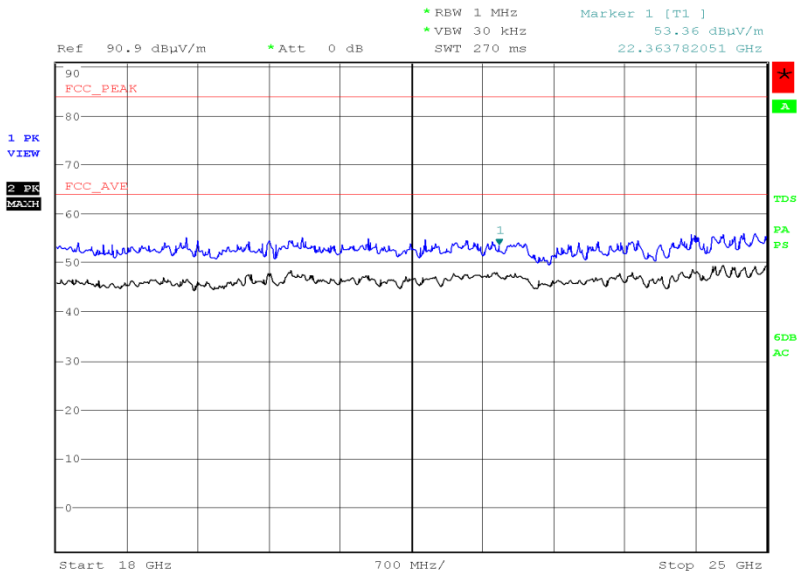
Product Service

## 8 GHz to 18 GHz




Date: 13.JUN.2013 03:52:56

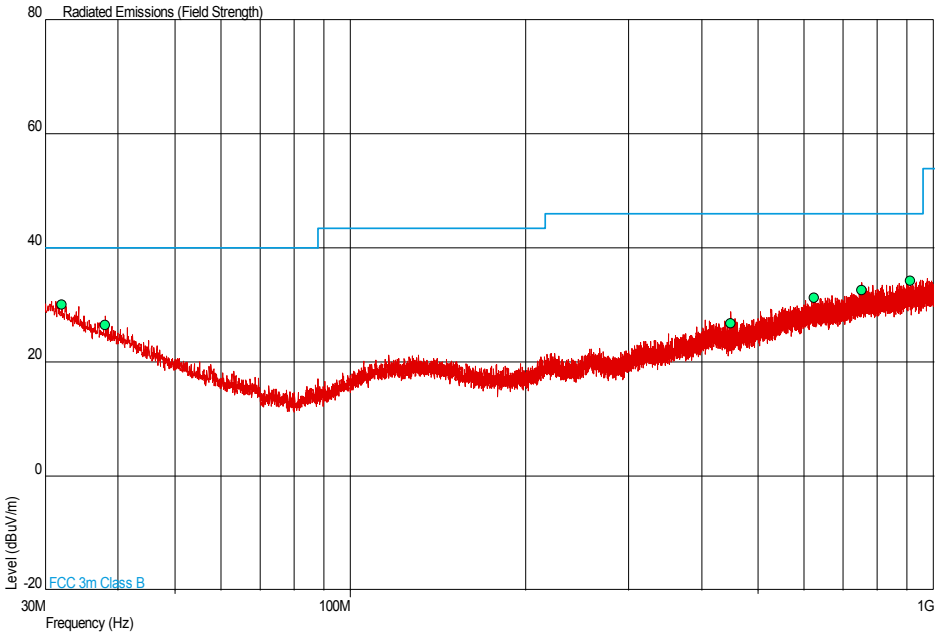
## 18 GHz to 25 GHz




Date: 13.JUN.2013 23:29:09

2441 MHz

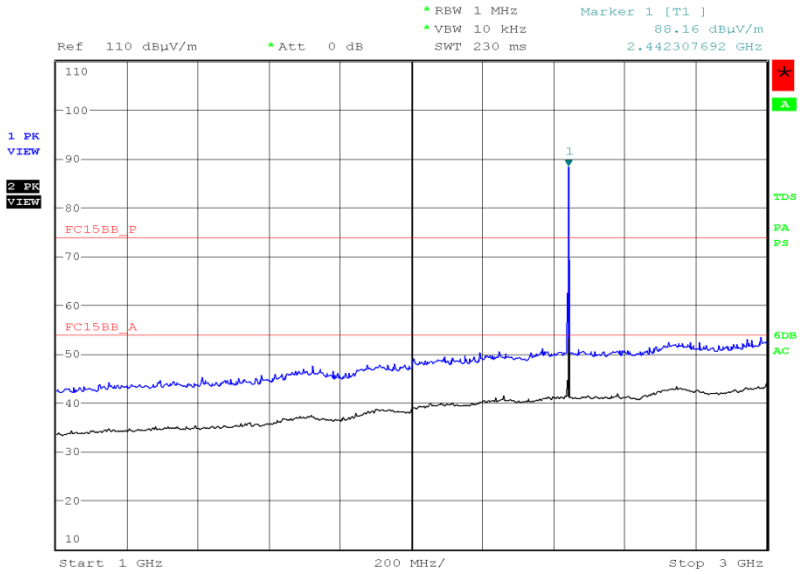
30 MHz to 1 GHz




| Frequency (MHz) | QP Level (dBµV/m) | QP Level (µV/m) | QP Limit (dBµV/m) | QP Limit (µV/m) | QP Margin (dBµV/m) | QP Margin (µV/m) | Angle (Deg) | Height (m) | Polarity | |
|---|---|---|---|---|---|---|---|---|---|---|
| 32.037 | 30.1 | 32.0 | 40.0 | 100 | -9.9 | 68.0 | 0 | 1.00 | Vertical | |
| 38.051 | 26.6 | 21.4 | 40.0 | 100 | -13.4 | 78.6 | 0 | 1.00 | Vertical | |
| 449.428 | 26.8 | 21.9 | 46.0 | 200 | -19.2 | 178.1 | 0 | 1.00 | Vertical | |
| 623.398 | 31.3 | 36.7 | 46.0 | 200 | -14.7 | 163.3 | 0 | 1.00 | Vertical | |
| 752.020 | 32.5 | 42.2 | 46.0 | 200 | -13.5 | 157.8 | 0 | 1.00 | Vertical | |
| 910.809 | 34.2 | 51.3 | 46.0 | 200 | -11.8 | 148.7 | 0 | 1.00 | Horizontal | |

