**Exhibit 6: Test Report**

**TEST REPORT FROM:**

COMMUNICATION CERTIFICATION LABORATORY
1940 W. Alexander Street
Salt Lake City, Utah
84119-2039

Type of Report: Certification

TEST OF: 240C and 242C

FCC ID: L82-242240

To FCC PART 15.247, Subpart C

Test Report Serial No: 73-6954

Applicant:

Siemens Information and Communication Products, LLC,
Communication Devices
2205 Grand Avenue Parkway
Austin, TX 78728-3811

Date(s) of Test: August 9 - 11, 1999

Issue Date: August 16, 1999

Equipment Receipt Date: August 9, 1999

**CERTIFICATION OF ENGINEERING REPORT**

This report has been prepared by Communication Certification Laboratory to determine compliance of the device described below with the requirements of FCC PART 15.247, Subpart C. This report may be reproduced in full, partial reproduction may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

- Applicant: Siemens Information and Communication Products, LLC, Communication Devices
- Manufacturer: Siemens Information and Communication Products, LLC, Communication Devices
- Brand Name: SIEMENS
- Model Number: 240C and 242C
- FCC ID: L82-242240

On this 16th day of August 1999, I, individually, and for Communication Certification Laboratory, certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

COMMUNICATION CERTIFICATION LABORATORY

______________________________________
Checked by: William S. Hurst, P.E.
Vice President

______________________________________
Tested by: Roger J. Midgley
EMC Engineering Manager

## SECTION 1. CLIENT INFORMATION AND RESPONSIBLE PARTY:

### 1.1 Client Information:

Company Name: Siemens Information and Communication Products, LLC, Communication Devices
2205 Grand Avenue Parkway
Austin, TX 78728-3811

Contact Name: Jim Davis
Title: EMC Engineer

## SECTION 2. EQUIPMENT UNDER TEST (EUT)

### 2.1 Identification of EUT:

| | |
|---|---|
| Trade Name: | SIEMENS |
| Model Name or Number: | 240C and 242C |
| Serial Number: | N/A |
| Options Fitted: | None |
| Country of Manufacture: | U.S.A. |

### 2.2 Description of EUT:

The Siemens 240 Series is a cordless telephone that is designed to work in the 2.45 GHz ISM band. It is marketed under two different model numbers, 240C and 242C. The radio portion of both models are identical the only difference is that the 242C provides caller ID. The data in this report was taken on the 242C as representative of both models.

The 240 Series cordless phone uses direct sequence spread spectrum modulation in the band 2410.5 – 2473.5 MHz. The band is divided into 43 duplex channels by using a TDD (Time Division Duplex) transmit scheme (see list of channels below). Each channels uses 32 kbit/s ADPCM voice coding for transmitting the payload data, together with the data channel this results in a 100 kbit system data rate. The spreading encoding provides a 12 dB spreading gain, by using a 15 Bit PN sequence, resulting in a 1.5 Mchip/s spreading rate. The transmitter has variable output power, transmitting up to a maximum of 100 mW.

This report covers the transmitter only the receiver is covered under a separate verification report.

### 2.3 Modification Incorporated/Special Accessories on EUT:

There were no modifications or special accessories required to comply with the specification.

## 2.4 EUT and Support Equipment:

The FCC ID numbers for all the EUT and support equipment used during the test (including inserted cards) are listed below:

| Brand Name<br>Model Number<br>Serial No. | FCC ID Number | Description | Name of Interface Ports/Interface Cables |
|---|---|---|---|
| BN: SIEMENS<br>MN: 242C<br>SN: N/A | L82-242240 | Direct Sequence Spread Spectrum Handset and Base Station (EUT) | N/A |

## 2.5 List of Channels:

| Channel Number | Channel Frequency (MHz) | Channel Number | Channel Frequency (MHz) |
|---|---|---|---|
| 1 | 2410.5 | 23 | 2443.5 |
| 2 | 2412.0 | 24 | 2445.0 |
| 3 | 2413.5 | 25 | 2446.5 |
| 4 | 2415.0 | 26 | 2448.0 |
| 5 | 2416.5 | 27 | 2449.5 |
| 6 | 2418.0 | 28 | 2451.0 |
| 7 | 2419.5 | 29 | 2452.5 |
| 8 | 2421.0 | 30 | 2454.0 |
| 9 | 2422.5 | 31 | 2455.5 |
| 10 | 2424.0 | 32 | 2457.0 |
| 11 | 2425.0 | 33 | 2458.5 |
| 12 | 2427.0 | 34 | 2460.0 |
| 13 | 2423.5 | 35 | 2461.5 |
| 14 | 2430.0 | 36 | 2463.0 |
| 15 | 2431.5 | 37 | 2464.5 |
| 16 | 2433.0 | 38 | 2466.0 |
| 17 | 2434.5 | 39 | 2467.5 |
| 18 | 2436.0 | 40 | 2469.0 |
| 19 | 2437.5 | 41 | 2470.5 |
| 20 | 2439.0 | 42 | 2472.0 |
| 21 | 2440.5 | 43 | 2473.5 |
| 22 | 2442.0 | | |

## SECTION 3. TEST SPECIFICATION, METHODS & PROCEDURES

### 3.1 Test Specification:

Title: FCC PART 15.247, Subpart C (47 CFR 15).

Limits and methods of measurement of radio interference characteristics of radio frequency devices. Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

Purpose of Test: The tests were performed to demonstrate Initial compliance.

### 3.2 Methods & Procedures:

#### 3.2.1 § 15.247

(a) Operation under the provisions of this section is limited to frequency hopping and direct sequence spread spectrum intentional radiators that comply with the following provisions:

(1) Frequency hoping 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. The system shall hop to channel frequencies that are selected at the system-hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. 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 transmitting signals.

(i) Frequency hopping systems operating in the 902 - 928 MHz band shall use at least 50 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

(ii) Frequency hopping systems operating in the 2400 – 2483.5 MHz and the 5725 – 5850 MHz bands shall use at least 75 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

(b) The maximum peak output power of the transmitter shall not exceed 1 watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) In any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209 (a), whichever results in the lesser attenuation. All other emissions outside these bands shall not exceed the general radiated emission limits specified in § 15.209 (a).

(d) For direct sequence system, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

(e) The processing gain of a direct sequence system shall be at least 10 dB. The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned off to the signal to noise ratio with the system spreading code turned on, as measured at the demodulated output of the receiver.

(f) Hybrid systems that employ a combination of both direct sequence and frequency hopping modulation techniques shall achieve a processing gain of at least 17 dB from the combined techniques. The frequency hopping operation of the hybrid system, with the direct sequence operation turned off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period equal to the number of hopping frequencies employed multiplied by 0.4. The direct sequence operation of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

NOTE: Spread spectrum systems are sharing these bands on a non-interference basis with systems supporting critical Government requirements that have been allocated the usage of these bands, secondary only to ISM equipment operated under the provisions of part 18 of this chapter. Many of these Government systems are airborne radiolocation systems that emit a high EIRP, which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U.S. Government operations in the 902-928 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

### 3.2.2 § 15.207 Conducted Limits

(a) For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with the provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

(b) The following option may be employed if the conducted emissions exceed the limits in paragraph (a) of this section when measured using instrumentation employing a quasi-peak detector function: If the level of the emission measured using the quasi-peak instrumentation is 6 dB, or more, higher than the level of the same emission measured with instrumentation having an average detector and a 9 kHz minimum bandwidth, that emission is considered broadband and the level obtained with the quasi-peak detector may be reduced by 13 dB for comparison to the limits. When employing this option, the following conditions shall be observed:

(1) The measuring instrumentation with the average detector shall employ a linear IF amplifier.

(2) Care must be taken not to exceed the dynamic range of the measuring instrument when measuring an emission with a low duty cycle.

(3) The test report required for verification of for an application for a grant of equipment authorization shall contain all details supporting the use of this option.

(c) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operation as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μV within the frequency band 535-1705 kHz.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §§ 15.205, 15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operation while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

### 3.2.3 Test Procedure

The testing was performed according to the procedures in ANSI C63.4 (1992). Testing was performed at CCL's anechoic chamber located in Salt Lake City, Utah. This site has been fully described in a report submitted to the FCC, and was accepted in a letter dated March 1, 1999 (31040/SIT).

CCL participates in the National Voluntary Laboratory Accreditation Program (NVLAP) and has been accepted under NVLAP Lab Code:100272-0, which is effective until September 30,1999.

For radiated emissions testing that is performed at distances closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

## SECTION 4. OPERATION OF EUT DURING TESTING.

### 4.1 Operating Environment:

Power Supply: Handset - Operates via DC battery
Base Station – 120 VAC
AC Mains Frequency: 60 Hz

### 4.2 Operating Modes:

Each mode of operation was exercised to produce worst case emissions. The worst case emissions were with the 242C running in the following mode. The 242C was placed in the transmit mode with the same type of modulation that would normally be used during normal operation. The handset and base station were both tested separately, the data for both are enclosed in this report.

### 4.3 Configuration & Peripherals:

The 242C was placed on the table in the transmit mode with the same type of modulation that would normally be used during normal operation.

## SECTION 5. SUMMARY OF TEST RESULTS:

### 5.1 FCC PART 15.247, Subpart C

#### 5.1.1 Summary of Tests:

| Section | Test Performed | Frequency Range (MHz) | Result |
|---|---|---|---|
| 15.247 (a)(2) | Emission Bandwidth | 2400 to 2483.5 | Complied |
| 15.247 (b)(1) | Peak Output Power | 2400 to 2483.5 | Complied |
| 15.247 (C) | Antenna Conducted Spurious Emissions | 10 to 25,000 | Complied |
| 15.247 (C) | Radiated Spurious Emissions | 10 to 25,000 | Complied |
| 15.247 (d) | Power Spectral Density | 2400 to 2483.5 | Complied |
| 15.247 (e) | Processing Gain | 2400 to 2483.5 | Complied |
| 15.207 | Line Conducted Emissions<br>(Hot Lead to Ground) | 0.45 to 30 | Complied |
| 15.207 | Line Conducted Emissions<br>(Neutral Lead to Ground) | 0.45 to 30 | Complied |

### 5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.

## SECTION 6. MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS:

### 6.1 General Comments:

This section contains the test results only. Details of the test methods used, etc., can be found in Appendix B of this report.

### 6.2 Test Results

#### 6.2.1 § 15.247 (a) (2)

**Measurement Data Emission Bandwidth:**

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3 and 4.

**Handset**

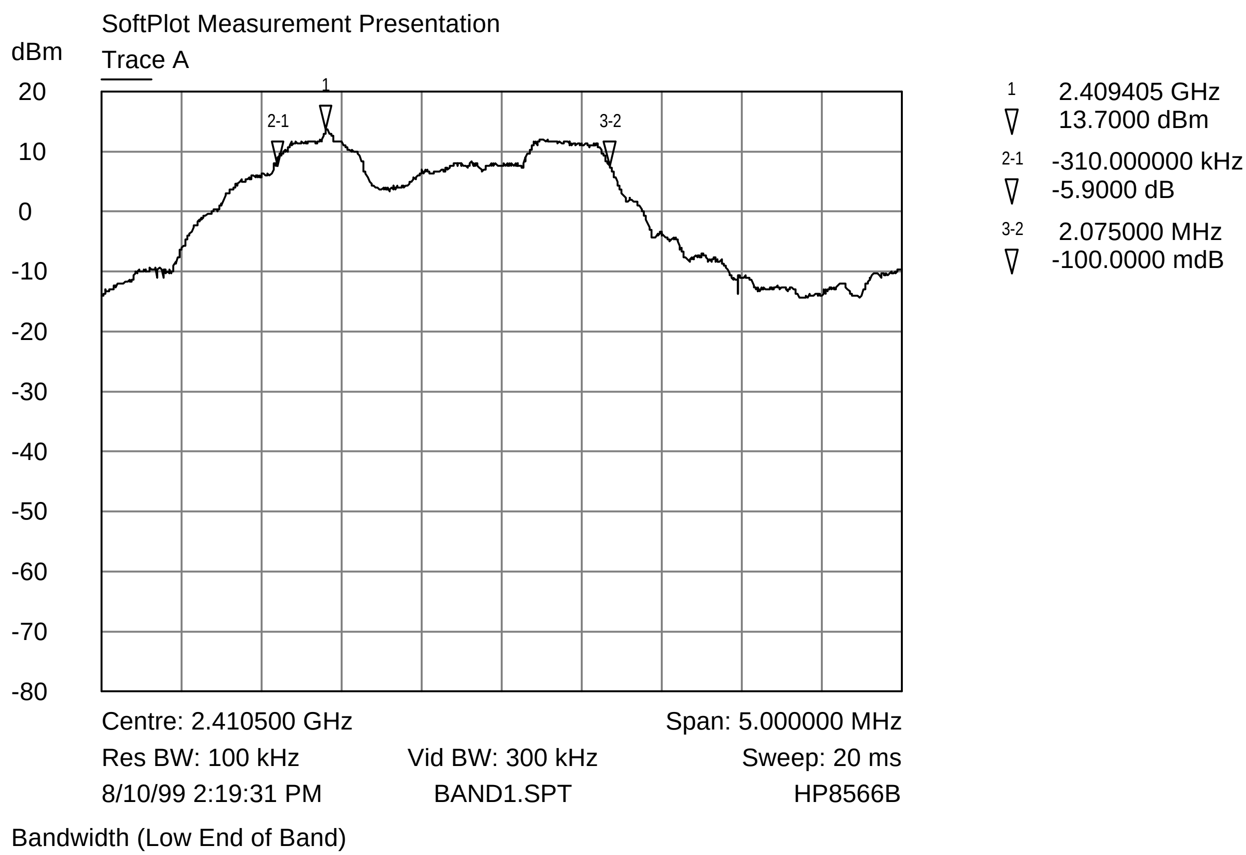
| Frequency (MHz) | Emission Bandwidth (MHz) |
|---|---|
| 2410.5 | 2.07 |
| 2440.5 | 2.54 |
| 2473.5 | 2.42 |

**Base Station**

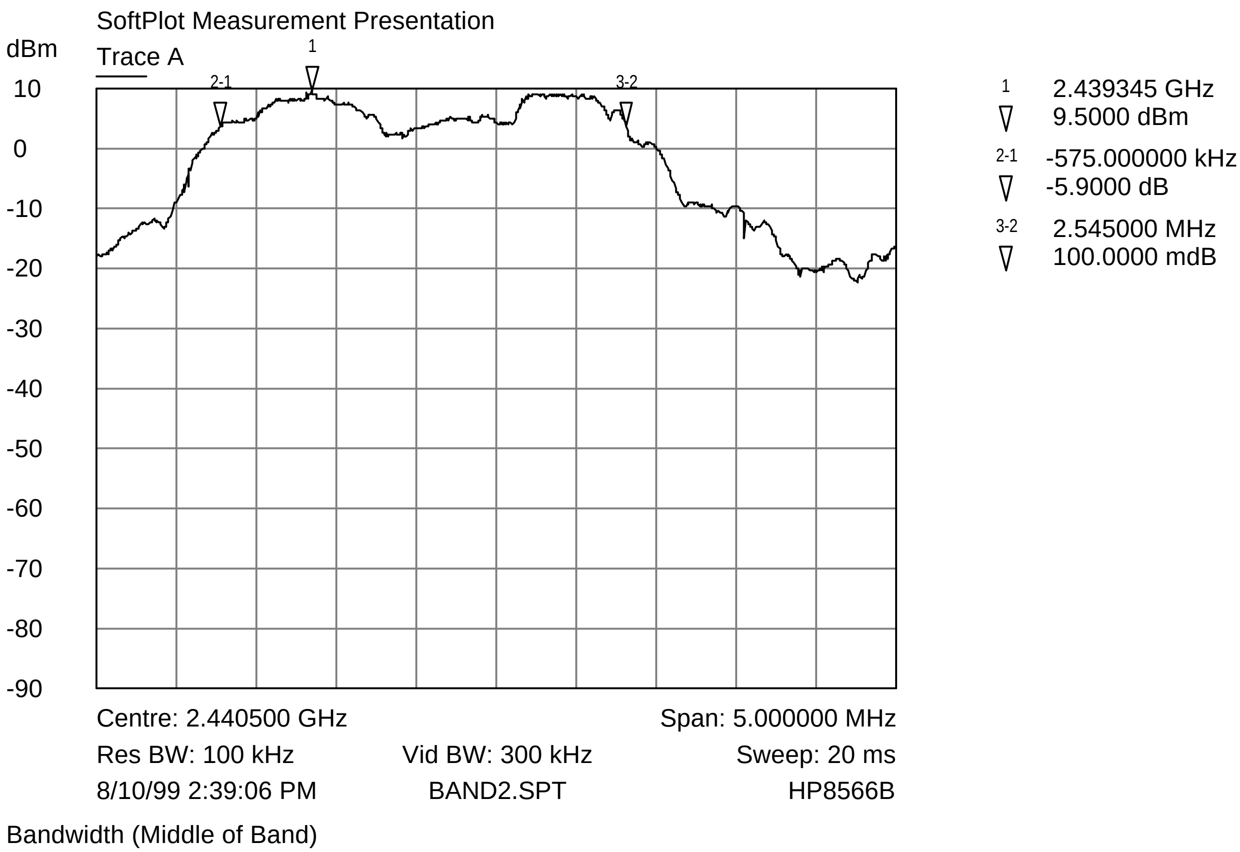
| Frequency (MHz) | Emission Bandwidth (MHz) |
|---|---|
| 2410.5 | 2.35 |
| 2440.5 | 2.38 |
| 2473.5 | 2.70 |

**RESULT**

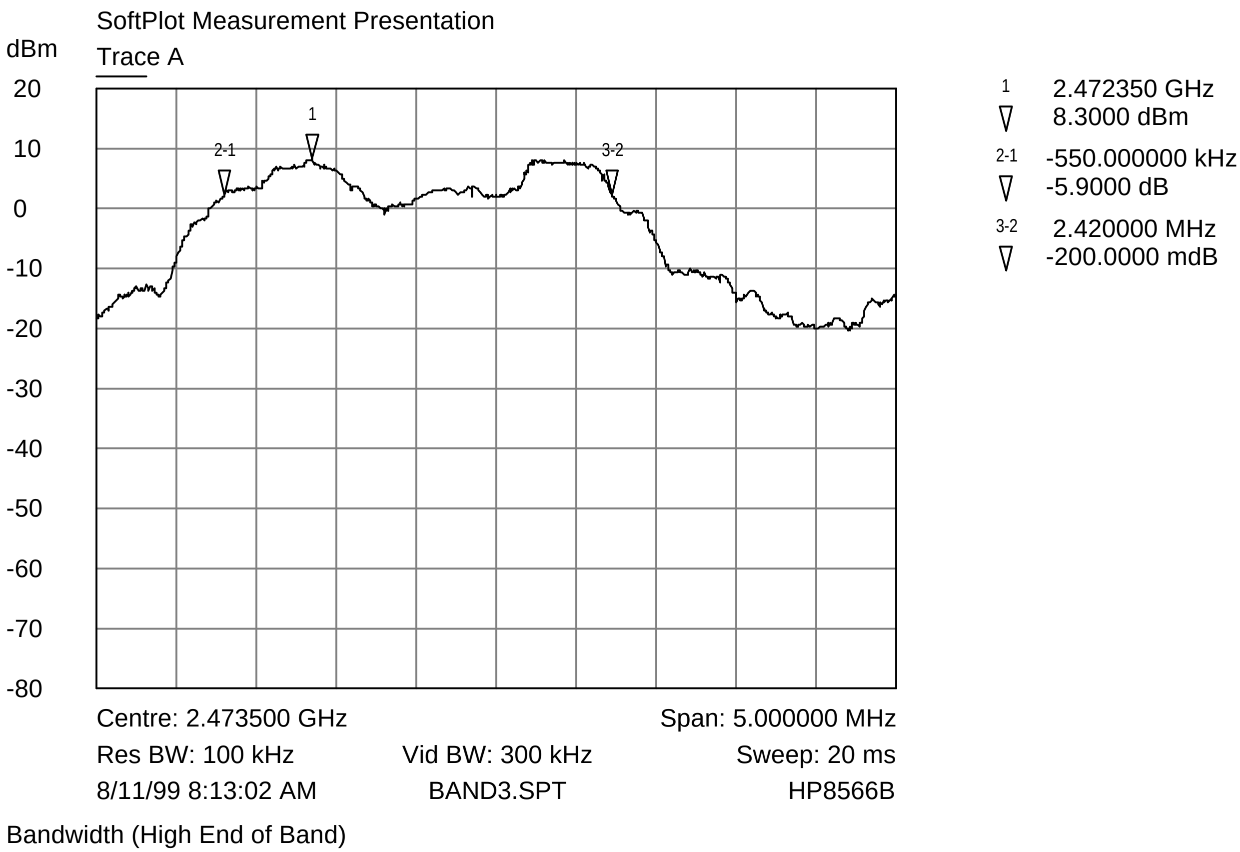
In the configuration tested, the 6 dB bandwidth was greater than 500 kHz; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plots below).



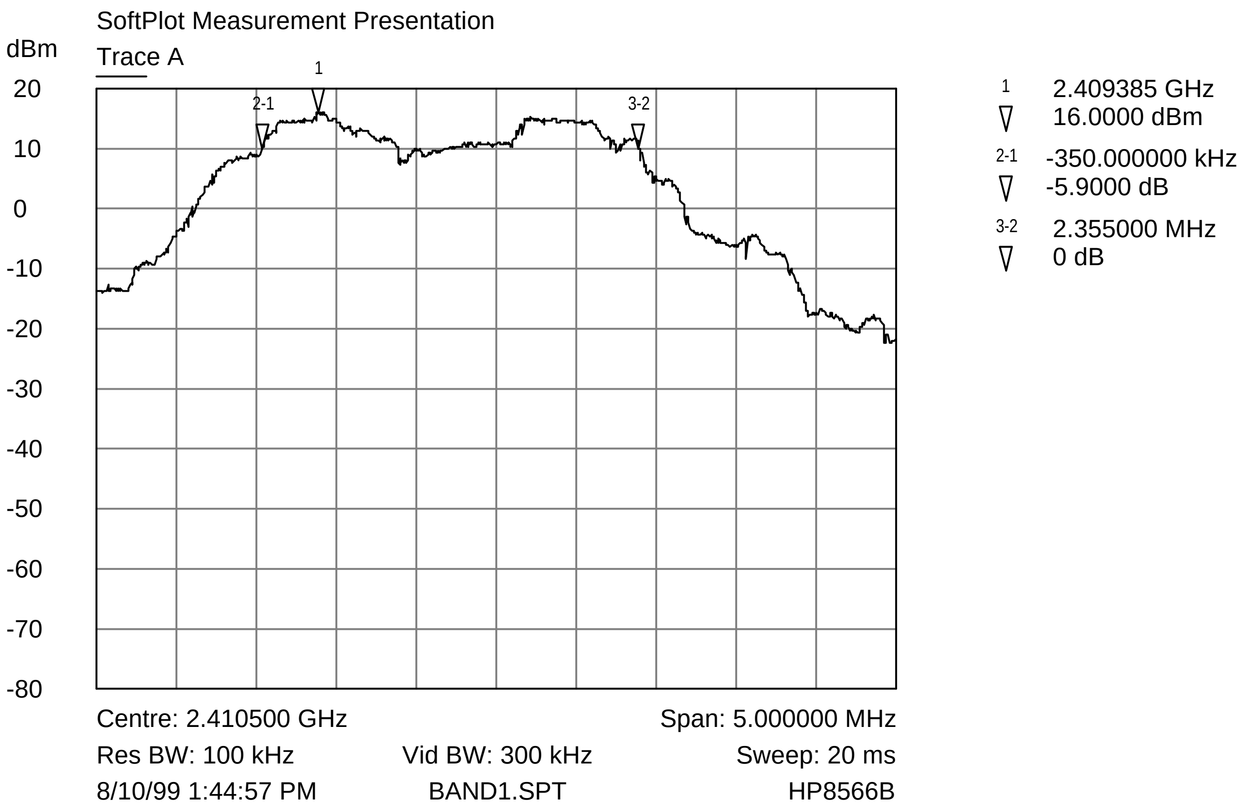

Emission Bandwidth Plot - Handset (Low Channel)




Emission Bandwidth Plot - Handset (Middle Channel)

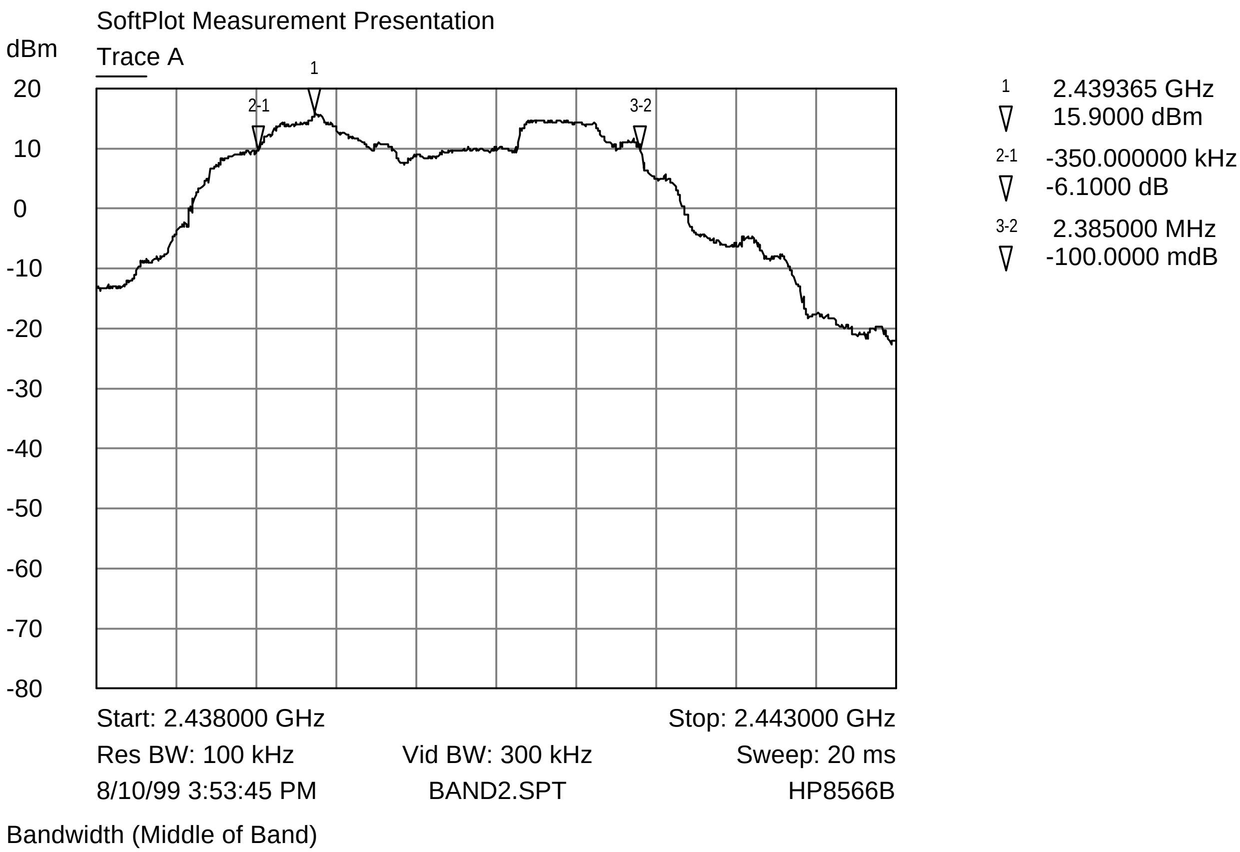



Emission Bandwidth Plot - Handset (High Channel)

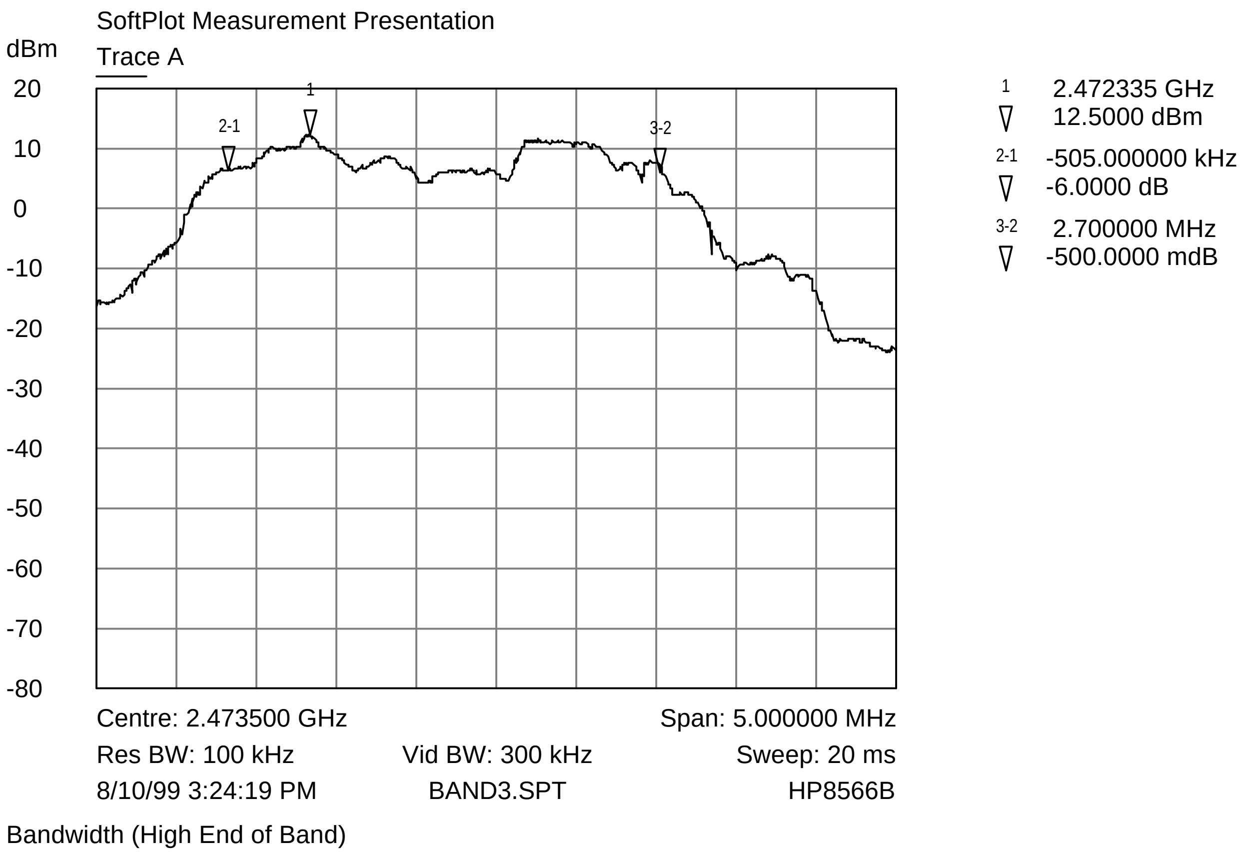



Bandwidth (Low End of Band)

Emission Bandwidth Plot – Base Station (Low Channel)




Emission Bandwidth Plot – Base Station (Middle Channel)




Emission Bandwidth Plot - Base Station (High Channel)

**6.2.2 § 15.247 (b) Peak Output Power:**

**Measurement Data:**

The maximum peak output power measured for this device was 69.2 mW or 18.4 dBm. Shown below is the measured peak output power. The maximum directional gain of the antenna is less than 6 dBi; therefore, the maximum output power is not required to be reduced from the value measured.

The maximum directional gain of the antenna’s are shown below:

Handset – 0.6 dBi
Base Station – 1.1 dBi

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3 and 4.