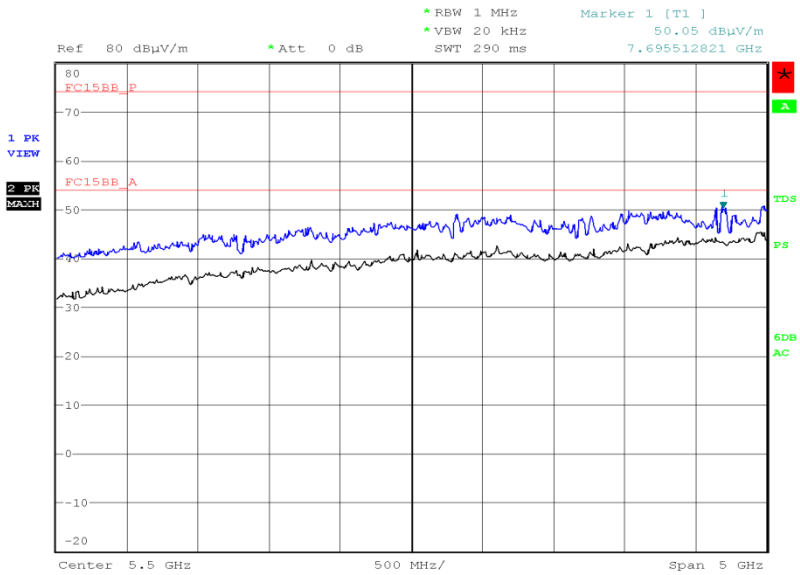
Product Service

## 1 GHz to 3 GHz




Date: 12.JUN.2013 21:23:19

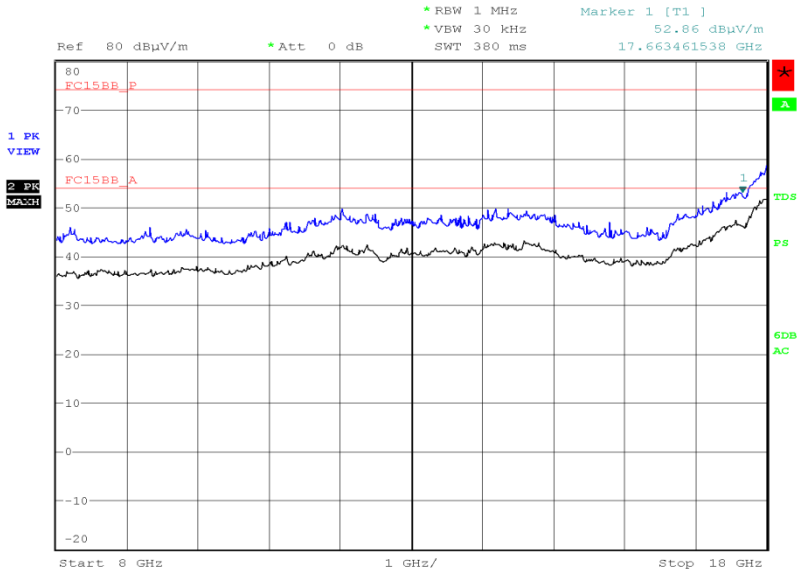
## 3 GHz to 8 GHz




Date: 13.JUN.2013 02:48:31

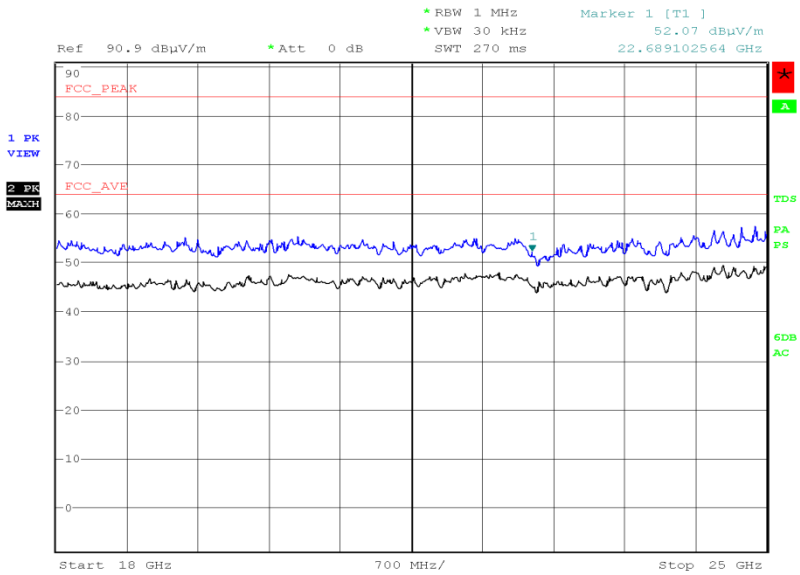
Product Service

## 8 GHz to 18 GHz




Date: 13.JUN.2013 03:59:28

## 18 GHz to 25 GHz

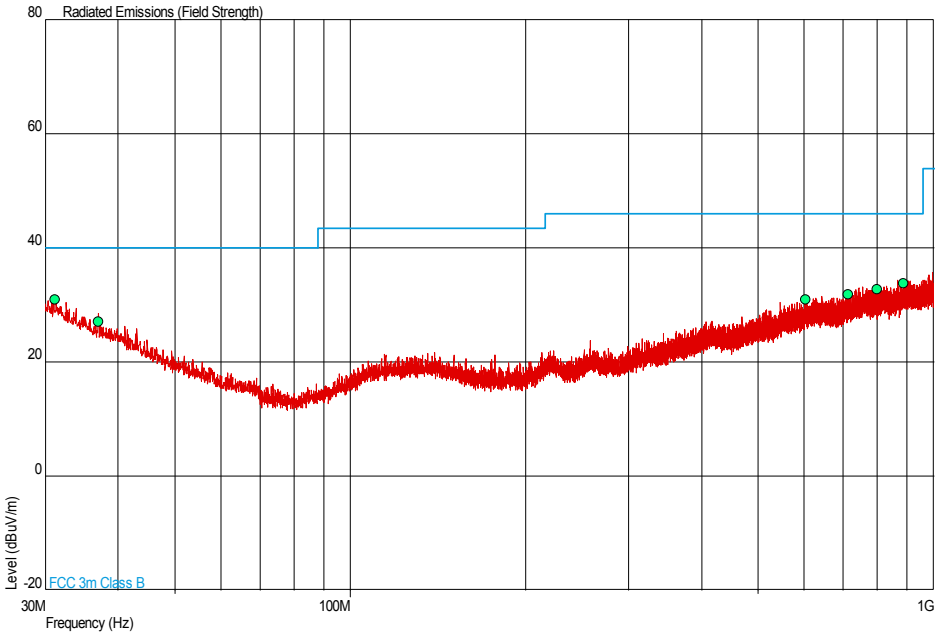



Date: 13.JUN.2013 23:37:31

Product Service

2480 MHz

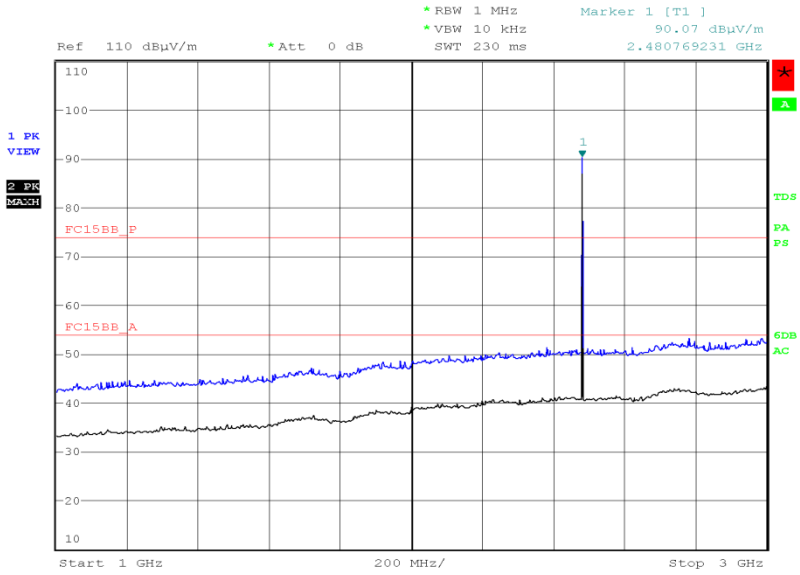
30 MHz to 1 GHz




| Frequency (MHz) | QP Level (dBµV/m) | QP Level (µV/m) | QP Limit (dBµV/m) | QP Limit (µV/m) | QP Margin (dBµV/m) | QP Margin (µV/m) | Angle (Deg) | Height (m) | Polarity | |
|---|---|---|---|---|---|---|---|---|---|---|
| 31.213 | 31.0 | 35.5 | 40.0 | 100 | -9.0 | 64.5 | 0 | 1.00 | Horizontal | |
| 36.984 | 27.1 | 22.6 | 40.0 | 100 | -12.9 | 77.4 | 0 | 1.00 | Horizontal | |
| 603.658 | 31.0 | 35.5 | 46.0 | 200 | -15.0 | 164.5 | 0 | 1.00 | Horizontal | |
| 713.263 | 31.9 | 39.4 | 46.0 | 200 | -14.1 | 160.6 | 0 | 1.00 | Horizontal | |
| 800.956 | 32.8 | 43.7 | 46.0 | 200 | -13.2 | 156.3 | 0 | 1.00 | Vertical | |
| 887.529 | 33.8 | 49.0 | 46.0 | 200 | -12.2 | 151.0 | 0 | 1.00 | Vertical | |