**Handset**

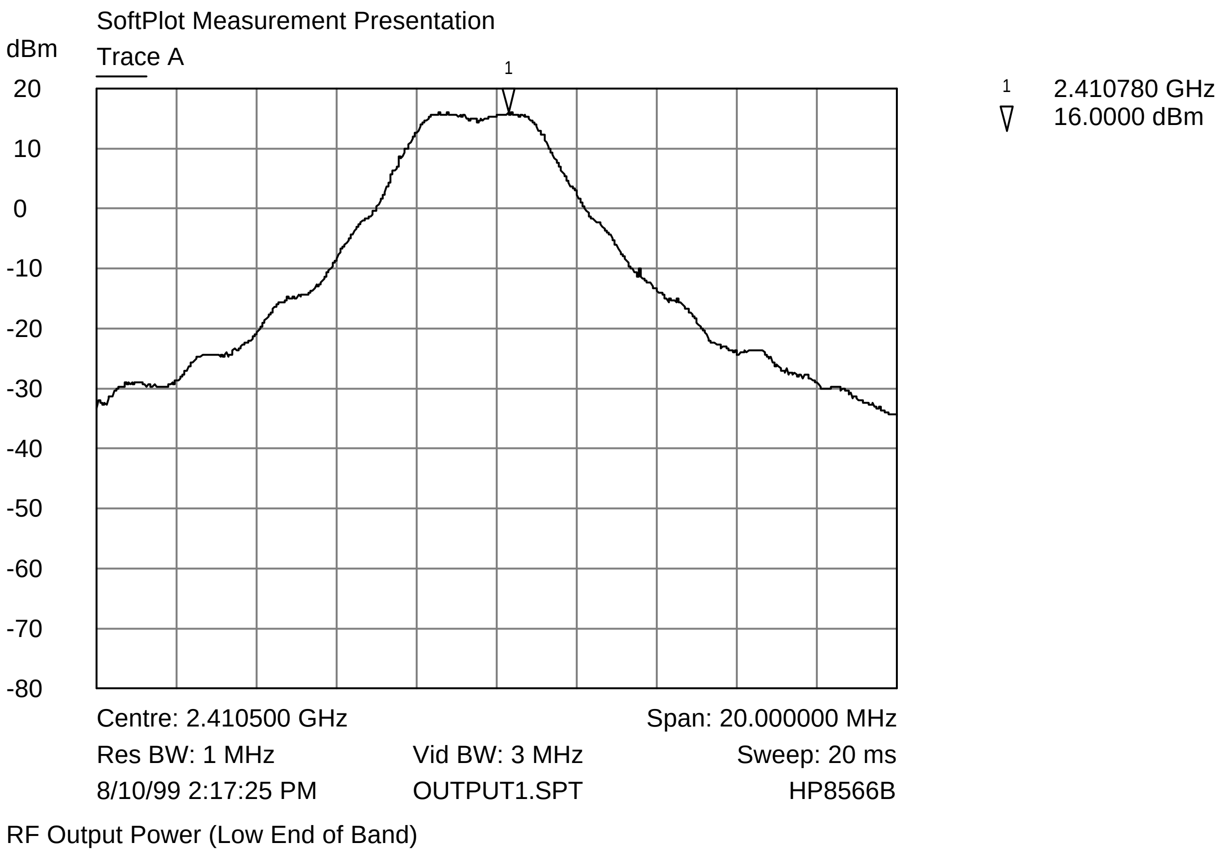
| Frequency (MHz) | Measured Output Power (dBm) | Measured Output Power (mW) |
|---|---|---|
| 2410.5 | 16.0 | 39.8 |
| 2440.5 | 14.4 | 27.5 |
| 2473.5 | 12.2 | 16.6 |

**Base Station**

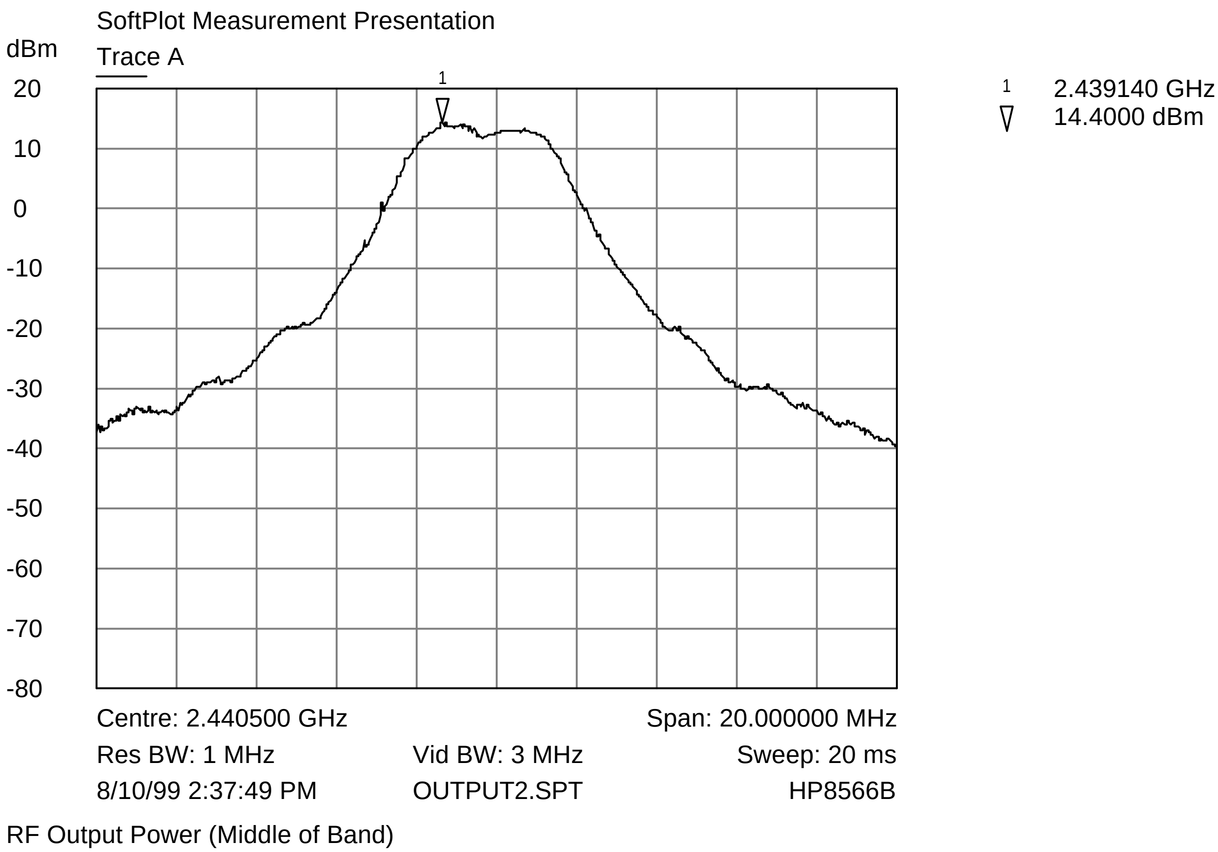
| Frequency (MHz) | Measured Output Power (dBm) | Measured Output Power (mW) |
|---|---|---|
| 2410.5 | 18.4 | 69.2 |
| 2440.5 | 18.0 | 63.1 |
| 2473.5 | 17.6 | 57.5 |

**RESULT**

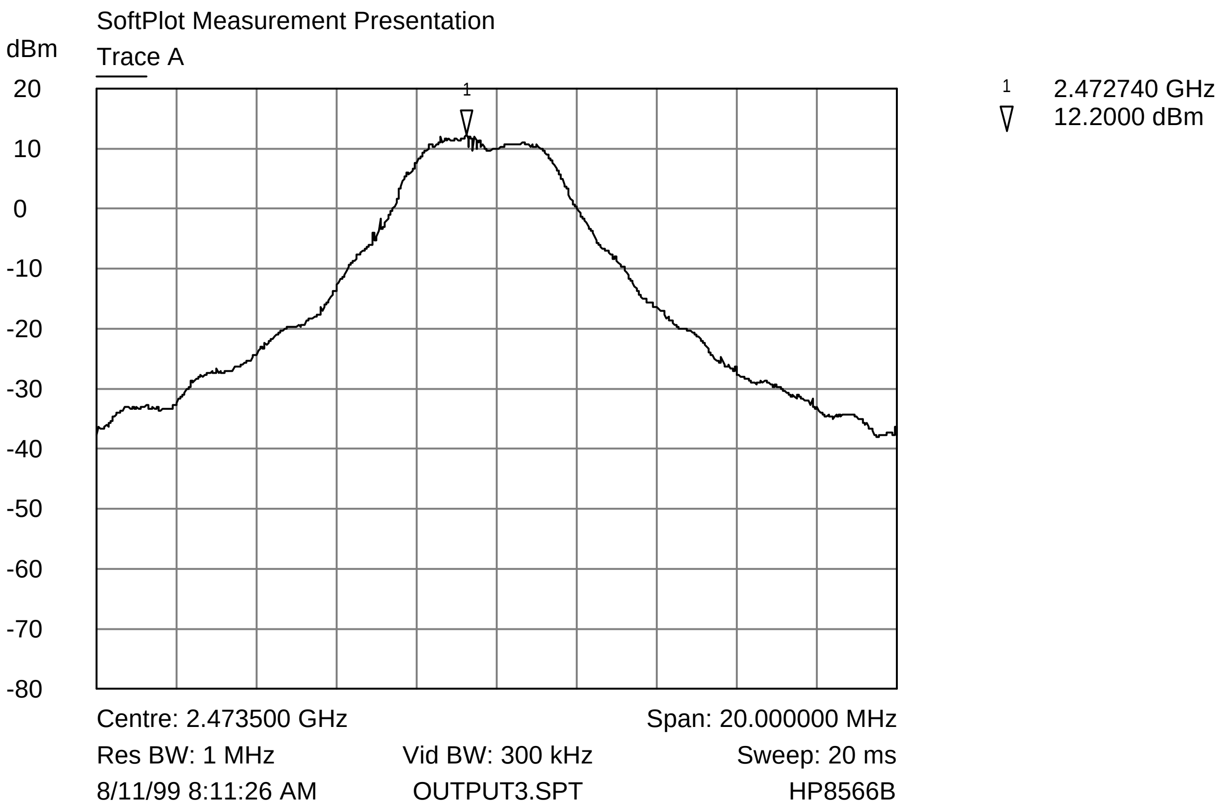
In the configuration tested, the EUT complied with the requirements of the specification (see spectrum analyzer plots below).




Peak Output Power Plot - Handset (Low Channel)

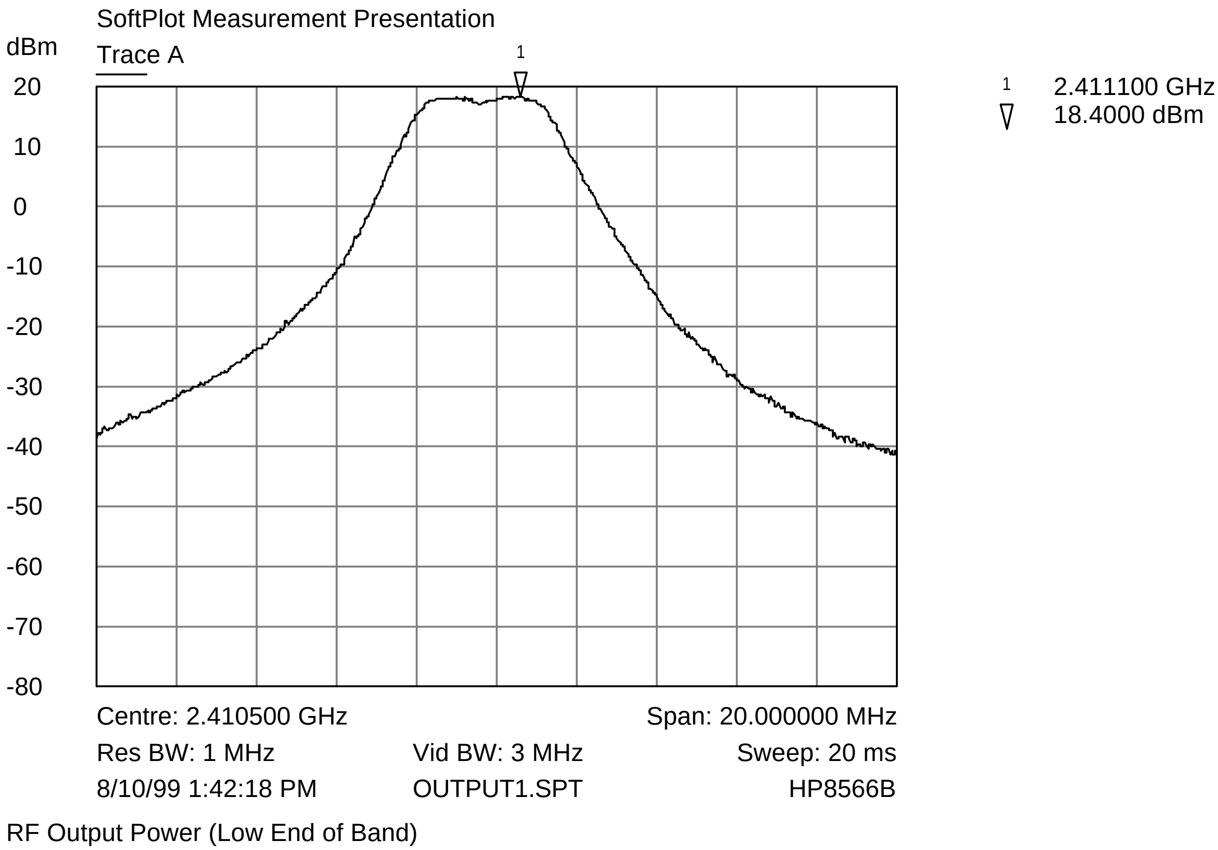



Peak Output Power Plot - Handset (Middle Channel)

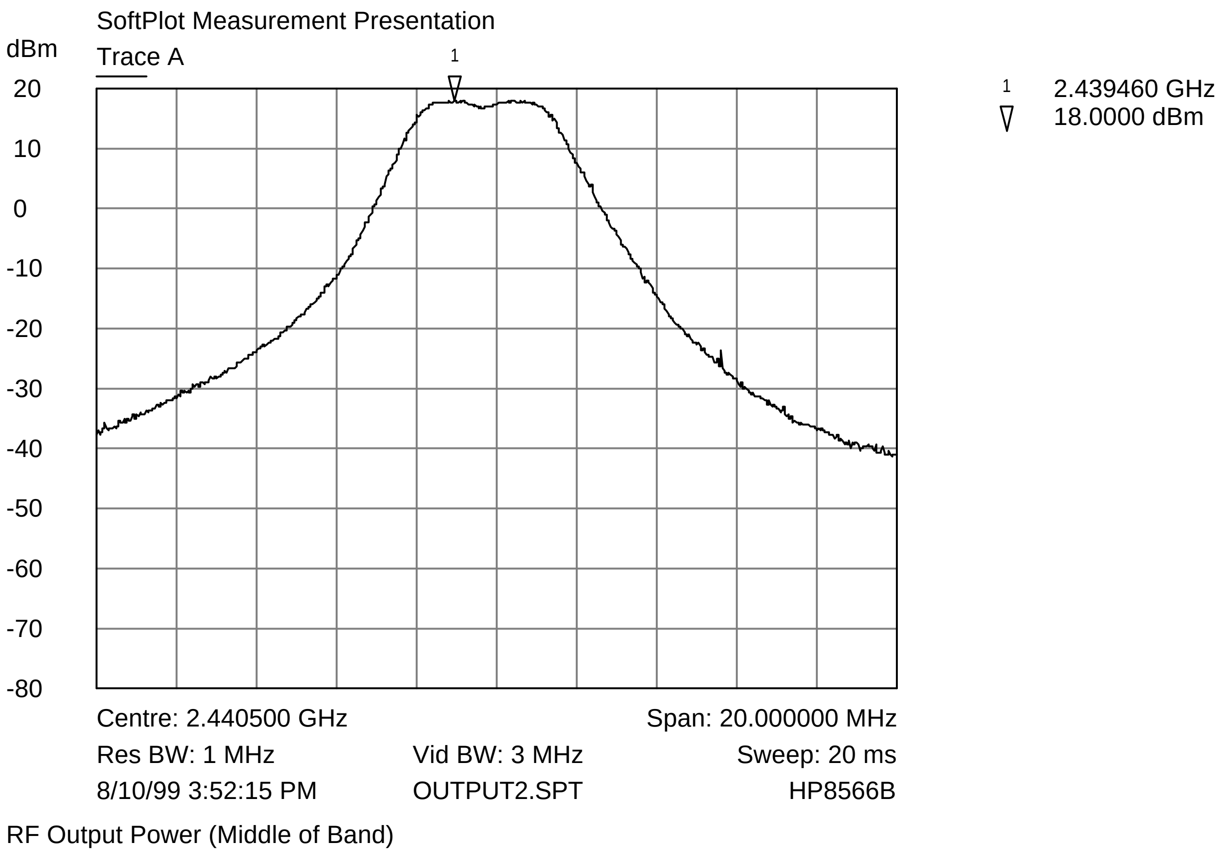



RF Output Power (High End of Band)

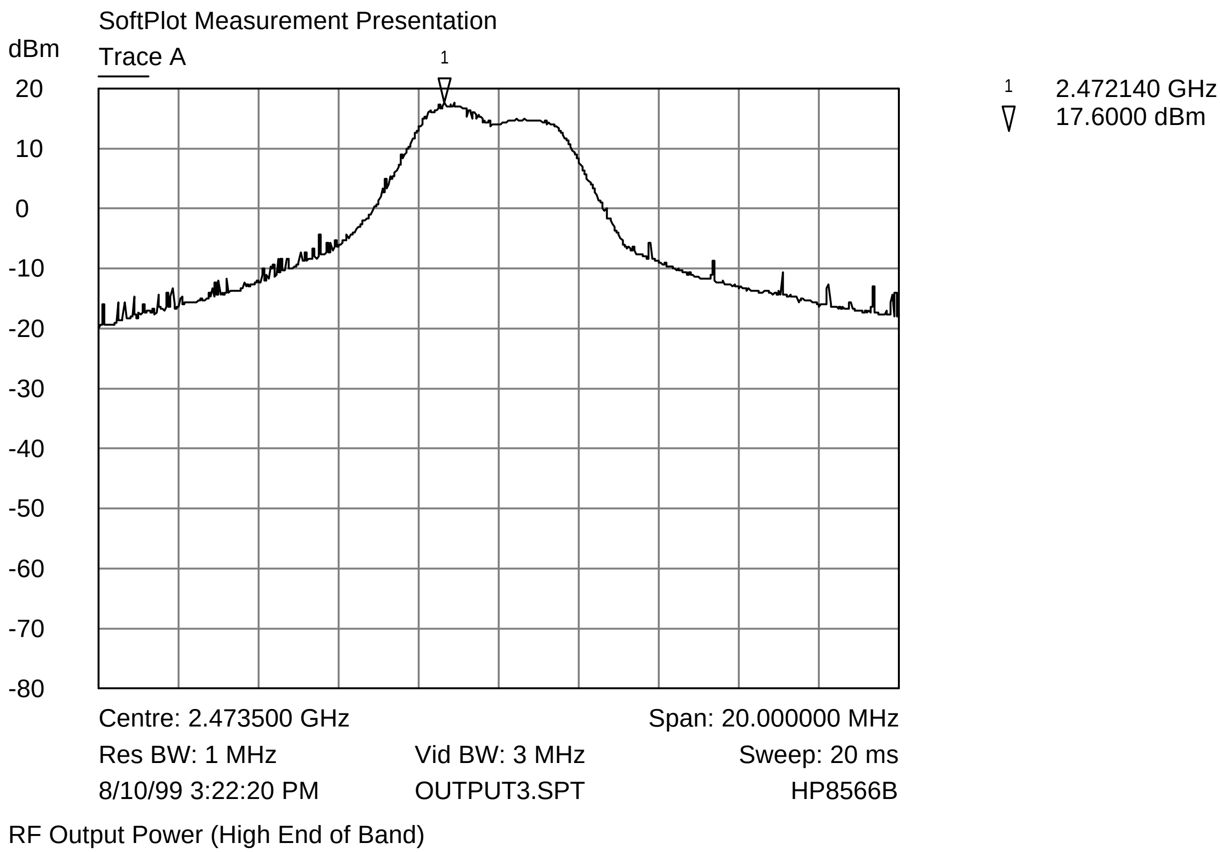
Peak Output Power Plot - Handset (High Channel)




Peak Output Power Plot – Base Station (Low Channel)




Peak Output Power Plot – Base Station (Middle Channel)




Peak Output Power Plot - Base Station (High Channel)

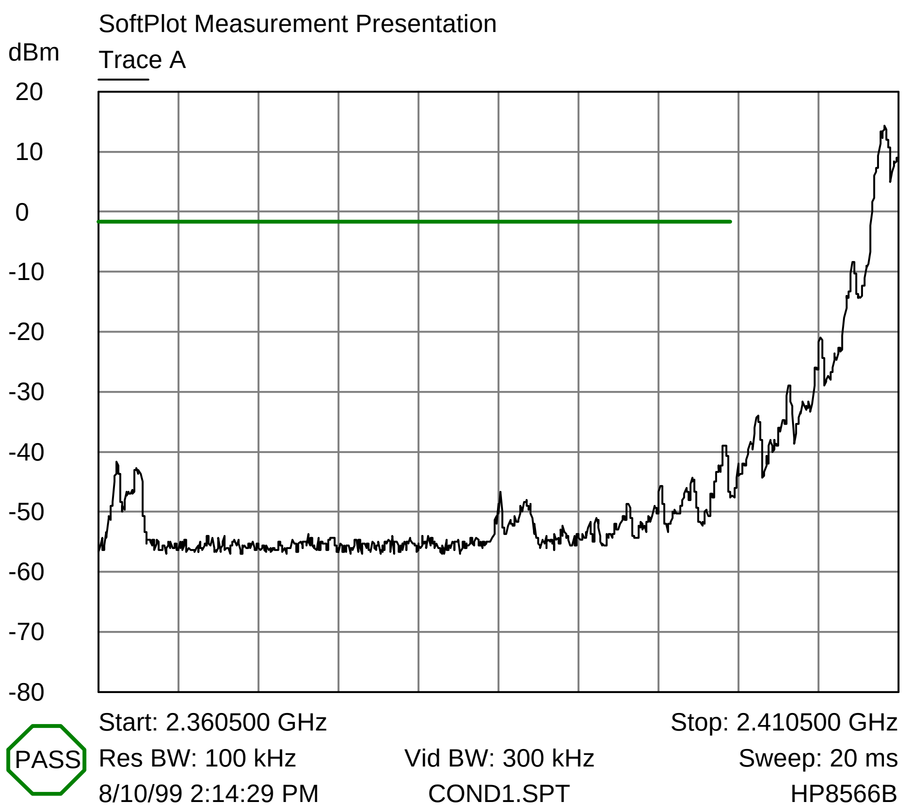
**6.2.3 § 15.247 (c) Spurious Emissions:**

**Measurement Data Antenna Conducted Emissions:**

The frequency range from 10 MHz to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. Shown below are plots with the 242C tuned to the upper and lower band edges. These demonstrate compliance with the provisions of this section.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

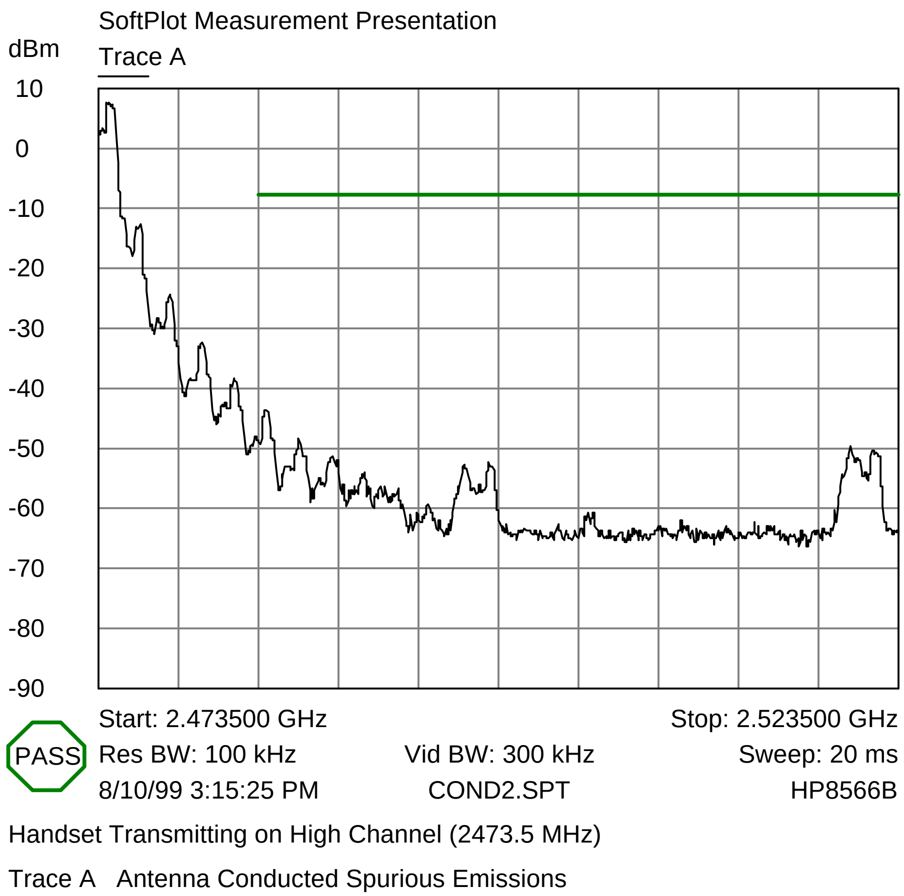
Test equipment used: 1, 3 and 4.




Handset Transmitting on Low Channel (2410.5 MHz)

Trace A Antenna Conducted Spurious Emissions

Spurious Emissions Plot - Handset (Transmitting on Lower Channel)




Spurious Emissions Plot - Handset (Transmitting on Upper Channel)

**Handset**

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 16.0 – 20.0 = -4.0 dBm.

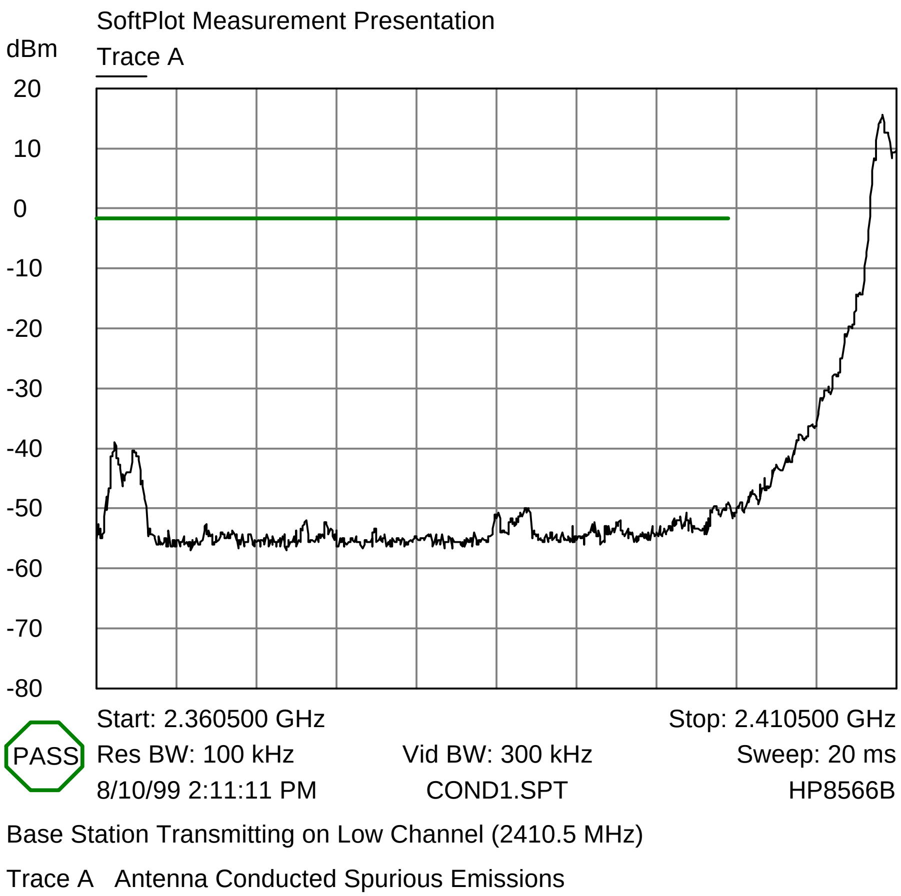
| Transmitting at 2410.5 MHz | | | |
|---|---|---|---|
| Frequency Range MHz | Frequency MHz | Corrected Level dBm | Criteria dBm |
| 10 -200 | 192.0 | -63.2 | -4.0 |
| 200 - 1000 | 408.0 | -37.2 | -4.0 |
| 1000 – 2000 | 1803.7 | -23.6 | -4.0 |
| 2000 – 2399.9 | 2025.4 | -33.8 | -4.0 |
| 2483.6 – 4000 | 2794.5 | -35.6 | -4.0 |
| 4000 - 6000 | 4821.0 | -62.1 | -4.0 |
| 6000 - 8000 | 7231.5 | -50.8 | -4.0 |
| 8000 – 11,000 | 9642.0 | -67.4 * | -4.0 |
| 11,000 – 13,000 | 12,052.5 | -67.8 * | -4.0 |
| 13,000 – 15,000 | 14,463.0 | -62.2 * | -4.0 |
| 15,000 – 17,000 | 16,873.5 | -63.1 * | -4.0 |
| 17,000 – 20,000 | 19,284.0 | -55.1 * | -4.0 |
| 20,000 – 23,000 | 21,694.5 | -54.3 * | -4.0 |
| 23,000 – 25,000 | 24,105.0 | -53.2 * | -4.0 |
| * Noise Floor | | | |

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 14.4 – 20.0 = -5.6 dBm.

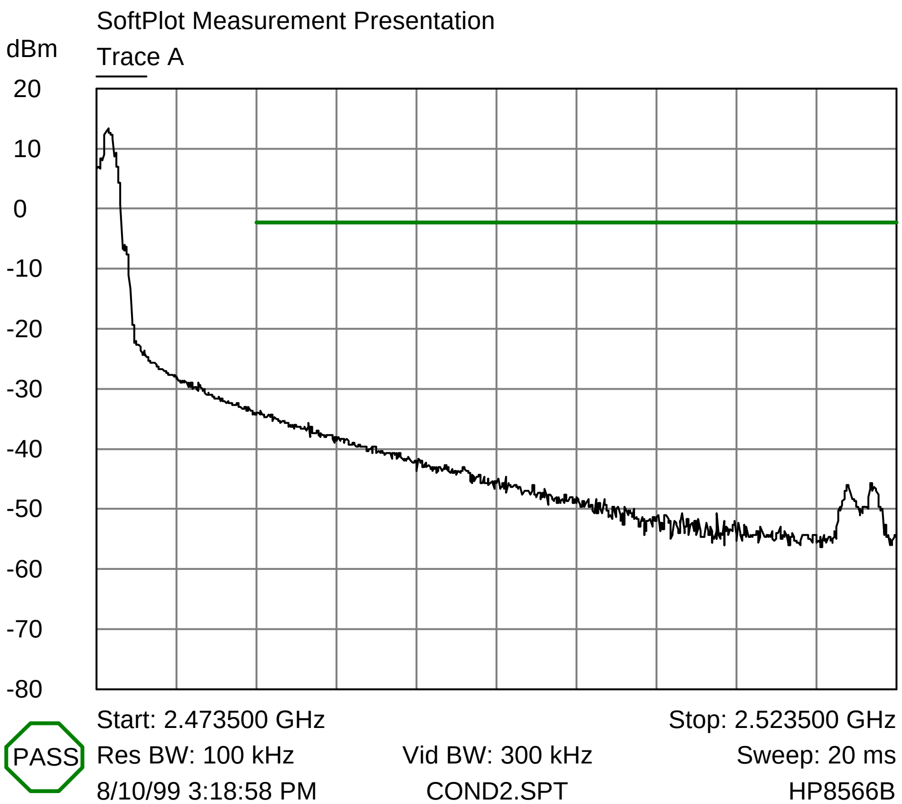
| Transmitting at 2440.5 MHz | | | |
|---|---|---|---|
| Frequency Range MHz | Frequency MHz | Corrected Level dBm | Criteria dBm |
| 10 -200 | 75.3 | -31.5 | -5.6 |
| 200 - 1000 | 408.0 | -30.6 | -5.6 |
| 1000 – 2000 | 1848.5 | -28.0 | -5.6 |
| 2000 – 2399.9 | 2031.4 | -25.2 | -5.6 |
| 2483.6 – 4000 | 2847.7 | -32.6 | -5.6 |
| 4000 - 6000 | 4881.0 | -62.7 | -5.6 |
| 6000 - 8000 | 7321.5 | -50.1 | -5.6 |
| 8000 – 11,000 | 9762.0 | -67.4 * | -5.6 |
| 11,000 – 13,000 | 12,202.5 | -67.8 * | -5.6 |
| 13,000 – 15,000 | 14,643.0 | -62.2 * | -5.6 |
| 15,000 – 17,000 | 16,083.5 | -63.1 * | -5.6 |
| 17,000 – 20,000 | 19,524.0 | -55.1 * | -5.6 |
| 20,000 – 23,000 | 21,964.5 | -54.3 * | -5.6 |
| 23,000 – 25,000 | 24,405.0 | -53.2 * | -5.6 |
| * Noise Floor | | | |

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 12.2 – 20.0 = -7.8 dBm.

| Transmitting at 2473.5 MHz | | | |
|---|---|---|---|
| Frequency Range MHz | Frequency MHz | Corrected Level dBm | Criteria dBm |
| 10 -200 | 175.2 | -28.8 | -7.8 |
| 200 - 1000 | 459.4 | -9.1 | -7.8 |
| 1000 – 2000 | 1549.8 | -27.9 | -7.8 |
| 2000 – 2399.9 | 2011.1 | -10.1 | -7.8 |
| 2483.6 – 4000 | 2931.6 | 19.3 | -7.8 |
| 4000 - 6000 | 4947.0 | -54.3 | -7.8 |
| 6000 - 8000 | 7420.5 | -53.4 | -7.8 |
| 8000 – 11,000 | 9894.0 | -67.4 * | -7.8 |
| 11,000 – 13,000 | 12,367.5 | -67.8 * | -7.8 |
| 13,000 – 15,000 | 14,841.0 | -62.2 * | -7.8 |
| 15,000 – 17,000 | 16,314.5 | -63.1 * | -7.8 |
| 17,000 – 20,000 | 19,788.0 | -55.1 * | -7.8 |
| 20,000 – 23,000 | 21,261.5 | -54.3 * | -7.8 |
| 23,000 – 25,000 | 24,735.0 | -53.2 * | -7.8 |
| * Noise Floor | | | |