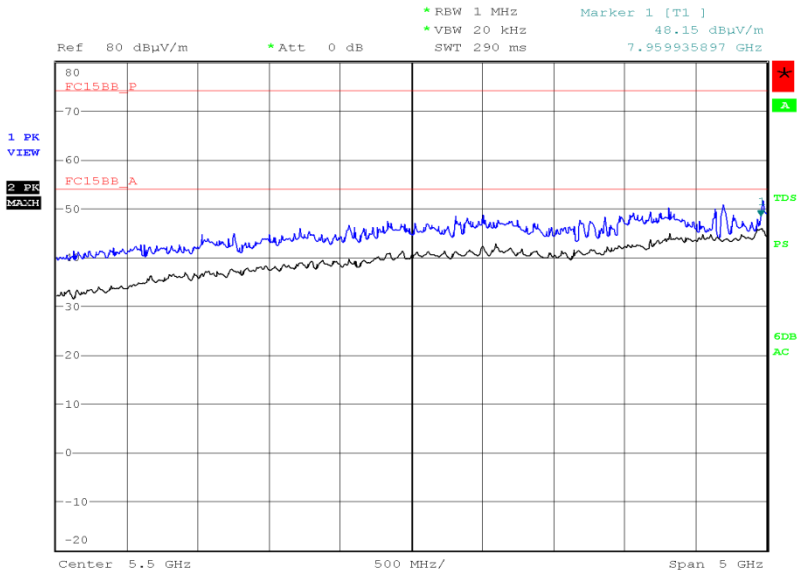
Product Service

1 GHz to 3 GHz




Date: 12.JUN.2013 21:30:01

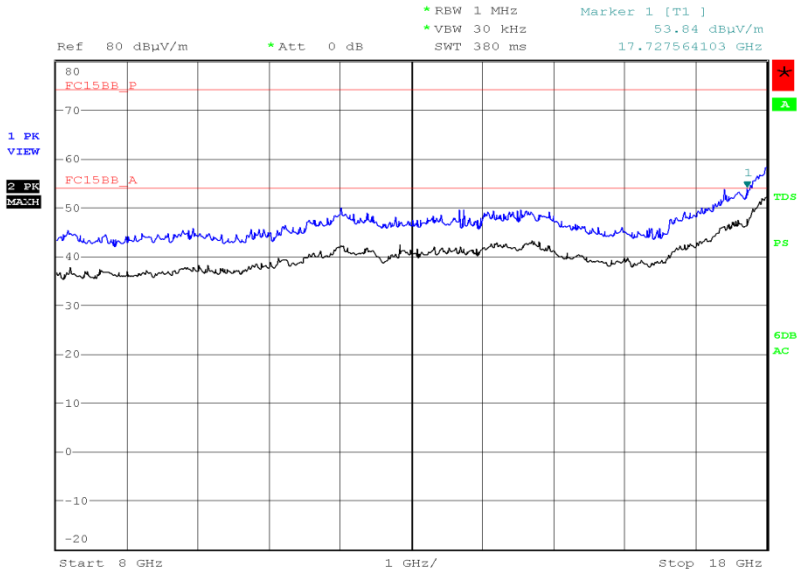
3 GHz to 8 GHz




Date: 13.JUN.2013 02:55:32

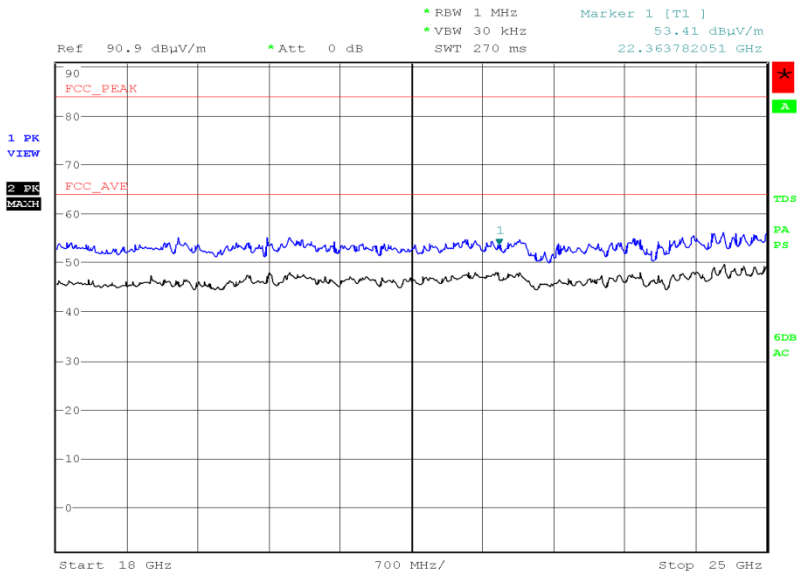
Product Service

8 GHz to 18 GHz




Date: 13.JUN.2013 04:05:47