Spurious Emissions Plot – Base Station (Transmitting on Lower Channel)




Base Station Transmitting on High Channel (2473.5 MHz)

Trace A Antenna Conducted Spurious Emissions

Spurious Emissions Plot – Base Station (Transmitting on Upper Channel)

**Base Station**

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 18.4 – 20.0 = -1.6 dBm.

| Transmitting at 2410.5 MHz | | | |
|---|---|---|---|
| Frequency Range MHz | Frequency MHz | Corrected Level dBm | Criteria dBm |
| 10 -200 | 37.8 | -68.8 | -1.6 |
| 200 - 1000 | 528.8 | -43.9 | -1.6 |
| 1000 – 2000 | 1805.7 | -33.1 | -1.6 |
| 2000 – 2399.9 | 2361.5 | -40.1 | -1.6 |
| 2483.6 – 4000 | 2937.4 | -47.9 | -1.6 |
| 4000 - 6000 | 4821.0 | -35.2 | -1.6 |
| 6000 - 8000 | 7231.5 | -34.3 | -1.6 |
| 8000 – 11,000 | 9642.0 | -57.3 | -1.6 |
| 11,000 – 13,000 | 12,052.5 | -67.8 * | -1.6 |
| 13,000 – 15,000 | 14,463.0 | -62.2 * | -1.6 |
| 15,000 – 17,000 | 16,873.5 | -63.1 * | -1.6 |
| 17,000 – 20,000 | 19,284.0 | -55.1 * | -1.6 |
| 20,000 – 23,000 | 21,694.5 | -54.3 * | -1.6 |
| 23,000 – 25,000 | 24,105.0 | -53.2 * | -1.6 |
| * Noise Floor | | | |

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 18.0 – 20.0 = -2.0 dBm.

| Transmitting at 2440.5 MHz | | | |
|---|---|---|---|
| Frequency Range MHz | Frequency MHz | Corrected Level dBm | Criteria dBm |
| 10 -200 | 80.0 | -44.9 | -2.0 |
| 200 - 1000 | 631.2 | -42.9 | -2.0 |
| 1000 – 2000 | 1848.5 | -32.6 | -2.0 |
| 2000 – 2399.9 | 2391.4 | -39.2 | -2.0 |
| 2483.6 – 4000 | 2487.4 | -39.7 | -2.0 |
| 4000 - 6000 | 4881.0 | -38.8 | -2.0 |
| 6000 - 8000 | 7321.5 | -37.7 | -2.0 |
| 8000 – 11,000 | 9762.0 | -61.3 | -2.0 |
| 11,000 – 13,000 | 12,202.5 | -67.8 * | -2.0 |
| 13,000 – 15,000 | 14,643.0 | -62.2 * | -2.0 |
| 15,000 – 17,000 | 16,083.5 | -63.1 * | -2.0 |
| 17,000 – 20,000 | 19,524.0 | -55.1 * | -2.0 |
| 20,000 – 23,000 | 21,964.5 | -54.3 * | -2.0 |
| 23,000 – 25,000 | 24,405.0 | -53.2 * | -2.0 |
| * Noise Floor | | | |

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 17.6 – 20.0 = -2.4 dBm.

| Transmitting at 2473.5 MHz | | | |
|---|---|---|---|
| Frequency Range MHz | Frequency MHz | Corrected Level dBm | Criteria dBm |
| 10 -200 | 58.2 | -53.2 | -2.4 |
| 200 - 1000 | 824.5 | -36.7 | -2.4 |
| 1000 – 2000 | 1648.3 | -46.2 | -2.4 |
| 2000 – 2399.9 | 2378.4 | -44.5 | -2.4 |
| 2483.6 – 4000 | 2483.6 | -35.1 | -2.4 |
| 4000 - 6000 | 4947.0 | -45.4 | -2.4 |
| 6000 - 8000 | 7420.5 | -42.2 | -2.4 |
| 8000 – 11,000 | 9894.0 | -57.4 | -2.4 |
| 11,000 – 13,000 | 12,367.5 | -67.8 * | -2.4 |
| 13,000 – 15,000 | 14,841.0 | -62.2 * | -2.4 |
| 15,000 – 17,000 | 16,314.5 | -63.1 * | -2.4 |
| 17,000 – 20,000 | 19,788.0 | -55.1 * | -2.4 |
| 20,000 – 23,000 | 21,261.5 | -54.3 * | -2.4 |
| 23,000 – 25,000 | 24,735.0 | -53.2 * | -2.4 |
| * Noise Floor | | | |

**Measurement Data Radiated Emissions Restricted Bands § 15.205:**

The frequency range from 10 MHz to 10 GHz was investigated to measure any radiated emissions in the restricted bands.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3, 4, 7, 8, 9 and 12.

AVERAGE FACTOR

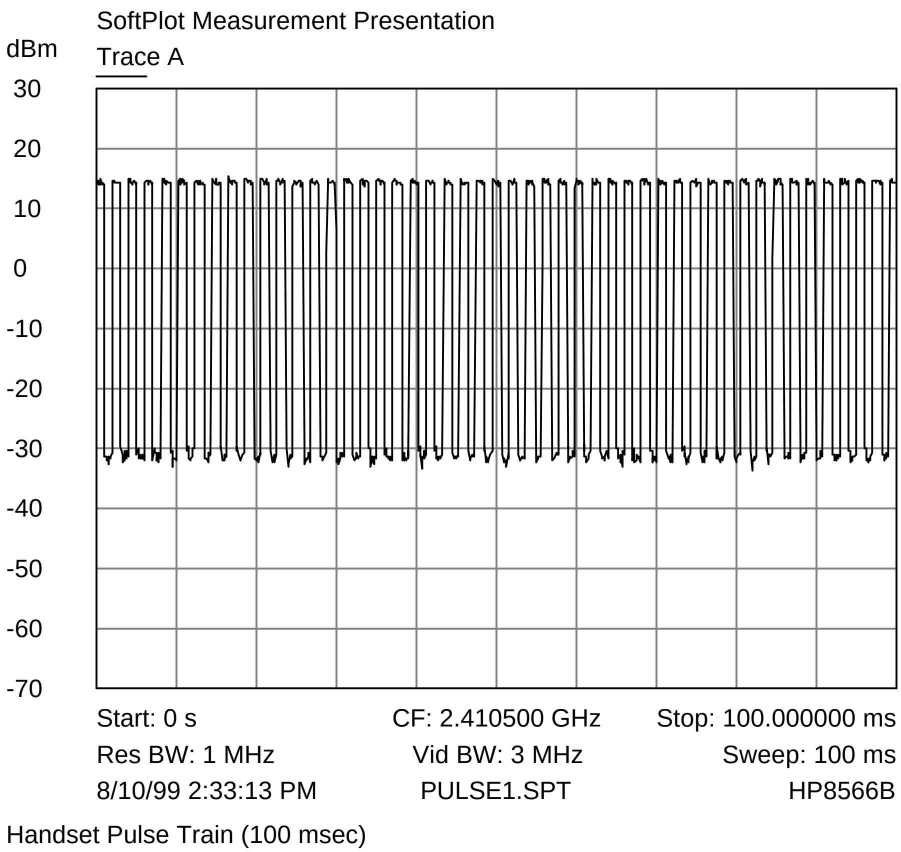
The pulse train in 100 msec consists of 49 pulses that are on for 1.02 msec each. Therefore, the total pulse period in 100 msec is 49.98 msec (49 x 1.02 msec).

The average factor for the 242C is –6.0 dB. This factor is derived using the following formula:

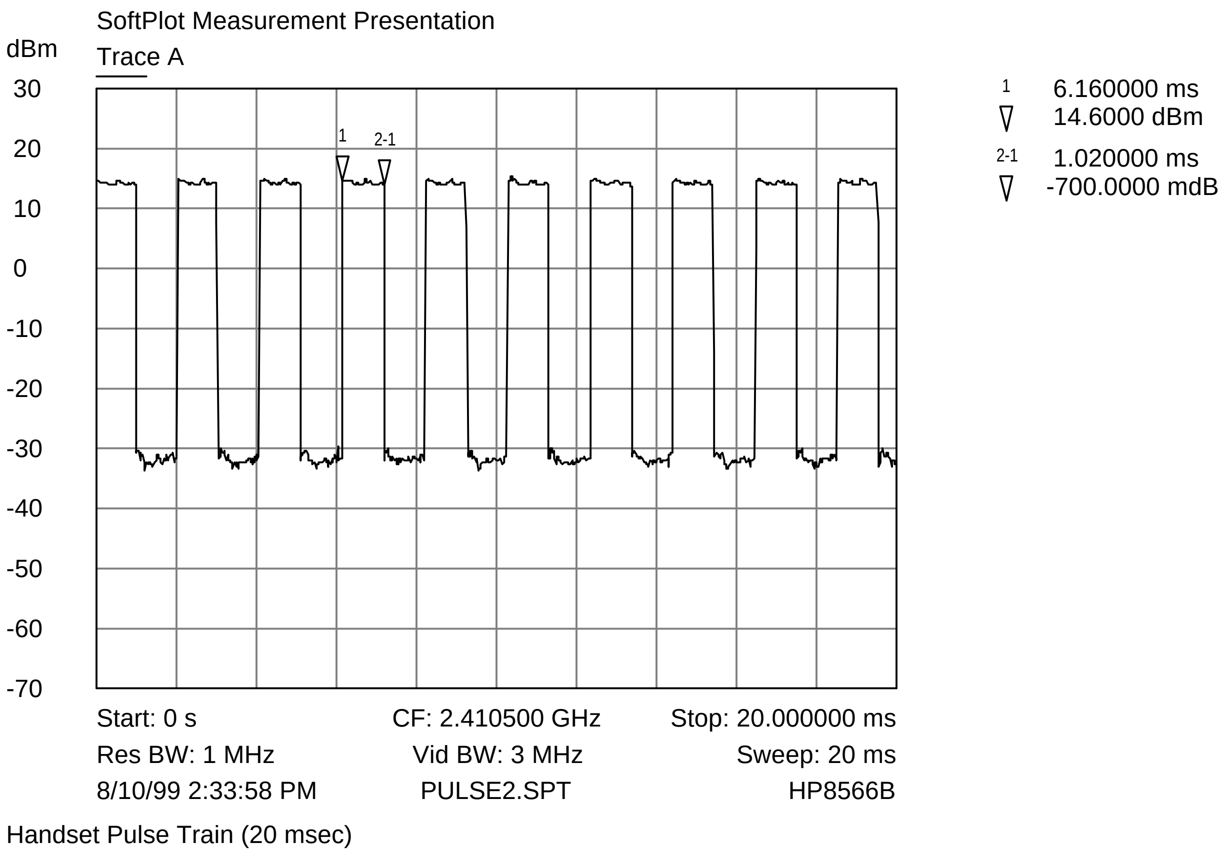
$$20 \log \frac{49.98 \text{ msec}}{100 \text{ msec}} = 20 \log 0.4998 = -6.0 \text{ dB}$$

See plots below for the pulse trains that were used to compute this average factor.

It was not possible to place the 242C in continuous transmit mode; therefore, the average factor was not subtracted from the average readings.




Pulse Train Plot - Handset (100 msec)




Pulse Train Plot – Handset (20 msec)

**Vertical Polarity**
**Handset**

| Transmitting at 2410.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4821.0 P | 21.6 | 42.5 | -6.0 | 58.1 | 74.0 |
| 4821.0 A | 5.3 | 42.5 | 0.0 | 47.8 | 54.0 |
| 12,052.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,052.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,284.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,284.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2440.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4881.0 P | 20.5 | 42.8 | -6.0 | 57.3 | 74.0 |
| 4881.0 A | 3.5 | 42.8 | 0.0 | 46.3 | 54.0 |
| 7321.5 P | 6.6 | 39.7 | -6.0 | 40.3 | 74.0 |
| 7321.5 A | -6.6 | 39.7 | 0.0 | 33.1 | 54.0 |
| 12,202.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,202.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,524.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,524.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2473.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4947.0 P | 16.3 | 43.2 | -6.0 | 53.5 | 74.0 |
| 4947.0 A | 2.6 | 43.2 | 0.0 | 45.8 | 54.0 |
| 7420.5 P | 3.7 | 39.9 | -6.0 | 37.6 | 74.0 |
| 7420.5 A | -4.6 | 39.9 | 0.0 | 35.3 | 54.0 |
| 12,367.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,367.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,788.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,788.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |
| 22,261.5 P | 16.8 * | 47.2 | -6.0 | 58.0 | 74.0 |
| 22,261.5 A | 1.8 * | 47.2 | 0.0 | 49.0 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

**Horizontal Polarity**
**Handset**

| Transmitting at 2410.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4821.0 P | 13.9 | 42.5 | -6.0 | 50.4 | 74.0 |
| 4821.0 A | 5.4 | 42.5 | 0.0 | 47.9 | 54.0 |
| 12,052.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,052.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,284.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,284.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2440.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4881.0 P | 12.8 | 42.8 | -6.0 | 49.6 | 74.0 |
| 4881.0 A | 3.7 | 42.8 | 0.0 | 46.5 | 54.0 |
| 7321.5 P | 5.5 | 39.7 | -6.0 | 39.2 | 74.0 |
| 7321.5 A | -6.8 | 39.7 | 0.0 | 32.9 | 54.0 |
| 12,202.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,202.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,524.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,524.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

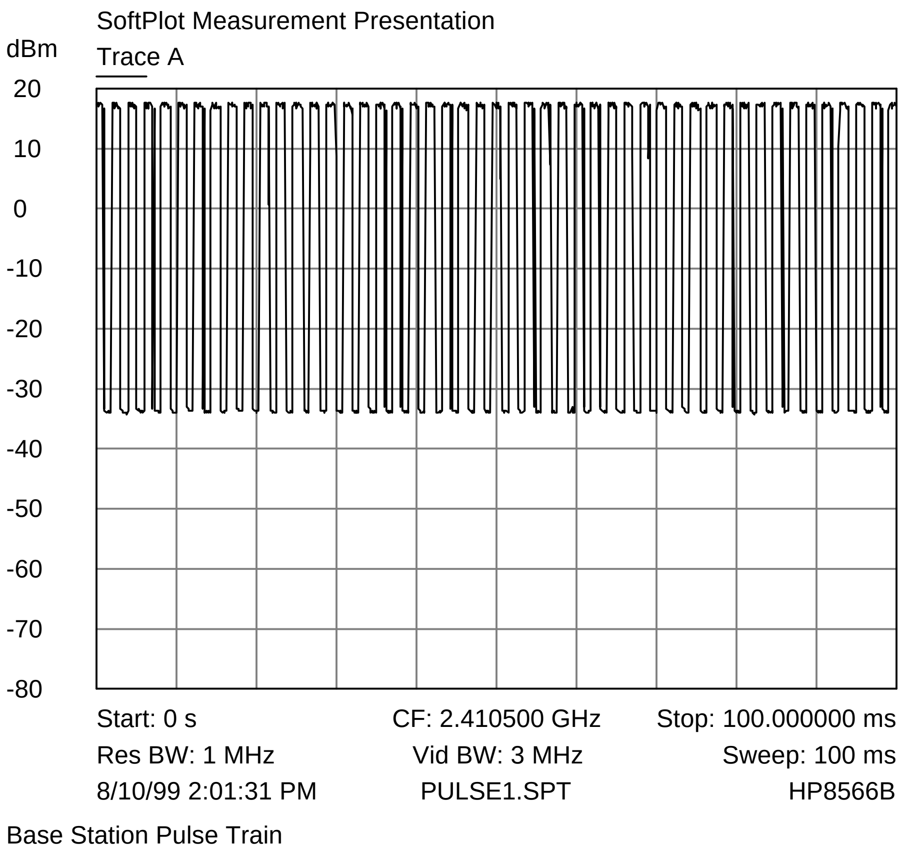
* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2473.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4947.0 P | 15.1 | 43.2 | -6.0 | 52.3 | 74.0 |
| 4947.0 A | 2.1 | 43.2 | 0.0 | 45.3 | 54.0 |
| 7420.5 P | 5.4 | 39.9 | -6.0 | 39.3 | 74.0 |
| 7420.5 A | -7.1 | 39.9 | 0.0 | 32.8 | 54.0 |
| 12,367.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,367.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,788.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,788.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |
| 22,261.5 P | 16.8 * | 47.2 | -6.0 | 58.0 | 74.0 |
| 22,261.5 A | 1.8 * | 47.2 | 0.0 | 49.0 | 54.0 |

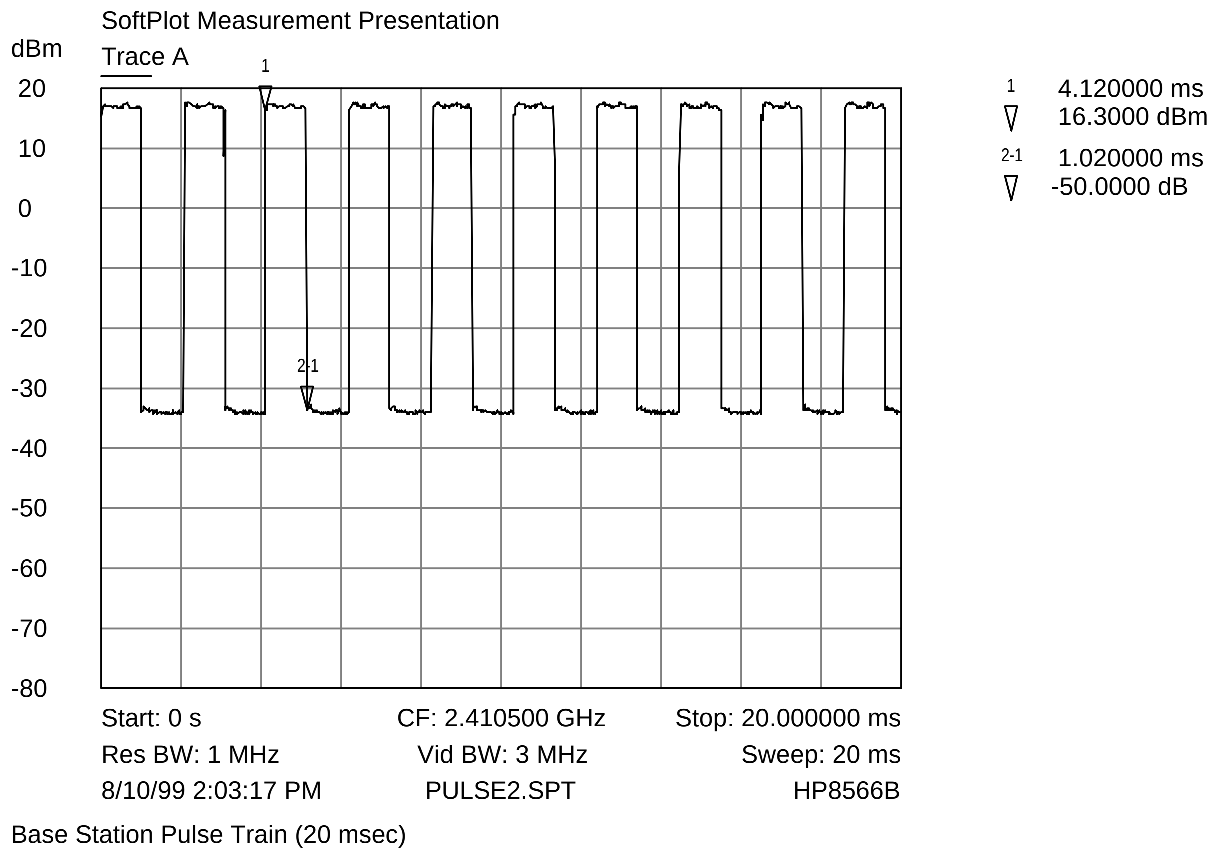
P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer




Pulse Train Plot – Base Station (100 msec)




Pulse Train Plot – Base Station (20 msec)

**Vertical Polarity**
**Base Station**

| Transmitting at 2410.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4821.0 P | 31.6 | 42.5 | -6.0 | 68.1 | 74.0 |
| 4821.0 A | 7.9 | 42.5 | 0.0 | 50.4 | 54.0 |
| 12,052.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,052.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,284.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,284.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2440.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4881.0 P | 27.7 | 42.8 | -6.0 | 64.5 | 74.0 |
| 4881.0 A | 3.6 | 42.8 | 0.0 | 46.4 | 54.0 |
| 7321.5 P | 10.6 | 39.7 | -6.0 | 44.3 | 74.0 |
| 7321.5 A | -7.1 | 39.7 | 0.0 | 32.6 | 54.0 |
| 12,202.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,202.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,524.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,524.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2473.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4947.0 P | 14.2 | 43.2 | -6.0 | 51.4 | 74.0 |
| 4947.0 A | 0.2 | 43.2 | 0.0 | 43.4 | 54.0 |
| 7420.5 P | 4.0 | 39.9 | -6.0 | 37.9 | 74.0 |
| 7420.5 A | -7.7 | 39.9 | 0.0 | 32.2 | 54.0 |
| 12,367.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,367.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,788.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,788.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |
| 22,261.5 P | 16.8 * | 47.2 | -6.0 | 58.0 | 74.0 |
| 22,261.5 A | 1.8 * | 47.2 | 0.0 | 49.0 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

**Horizontal Polarity**
**Base Station**

| Transmitting at 2410.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4821.0 P | 27.3 | 42.5 | -6.0 | 63.8 | 74.0 |
| 4821.0 A | 6.7 | 42.5 | 0.0 | 49.2 | 54.0 |
| 12,052.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,052.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,284.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,284.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2440.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4881.0 P | 19.7 | 42.8 | -6.0 | 56.5 | 74.0 |
| 4881.0 A | 4.7 | 42.8 | 0.0 | 47.5 | 54.0 |
| 7321.5 P | 11.3 | 39.7 | -6.0 | 45.0 | 74.0 |
| 7321.5 A | -6.1 | 39.7 | 0.0 | 33.6 | 54.0 |
| 12,202.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,202.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,524.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,524.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

| Transmitting at 2473.5 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency MHz | Receiver Reading dBμV | Correction Factor dB | Average Factor dB | Corrected Reading dBμV/m | Limit dBμV/m |
| 4947.0 P | 11.6 | 43.2 | -6.0 | 48.8 | 74.0 |
| 4947.0 A | 2.7 | 43.2 | 0.0 | 45.9 | 54.0 |
| 7420.5 P | 11.2 | 39.9 | -6.0 | 45.1 | 74.0 |
| 7420.5 A | -7.4 | 39.9 | 0.0 | 32.5 | 54.0 |
| 12,367.5 P | 12.9 * | 43.0 | -6.0 | 49.9 | 74.0 |
| 12,367.5 A | -1.5 * | 43.0 | 0.0 | 41.5 | 54.0 |
| 19,788.0 P | 17.4 * | 48.6 | -6.0 | 60.0 | 74.0 |
| 19,788.0 A | 2.0 * | 48.6 | 0.0 | 50.6 | 54.0 |
| 22,261.5 P | 16.8 * | 47.2 | -6.0 | 58.0 | 74.0 |
| 22,261.5 A | 1.8 * | 47.2 | 0.0 | 49.0 | 54.0 |

P = Peak Detection

A = Average Detection

* No emissions were detected with the antenna 1 meter from the EUT, the indicated readings are the noise floor measurements from the spectrum analyzer

**Sample Field Strength Calculation:**

The field strength is calculated by adding the Correction Factor (Antenna Factor + Cable Factor), to the measured level from the receiver. The basic equation with a sample calculation is shown below:

FS = RA + CF - AF Where
FS = Field Strength
RA = Receiver Amplitude (Receiver Reading - Amplifier Gain)
CF = Correction Factor (Antenna Factor + Cable Factor)
AF = Average Factor

**RESULT**

In the configuration tested, the EUT complied with the requirements of the specification.

**6.2.4 § 15.247 (d) Power Spectral Density:**

**Measurement Data:**

The maximum power spectral density measured for this device is 4.0 dBm (Base Station). Shown below is the measured power spectral density.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3 and 4.

**Handset**

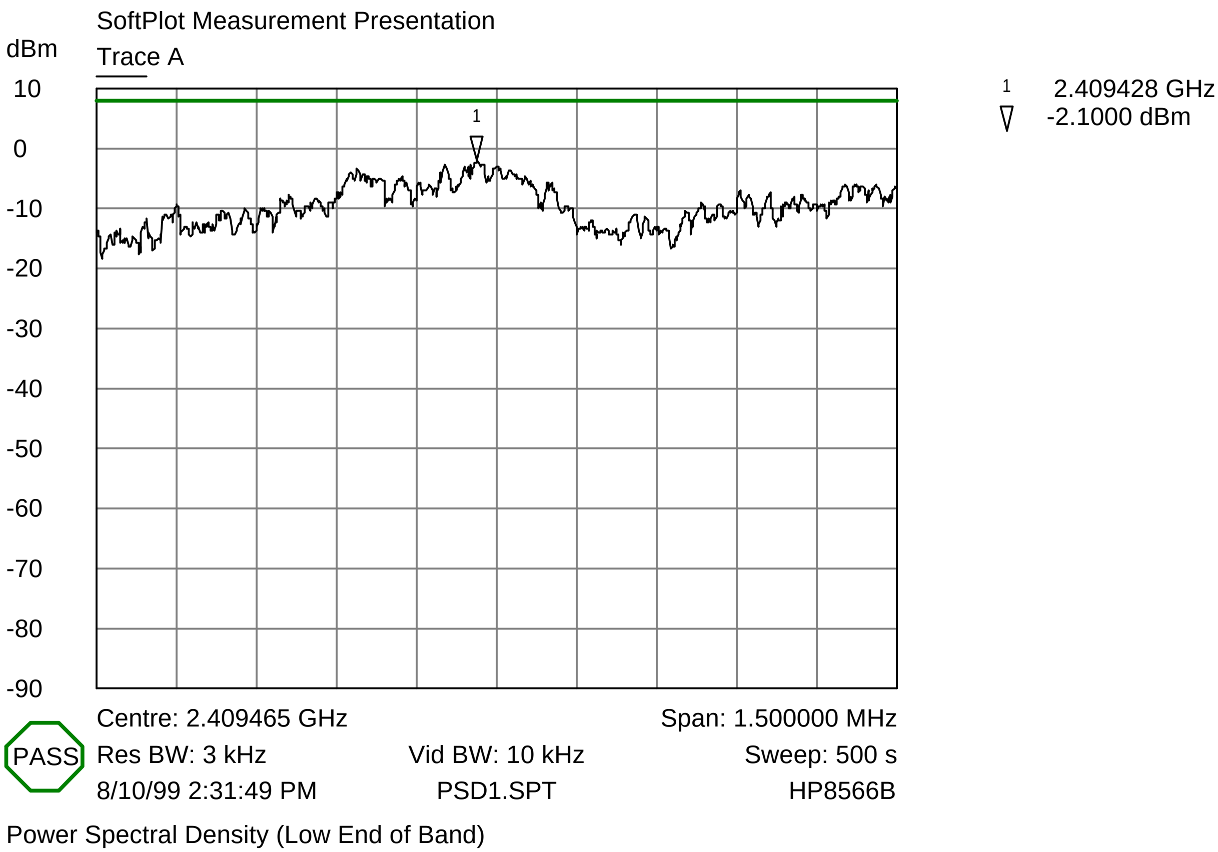
| Frequency (MHz) | Measured Power Spectral Density (dBm) |
|---|---|
| 2410.5 | -2.1 |
| 2440.5 | -0.2 |
| 2473.5 | -4.7 |

**Base Station**

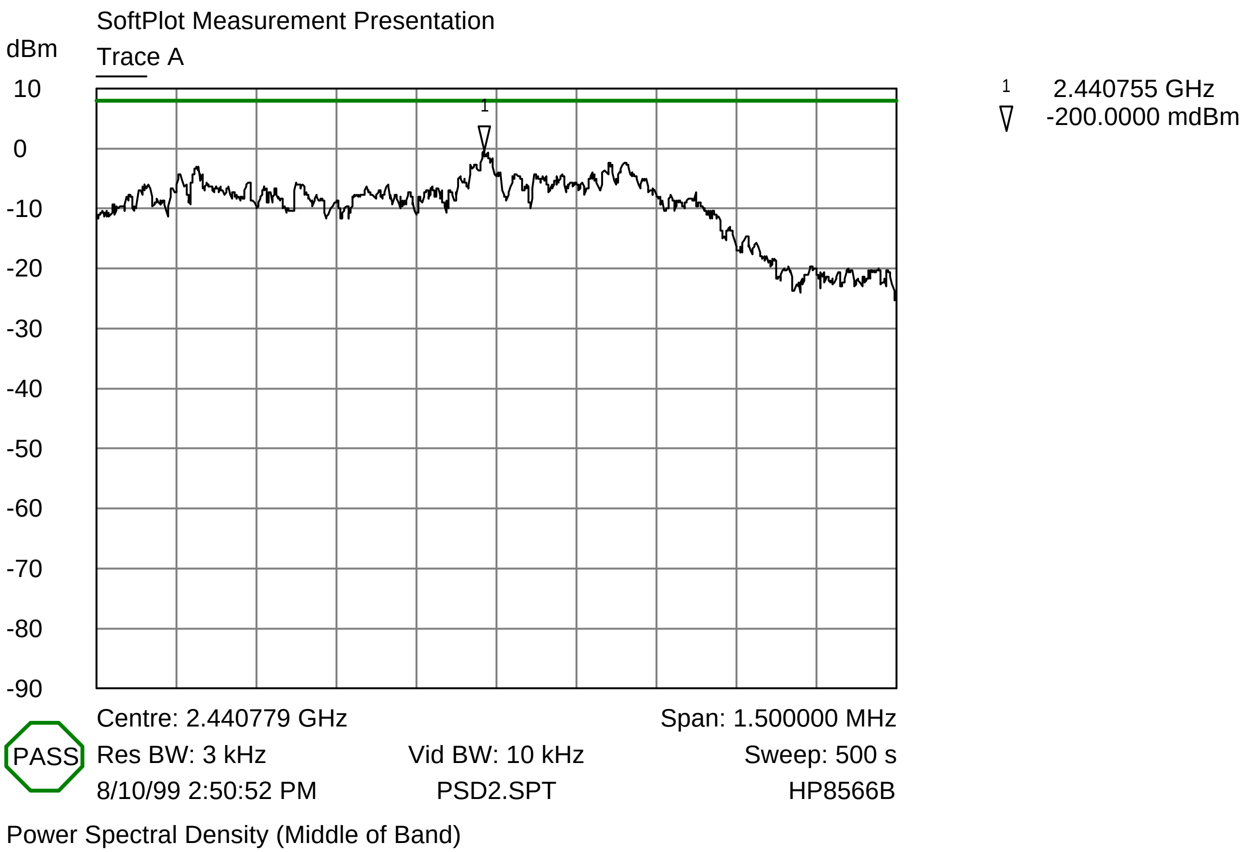
| Frequency (MHz) | Measured Power Spectral Density (dBm) |
|---|---|
| 2410.5 | 4.0 |
| 2440.5 | 2.8 |
| 2473.5 | -1.6 |

**RESULT**

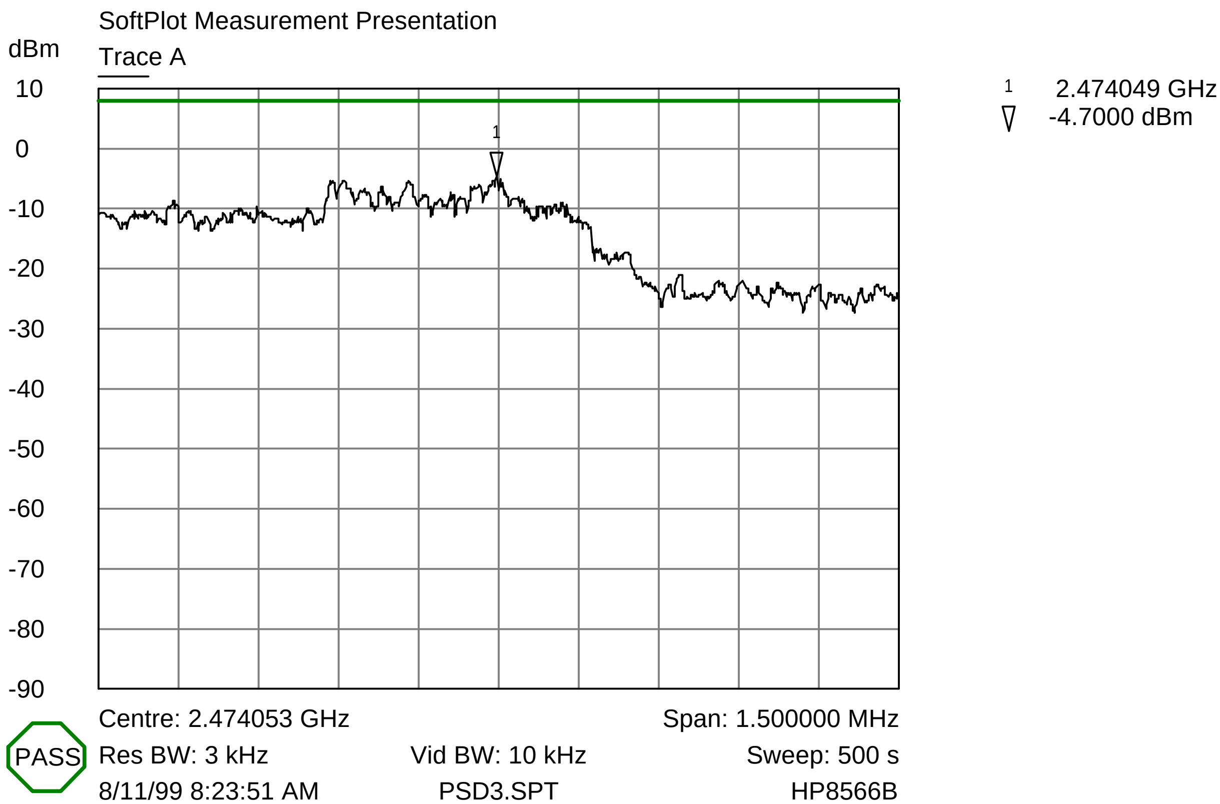
In the configuration tested, the EUT complied with the requirements of the specification (see spectrum analyzer plots below).