18 GHz to 25 GHz




Date: 13.JUN.2013 23:49:10

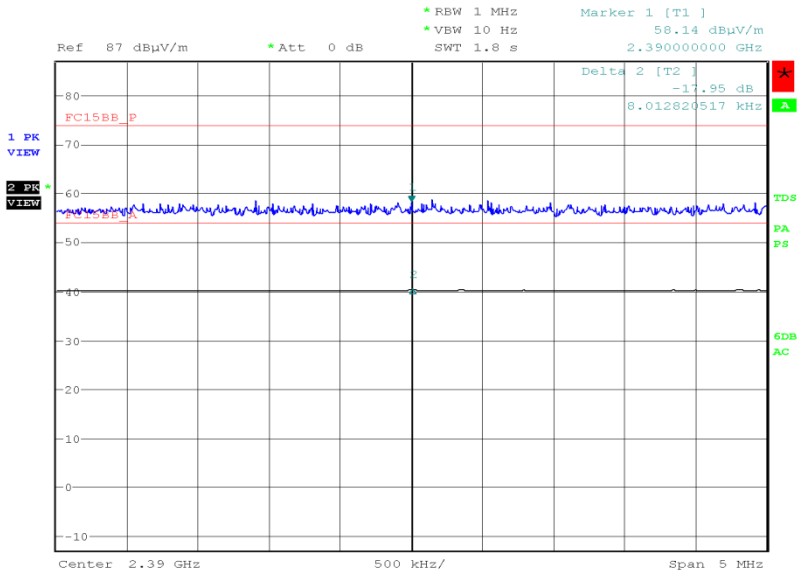
Limit

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

Band Edge Emissions

2402 MHz

| Polarisation | Final Peak (dBµV/m) | Final Average (dBµV/m) |
|---|---|---|
| Horizontal | 58.14 | 40.19 |