Power Spectral Density Plot - Handset (Low Channel)

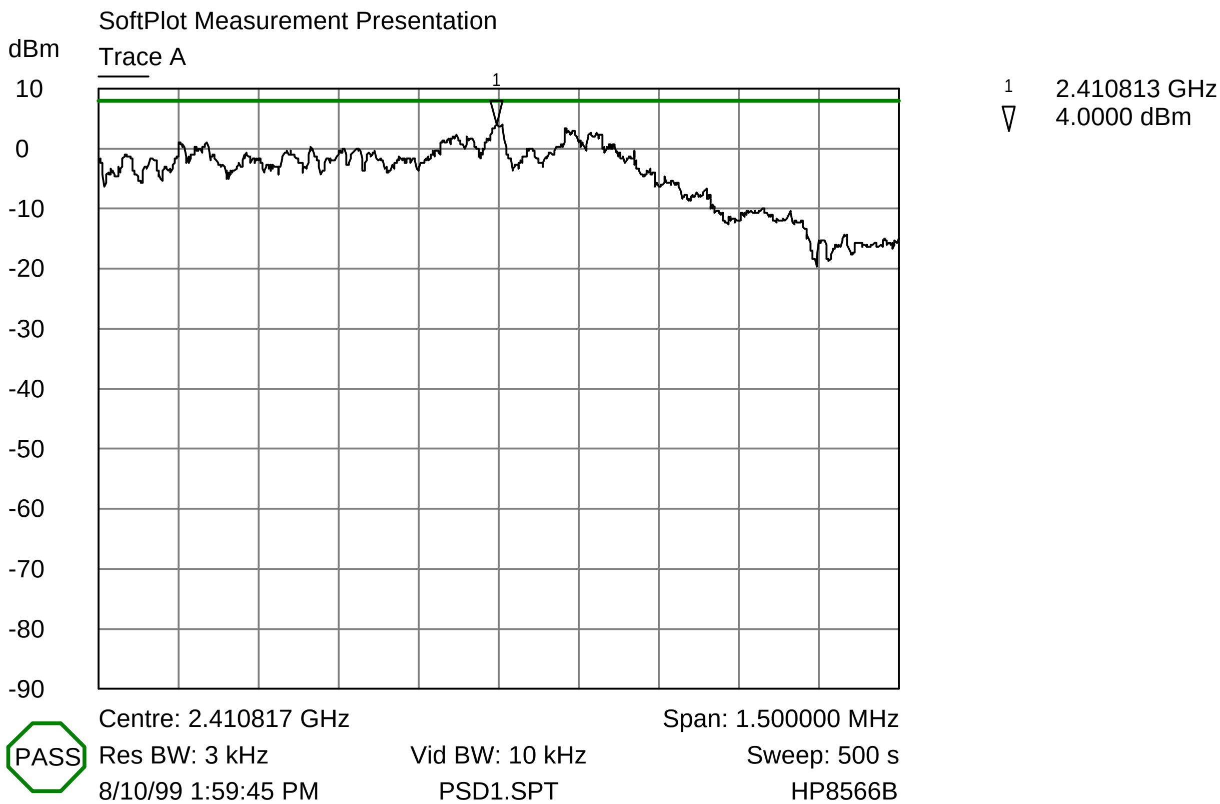



Power Spectral Density Plot - Handset (Middle Channel)



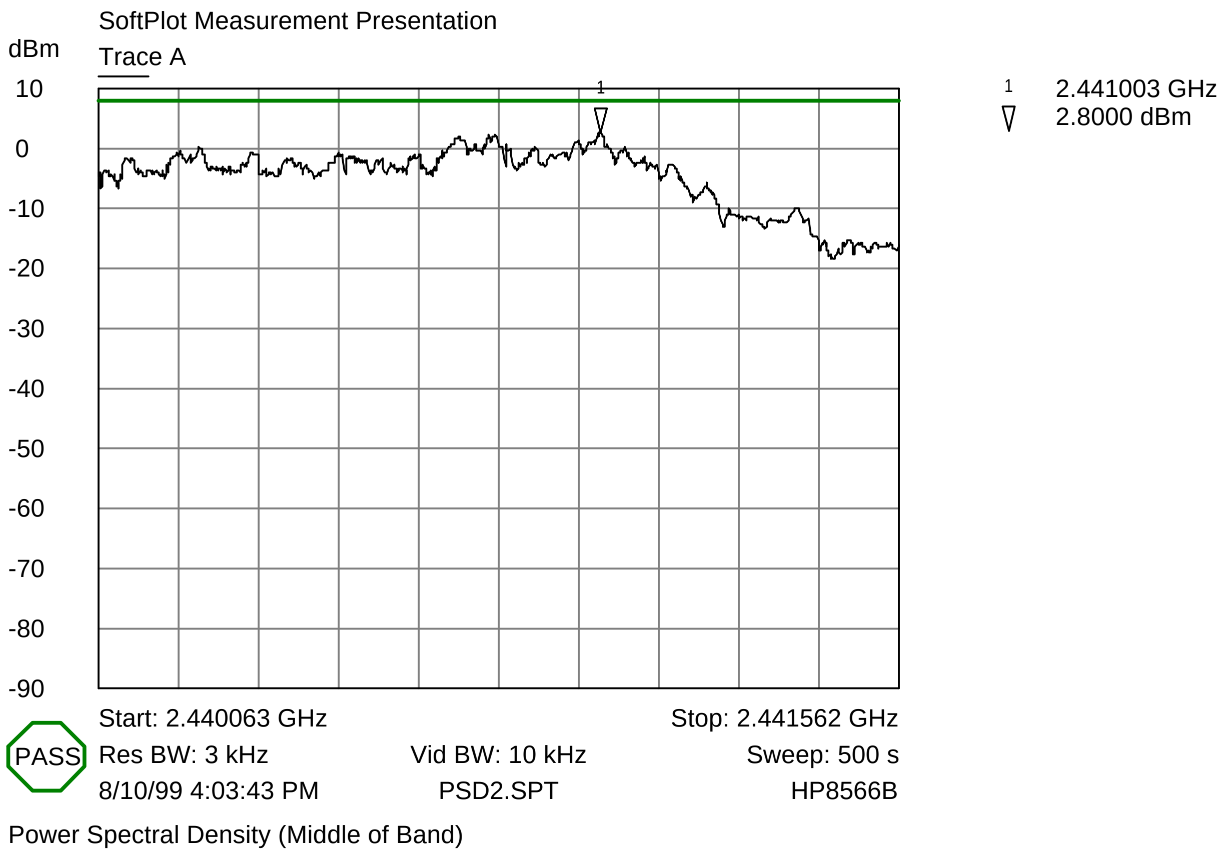

Power Spectral Density (High End of Band)

Power Spectral Density Plot - Handset (High Channel)

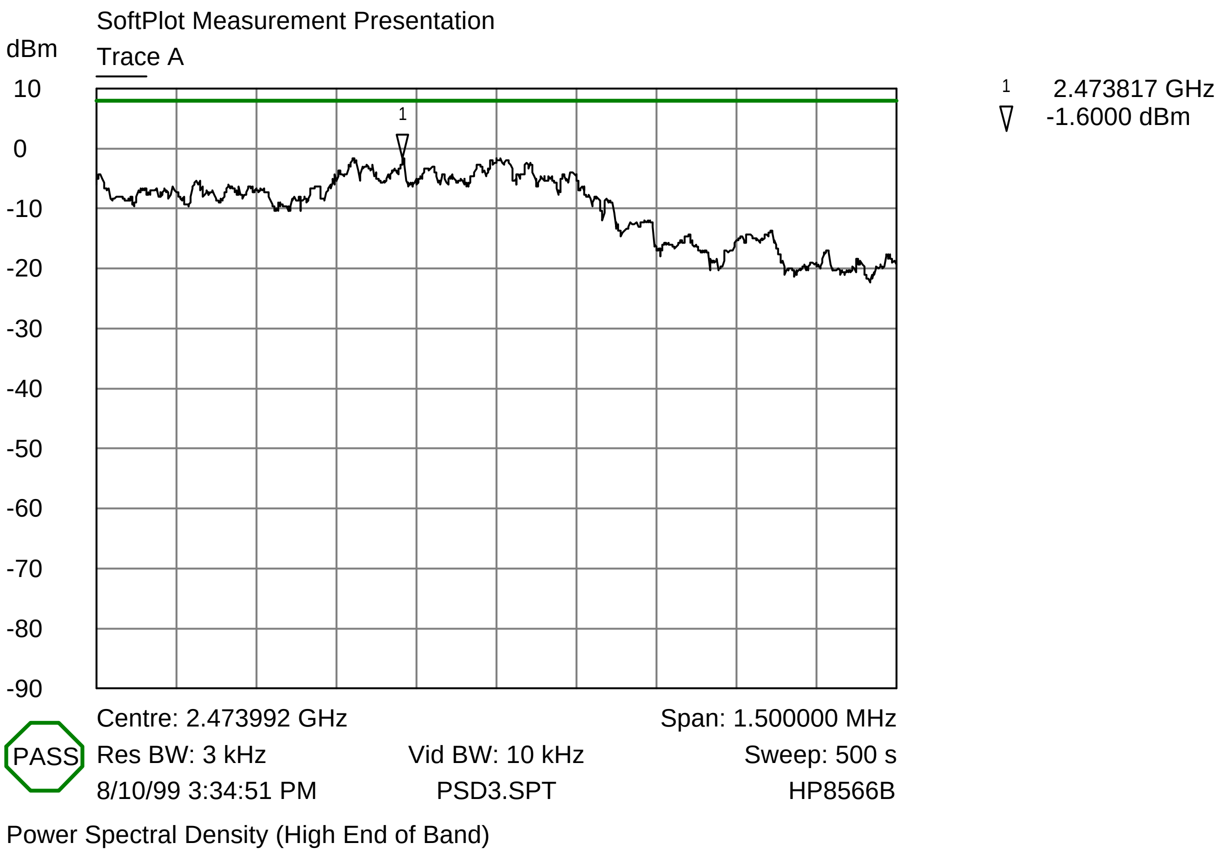



Power Spectral Density (Low End of Band)

Power Spectral Density Plot – Base Station (Low Channel)




Power Spectral Density Plot – Base Station (Middle Channel)




Power Spectral Density Plot – Base Station (High Channel)

**6.2.5 § 15.247 (e) Processing Gain:**

The minimum processing gain measured for this device was 13.96 dB.

# Processing Gain Measurement:

# Siemens 240 Series

# IGOR CHIP SET

Paulus Sastrodjojo
Siemens Communication Devices
Phone: (512) 990-6084
Fax: (512) 990-6342
Email: Paulus.K.Sastrodjojo@icn.siemens.com

Summary

This document describes how the processing gain was measured for the Level One IGOR, digital spread spectrum telephone transceiver chip set. Included are specifications, test setup, and test results. The Siemens 240 Series uses this same chip set in both the handset and the base station.

**Requirements**

According to the FCC requirement 15.247 for direct sequence spread spectrum systems, the minimum processing gain is 10 dB. The CW jamming method was used to determine the IGOR processing gain. The processing gain was calculated using the following equation:

$G_p = S/I + J/S + L_{sys}$ where:

$G_p$ = Processing Gain
S/I = Signal to noise required for a given error probability. In this case $1 \times 10^{-4}$ was used.
J/S = Jammer to signal ratio required to produce given error probability.
$L_{sys}$ = System loss due to non-ideal performance. Maximum allowed by the FCC is 2.0 dB.

The S/I ratio was determined to be 11.0 dB according to Jakes "Microwave Mobile Communications". Page 229 indicates the relevant curve showing error probability Vs S/I for a non-coherent FM system with a peak deviation equal to .35 of the modulation frequency:
$F_d = .35\ F_s$.

Given a minimum processing gain of 10 dB, the minimum allowable J/S ratio is -3.0 dB.

**Test Setup**

The processing gain was measured using the test setup shown in Figure 1:

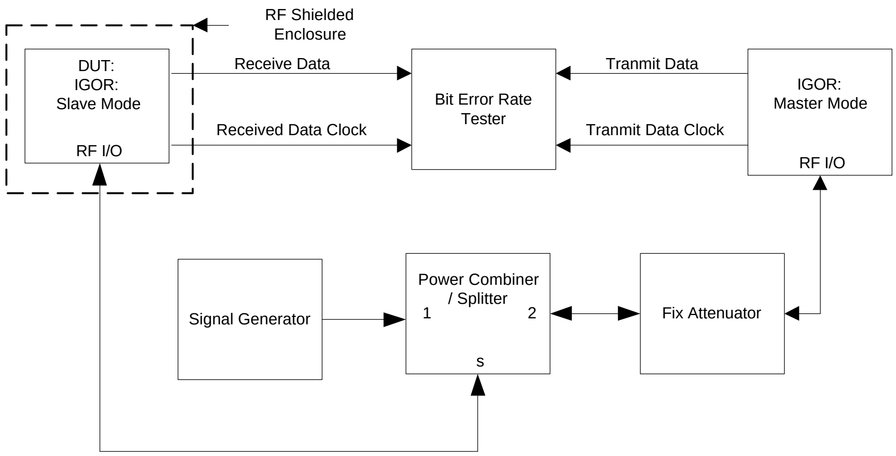



Figure 1: Processing Gain Test Setup

The following test equipment was used for this setup:

- Gigaset 240 systems, Master: PP060799-0217, Slave: FP060799-0217, Used 2.4GHz TESLA RFIC's.
- Rohde & Swarz SME 06 Signal Generator, S/N 842829 / 002.
- Hewlett Packard HP8596E Spectrum Analyzer, S/N: 3710A01020.
- Narda 4322-2 Power Divider; 0.5 – 2.5GHz, S/N: AIPD080199-1.
- GTEM 1100 Shielded Test Enclosure.
- Telecommunication Techniques Corp. Firebird MC6000A Communication Analyzer (BER tester) with Lab Interface Card, S/N: 9111.
- Semflex SMA cables.

The Siemens 240 Series system was set up at the low, middle, and high channels: 2410.50MHz, 2440.50 MHz, and 2473.50 MHz. The IGOR base band 3dB bandwidth is less than 1.0 MHz; therefore, the signal generator was used to inject a C / W jammer from (carrier – 1.0) MHz to (carrier + 1.0) MHz in 50 kHz increments. The DUT received input power was set at -45.1dBm for the low channel frequency of 2410.50MHz, -48.3dBm for the medium channel of 2440.50MHz, and –54.7dBm for high channel of 2473.50MHz. The jammer power was adjusted to achieve a bit error rates of $10^{-4}$ at each jammer frequency. The jammer power was recorded and the processing gain calculated for each jammer frequency from (carrier – 1.0) MHz to (carrier + 1.0) MHz.