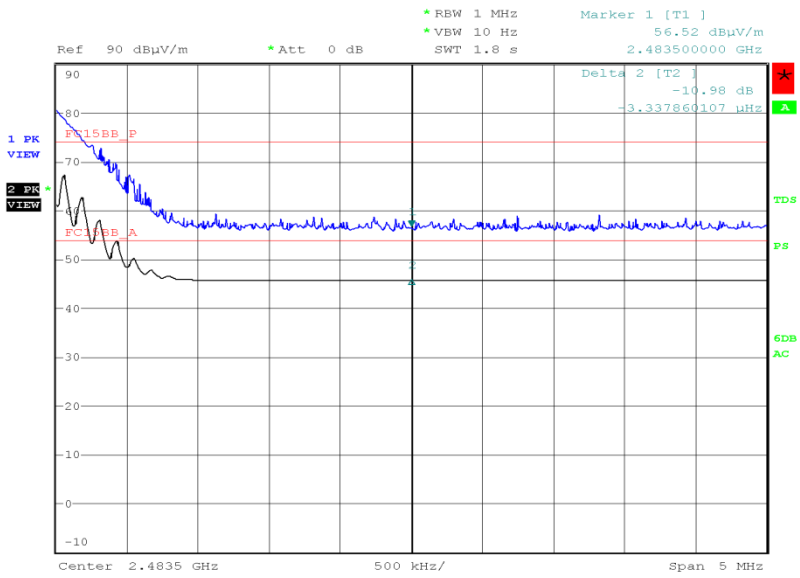



Date: 2.JUN.2013 16:07:55

Product Service

2480 MHz

| Polarisation | Final Peak (dBµV/m) | Final Average (dBµV/m) |
|---|---|---|
| Horizontal | 56.52 | 45.54 |




Limit

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

Product Service

**SECTION 3**

**TEST EQUIPMENT USED**

Product Service

## 3.1 TEST EQUIPMENT USED

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

| Instrument | Manufacturer | Type No. | TE No. | Calibration Period (months) | Calibration Due |
|---|---|---|---|---|---|
| **Section 2.1– AC Line Conducted Emissions** | | | | | |
| LISN | Rohde & Schwarz | ESH2-Z5 | 17 | 12 | 31-Jul-2013 |
| 3 phase LISN | Rohde & Schwarz | ESH2-Z5 | 323 | 12 | 15-Jan-2014 |
| Transient Limiter | Hewlett Packard | 11947A | 1032 | 12 | 28-Jun-2013 |
| Screened Room (5) | Rainford | Rainford | 1545 | 36 | 25-Dec-2013 |
| EMI Test Receiver | Rohde & Schwarz | ESU40 | 3506 | 12 | 11-Oct-2013 |
| 7m Armoured RF Cable | SSI Cable Corp. | 1501-13-13-7m WA(-) | 3600 | - | TU |
| **Section 2.2 - Occupied Bandwidth** | | | | | |
| Multimeter | White Gold | WG022 | 190 | 12 | 30-Oct-2013 |
| Communications Tester | Rohde & Schwarz | CMU 200 | 442 | 12 | 1-Nov-2013 |
| Attenuator 10dB/10W) | Trilithic | HFP-50N | 454 | 12 | 24-Jul-2013 |
| Attenuator: 6dB/10W | Trilithic | HFP-50N | 476 | 12 | 24-Jul-2013 |
| Spectrum Analyser | Hewlett Packard | E4407B | 1154 | 12 | 17-Jul-2013 |
| GPS Frequency Standard | Rapco | GPS-804/3 | 1312 | 6 | 23-Jul-2013 |
| Power Supply | Hewlett Packard | 6104A | 1948 | - | TU |
| Power Supply Unit | Farnell | TSV-70 | 2043 | - | O/P Mon |
| Multimeter | Iso-tech | IDM101 | 2419 | 12 | 3-Oct-2013 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 13-Jun-2013 |
| Attenuator (10dB, 20W) | Lucas Weinschel | 1 | 3225 | 12 | 11-Dec-2013 |
| Signal Analyser | Rohde & Schwarz | FSQ 26 | 3545 | 12 | 23-Jun-2013 |
| Network Analyser | Rohde & Schwarz | ZVA 40 | 3548 | 12 | 31-Aug-2013 |
| Combiner/Splitter | Weinschel | 1506A | 3877 | 12 | 19-Mar-2014 |
| Combiner/Splitter | Weinschel | 1506A | 3878 | 12 | 19-Mar-2014 |
| P-Series Power Meter | Agilent | N1911A | 3980 | 12 | 17-Sep-2013 |
| P-Series Power Meter | Agilent | N1911A | 3981 | 12 | 17-Sep-2013 |
| 50 MHz-18 GHz Wideband Power Sensor | Agilent | N1921A | 3982 | 12 | 17-Sep-2013 |
| 50 MHz-18 GHz Wideband Power Sensor | Agilent | N1921A | 3983 | 12 | 17-Sep-2013 |
| 1 Metre SMA Cable | Rhophase | 3PS-1801A-1000-3PS | 4100 | 12 | 25-Oct-2013 |
| 1 Metre K Type Cable | Rhophase | KPS-1501A-1000-KPS | 4105 | 12 | 25-Oct-2013 |
| **Section 2.3 - Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels** | | | | | |
| Attenuator 10dB/10W) | Trilithic | HFP-50N | 454 | 12 | 24-Jul-2013 |
| GPS Frequency Standard | Rapco | GPS-804/3 | 1312 | 6 | 23-Jul-2013 |
| Power Supply | Hewlett Packard | 6104A | 1948 | - | TU |
| Multimeter | Iso-tech | IDM101 | 2419 | 12 | 3-Oct-2013 |
| Spectrum Analyser | Rohde & Schwarz | FSU26 | 2747 | 12 | 30-Nov-2013 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 13-Jun-2013 |
| Network Analyser | Rohde & Schwarz | ZVA 40 | 3548 | 12 | 31-Aug-2013 |
| Combiner/Splitter | Weinschel | 1506A | 3878 | 12 | 19-Mar-2014 |
| P-Series Power Meter | Agilent | N1911A | 3980 | 12 | 17-Sep-2013 |
| 50 MHz-18 GHz Wideband Power Sensor | Agilent | N1921A | 3983 | 12 | 17-Sep-2013 |

Product Service

| Instrument | Manufacturer | Type No. | TE No. | Calibration Period (months) | Calibration Due |
|---|---|---|---|---|---|
| **Section 2.4 - Maximum Peak Conducted Output Power** | | | | | |
| Multimeter | White Gold | WG022 | 190 | 12 | 30-Oct-2013 |
| Attenuator 10dB/10W) | Trilithic | HFP-50N | 454 | 12 | 24-Jul-2013 |
| Attenuator: 6dB/10W | Trilithic | HFP-50N | 476 | 12 | 24-Jul-2013 |
| Spectrum Analyser | Hewlett Packard | E4407B | 1154 | 12 | 17-Jul-2013 |
| GPS Frequency Standard | Rapco | GPS-804/3 | 1312 | 6 | 23-Jul-2013 |
| Power Supply | Hewlett Packard | 6104A | 1948 | - | TU |
| Power Supply Unit | Farnell | TSV-70 | 2043 | - | O/P Mon |
| Multimeter | Iso-tech | IDM101 | 2419 | 12 | 3-Oct-2013 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 13-Jun-2013 |
| Attenuator (10dB, 20W) | Lucas Weinschel | 1 | 3225 | 12 | 11-Dec-2013 |
| Signal Analyser | Rohde & Schwarz | FSQ 26 | 3545 | 12 | 23-Jun-2013 |
| Network Analyser | Rohde & Schwarz | ZVA 40 | 3548 | 12 | 31-Aug-2013 |
| Combiner/Splitter | Weinschel | 1506A | 3877 | 12 | 19-Mar-2014 |
| Combiner/Splitter | Weinschel | 1506A | 3878 | 12 | 19-Mar-2014 |
| P-Series Power Meter | Agilent | N1911A | 3980 | 12 | 17-Sep-2013 |
| P-Series Power Meter | Agilent | N1911A | 3981 | 12 | 17-Sep-2013 |
| 50 MHz-18 GHz Wideband Power Sensor | Agilent | N1921A | 3982 | 12 | 17-Sep-2013 |
| 50 MHz-18 GHz Wideband Power Sensor | Agilent | N1921A | 3983 | 12 | 17-Sep-2013 |
| 1 Metre SMA Cable | Rhophase | 3PS-1801A-1000-3PS | 4100 | 12 | 25-Oct-2013 |
| 1 Metre K Type Cable | Rhophase | KPS-1501A-1000-KPS | 4105 | 12 | 25-Oct-2013 |
| **.Section 2.5 - EIRP Peak Power** | | | | | |
| Antenna (Double Ridge Guide, 1GHz-18GHz) | EMCO | 3115 | 234 | 12 | 3-Apr-2014 |
| Antenna (Double Ridge Guide, 1GHz-18GHz) | EMCO | 3115 | 235 | 12 | 9-Nov-2013 |
| Signal Generator (10MHz to 40GHz) | Rohde & Schwarz | SMR40 | 1002 | 12 | 7-Aug-2013 |
| Screened Room (5) | Rainford | Rainford | 1545 | 36 | 25-Dec-2013 |
| Turntable Controller | Inn-Co GmbH | CO 1000 | 1606 | - | TU |
| Antenna (Log Periodic) | Schaffner | UPA6108 | 3108 | 12 | 5-Apr-2014 |
| EMI Test Receiver | Rohde & Schwarz | ESU40 | 3506 | 12 | 11-Oct-2013 |
| 7m Armoured RF Cable | SSI Cable Corp. | 1501-13-13-7m WA(-) | 3600 | - | TU |
| 9m RF Cable (N Type) | Rhophase | NPS-2303-9000-NPS | 3791 | - | TU |
| Tilt Antenna Mast | maturo Gmbh | TAM 4.0-P | 3916 | - | TU |
| Mast Controller | maturo Gmbh | NCD | 3917 | - | TU |
| **Section 2.6 - Spurious and Band Edge Emissions** | | | | | |
| Multimeter | White Gold | WG022 | 190 | 12 | 30-Oct-2013 |
| Communications Tester | Rohde & Schwarz | CMU 200 | 442 | 12 | 1-Nov-2013 |
| Attenuator: 6dB/10W | Trilithic | HFP-50N | 476 | 12 | 24-Jul-2013 |
| Filter (High Pass) | Lorch | SHP7-7000-SR | 566 | 12 | 20-Feb-2014 |
| Spectrum Analyser | Hewlett Packard | E4407B | 1154 | 12 | 17-Jul-2013 |
| GPS Frequency Standard | Rapco | GPS-804/3 | 1312 | 6 | 23-Jul-2013 |
| Power Supply | Hewlett Packard | 6104A | 1948 | - | TU |
| Power Supply Unit | Farnell | TSV-70 | 2043 | - | O/P Mon |
| Multimeter | Iso-tech | IDM101 | 2419 | 12 | 3-Oct-2013 |
| High Pass Filter (4GHz) | RLC Electronics | F-100-4000-5-R | 2773 | 12 | 1-Feb-2014 |
| Test Receiver | Rohde & Schwarz | ESIB40 | 2941 | 12 | 23-Oct-2013 |
| Attenuator (20dB, 2W) | Pasternack | PE 7004-20 | 2943 | 12 | 27-Mar-2014 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 13-Jun-2013 |
| Attenuator (10dB, 20W) | Lucas Weinschel | 1 | 3225 | 12 | 11-Dec-2013 |
| Network Analyser | Rohde & Schwarz | ZVA 40 | 3548 | 12 | 31-Aug-2013 |
| Combiner/Splitter | Weinschel | 1506A | 3877 | 12 | 19-Mar-2014 |
| Data Logger | Yokogawa | MV1024 | 3948 | 12 | 7-Jun-2013 |

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 |
|---|---|
| Frequency Hopping Systems - 20dB Bandwidth and Channel Separation | ± 16.74 kHz |
| Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels | - |
| EIRP Peak Power | 30MHz to 1GHz: ± 5.1 dB<br>1GHz to 40GHz: ± 6.3 dB |
| Maximum Peak Conducted Output Power | ± 0.70 dB |
| Spurious and Band Edge Emissions | 30MHz to 1GHz: ± 5.1 dB<br>1GHz to 40GHz: ± 6.3 dB |
| AC Line Conducted Emissions | ± 3.2 dB |

## 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).