**Test Results**

The three worse case processing gains overall were seen for frequency 2410.50MHz

| Frequency | Processing Gain | Margin |
|---|---|---|
| 2409.95 MHz | 13.96 dB | 3.96 dB |
| 2409.90 MHz | 14.05 dB | 4.05 dB |
| 2410.15 MHz | 14.09 dB | 4.09 dB |

The three worse case processing gains were found in channel 2440.50MHz and were:

| Frequency | Processing Gain | Margin |
|---|---|---|
| 2439.95 MHz | 16.59 dB | 6.59 dB |
| 2440.00 MHz | 16.69 dB | 6.69 dB |
| 2440.05 MHz | 16.69 dB | 6.69 dB |

The three worse case processing gains for frequency 2473.50MHz were:

| Frequency | Processing Gain | Margin |
|---|---|---|
| 2472.90 MHz | 17.37 dB | 7.37 dB |
| 2472.95 MHz | 17.40 dB | 7.40 dB |
| 2472.80 MHz | 17.44 dB | 7.44 dB |

For all jamming frequencies, the processing gain was greater than 10.0 dB. All of the measured test data is recorded in Figure 2, 3, 4, 5, 6, and 7:

| | | |
|---|---|---|
| Channel Frequency = | 2410.50 | MHz |
| Bit Error Rate = | 1.00E-04 | |
| Required S/N for BER = | 11.0 | dB |
| System Losses = | 2.0 | dB |
| Signal Strength at Receiver = | -45.1 | dBm |

| Jammer Frequency (MHz) | Jammer Power (dBm) | Jammer to Signal Ratio J / S (dB) | Processing Gain (dB) |
|---|---|---|---|
| 2409.500 | -34.70 | 10.4 | 23.4 |
| 2409.550 | -36.49 | 8.6 | 21.6 |
| 2409.600 | -38.28 | 6.8 | 19.8 |
| 2409.650 | -39.72 | 5.4 | 18.4 |
| 2409.700 | -41.30 | 3.8 | 16.8 |
| 2409.750 | -42.81 | 2.3 | 15.3 |
| 2409.800 | -43.24 | 1.9 | 14.9 |
| 2409.850 | -43.80 | 1.3 | 14.3 |
| 2409.900 | -44.05 | 1.1 | 14.1 |
| 2409.950 | -44.14 | 1.0 | 14.0 |
| 2410.000 | -43.96 | 1.1 | 14.1 |
| 2410.050 | -43.99 | 1.1 | 14.1 |
| 2410.100 | -43.97 | 1.1 | 14.1 |
| 2410.150 | -44.01 | 1.1 | 14.1 |
| 2410.200 | -43.87 | 1.2 | 14.2 |
| 2410.250 | -43.07 | 2.0 | 15.0 |
| 2410.300 | -42.49 | 2.6 | 15.6 |
| 2410.350 | -41.85 | 3.3 | 16.3 |
| 2410.400 | -41.40 | 3.7 | 16.7 |
| 2410.450 | -41.85 | 3.3 | 16.3 |
| 2410.500 | -39.15 | 6.0 | 19.0 |
| 2410.550 | -41.69 | 3.4 | 16.4 |
| 2410.600 | -40.61 | 4.5 | 17.5 |
| 2410.650 | -40.80 | 4.3 | 17.3 |
| 2410.700 | -41.10 | 4.0 | 17.0 |
| 2410.750 | -41.17 | 3.9 | 16.9 |
| 2410.800 | -41.47 | 3.6 | 16.6 |
| 2410.850 | -41.71 | 3.3 | 16.3 |
| 2410.900 | -41.78 | 3.1 | 16.1 |

| | | | |
|---|---|---|---|
| 2410.950 | -42.01 | 3.0 | 16.0 |
| 2411.000 | -42.13 | 2.8 | 15.8 |
| 2411.050 | -42.35 | 2.9 | 15.9 |
| 2411.100 | -42.25 | 2.9 | 15.9 |
| 2411.150 | -42.22 | 3.3 | 16.3 |
| 2411.200 | -41.83 | 4.3 | 17.3 |
| 2411.250 | -40.77 | 5.5 | 18.5 |
| 2411.300 | -39.64 | 7.1 | 20.1 |
| 2411.350 | -38.01 | 8.8 | 21.8 |
| 2411.400 | -36.29 | 10.6 | 23.6 |
| 2411.450 | -34.50 | 12.4 | 25.4 |
| 2411.500 | -32.72 | 12.4 | 25.4 |

Figure 2: Processing Gain Measurements of frequency 2410.50 MHz

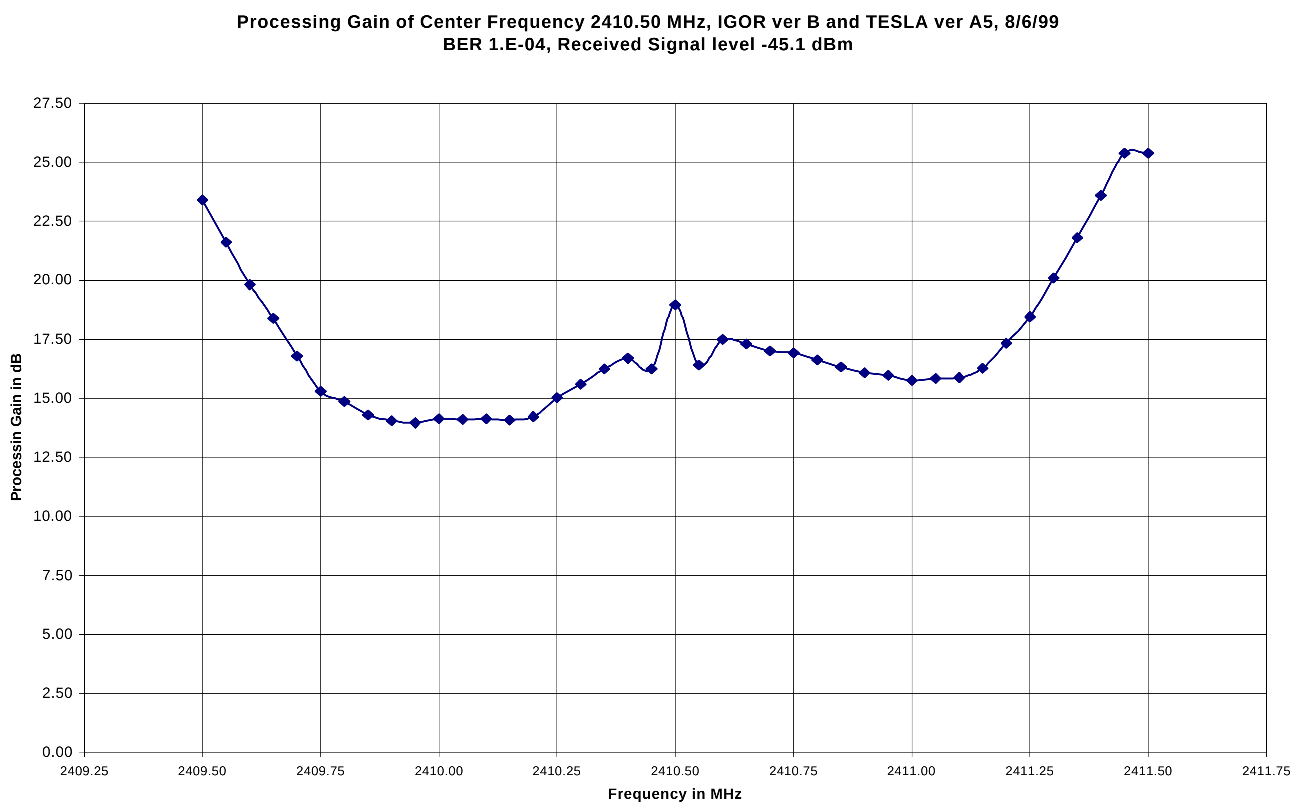



Figure 3: Processing Gain Vs Jammer Frequency at frequency 2410.40 MHz

| | | |
|---|---|---|
| Channel Frequency = | 2440.50 | MHz |
| Bit Error Rate = | 1.00E-04 | |
| Required S/N for BER = | 11.0 | dB |
| System Losses = | 2.0 | dB |
| Signal Strength at Receiver = | -48.3 | dBm |

| Jammer Frequency (MHz) | Jammer Power (dBm) | Jammer to Signal Ratio J / S (dB) | Processing Gain (dB) |
|---|---|---|---|
| 2439.500 | -35.3 | 13.0 | 26.0 |
| 2439.550 | -36.9 | 11.4 | 24.4 |
| 2439.600 | -39.1 | 9.2 | 22.2 |
| 2439.650 | -40.6 | 7.7 | 20.7 |
| 2439.700 | -42.0 | 6.3 | 19.3 |
| 2439.750 | -43.3 | 5.0 | 18.0 |
| 2439.800 | -44.1 | 4.2 | 17.2 |
| 2439.850 | -44.2 | 4.1 | 17.1 |
| 2439.900 | -44.5 | 3.8 | 16.8 |
| 2439.950 | -44.7 | 3.6 | 16.6 |
| 2440.000 | -44.6 | 3.7 | 16.7 |
| 2440.050 | -44.6 | 3.7 | 16.7 |
| 2440.100 | -44.5 | 3.8 | 16.8 |
| 2440.150 | -44.6 | 3.7 | 16.7 |
| 2440.200 | -44.4 | 3.9 | 16.9 |
| 2440.250 | -43.7 | 4.6 | 17.6 |
| 2440.300 | -43.1 | 5.2 | 18.2 |
| 2440.350 | -42.5 | 5.8 | 18.8 |
| 2440.400 | -42.1 | 6.2 | 19.2 |
| 2440.450 | -42.7 | 5.6 | 18.6 |
| 2440.500 | -39.9 | 8.4 | 21.4 |
| 2440.550 | -42.5 | 5.8 | 18.8 |
| 2440.600 | -41.4 | 6.9 | 19.9 |
| 2440.650 | -41.6 | 6.7 | 19.7 |
| 2440.700 | -41.8 | 6.5 | 19.5 |
| 2440.750 | -42.1 | 6.2 | 19.2 |
| 2440.800 | -42.4 | 5.9 | 18.9 |
| 2440.850 | -42.5 | 5.8 | 18.8 |
| 2440.900 | -42.7 | 5.6 | 18.6 |
| 2440.950 | -42.8 | 5.5 | 18.5 |

| | | | |
|---|---|---|---|
| 2441.000 | -43.0 | 5.3 | 18.3 |
| 2441.050 | -43.1 | 5.2 | 18.2 |
| 2441.100 | -43.1 | 5.2 | 18.2 |
| 2441.150 | -43.0 | 5.3 | 18.3 |
| 2441.200 | -42.6 | 5.7 | 18.7 |
| 2441.250 | -41.6 | 6.7 | 19.7 |
| 2441.300 | -40.4 | 7.9 | 20.9 |
| 2441.350 | -38.7 | 9.6 | 22.6 |
| 2441.400 | -36.9 | 11.4 | 24.4 |
| 2441.450 | -35.1 | 13.2 | 26.2 |
| 2441.500 | -33.2 | 15.1 | 28.1 |

Figure 4: Processing Gain Measurements of frequency 2440.50 MHz

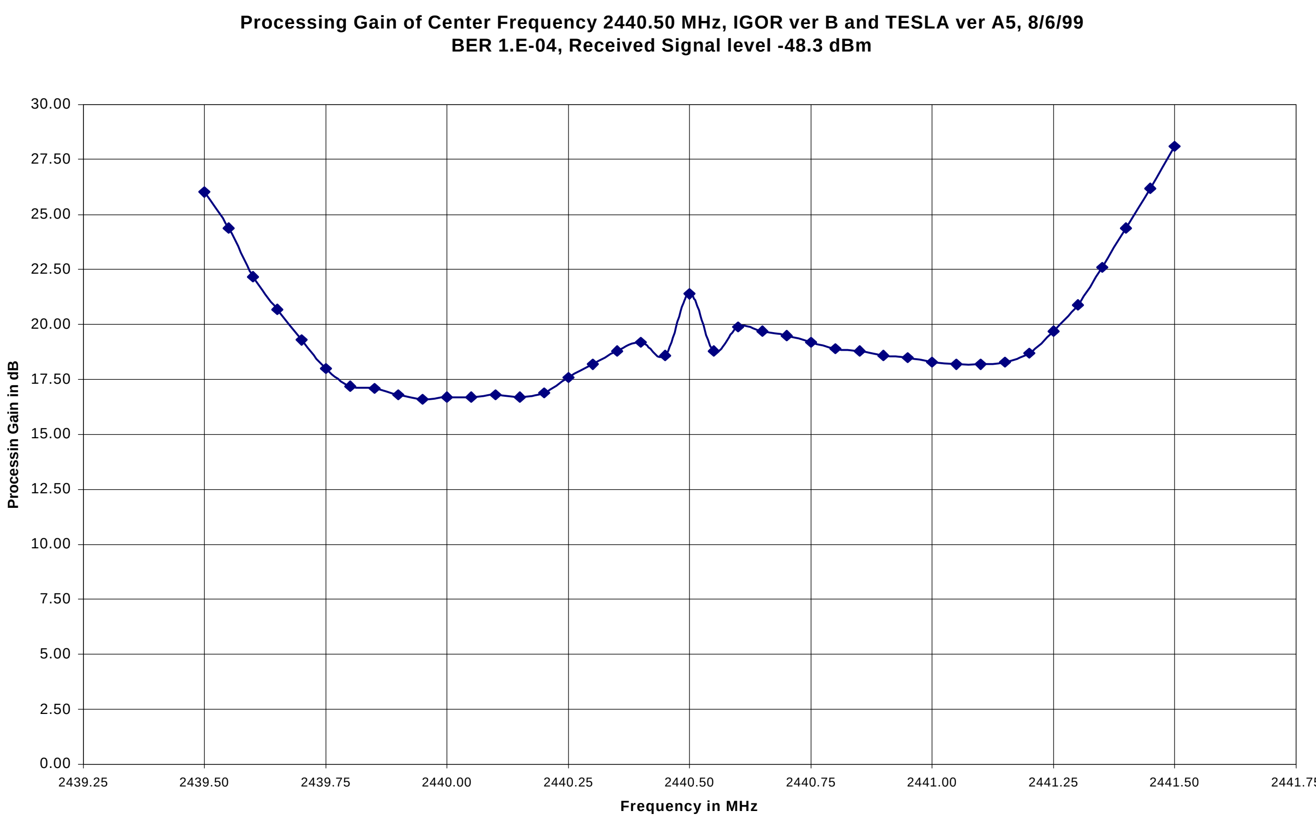



Figure 5: Processing Gain Vs Jammer Frequency at frequency 2440.50 MHz

Channel Frequency = 2473.50 MHz
Bit Error Rate = 1.00E-04
Required S/N for BER = 11.0 dB
System Losses = 2.0 dB
Signal Strength at Receiver = -54.7 dBm

| Jammer Frequency (MHz) | Jammer Power (dBm) | Jammer to Signal Ratio J / S (dB) | Processing Gain (dB) |
|---|---|---|---|
| 2472.500 | -40.98 | 13.72 | 26.7 |
| 2472.550 | -42.85 | 11.85 | 24.9 |
| 2472.600 | -44.61 | 10.09 | 23.1 |
| 2472.650 | -46.69 | 8.01 | 21.0 |
| 2472.700 | -48.50 | 6.20 | 19.2 |
| 2472.750 | -49.16 | 5.54 | 18.5 |
| 2472.800 | -50.26 | 4.44 | 17.4 |
| 2472.850 | -50.23 | 4.47 | 17.5 |
| 2472.900 | -50.33 | 4.37 | 17.4 |
| 2472.950 | -50.30 | 4.40 | 17.4 |
| 2473.000 | -50.14 | 4.56 | 17.6 |
| 2473.050 | -50.14 | 4.56 | 17.6 |
| 2473.100 | -50.14 | 4.56 | 17.6 |
| 2473.150 | -50.00 | 4.70 | 17.7 |
| 2473.200 | -49.91 | 4.79 | 17.8 |
| 2473.250 | -49.56 | 5.14 | 18.1 |
| 2473.300 | -49.19 | 5.51 | 18.5 |
| 2473.350 | -48.87 | 5.83 | 18.8 |
| 2473.400 | -48.75 | 5.95 | 19.0 |
| 2473.450 | -49.67 | 5.03 | 18.0 |
| 2473.500 | -48.95 | 5.75 | 18.8 |
| 2473.550 | -49.78 | 4.92 | 17.9 |
| 2473.600 | -48.88 | 5.82 | 18.8 |
| 2473.650 | -48.84 | 5.86 | 18.9 |
| 2473.700 | -49.22 | 5.48 | 18.5 |
| 2473.750 | -49.29 | 5.41 | 18.4 |
| 2473.800 | -49.59 | 5.11 | 18.1 |
| 2473.850 | -49.66 | 5.04 | 18.0 |
| 2473.900 | -49.87 | 4.83 | 17.8 |

| | | | |
|---|---|---|---|
| 2473.950 | -49.87 | 4.83 | 17.8 |
| 2474.000 | -50.08 | 4.62 | 17.6 |
| 2474.050 | -50.08 | 4.62 | 17.6 |
| 2474.100 | -50.11 | 4.59 | 17.6 |
| 2474.150 | -50.04 | 4.66 | 17.7 |
| 2474.200 | -49.69 | 5.01 | 18.0 |
| 2474.250 | -48.86 | 5.84 | 18.8 |
| 2474.300 | -47.88 | 6.82 | 19.8 |
| 2474.350 | -45.88 | 8.82 | 21.8 |
| 2474.400 | -44.02 | 10.68 | 23.7 |
| 2474.450 | -42.20 | 12.50 | 25.5 |
| 2474.500 | -40.31 | 14.39 | 27.4 |

Figure 6: Processing Gain Measurements of frequency 2473.50 MHz

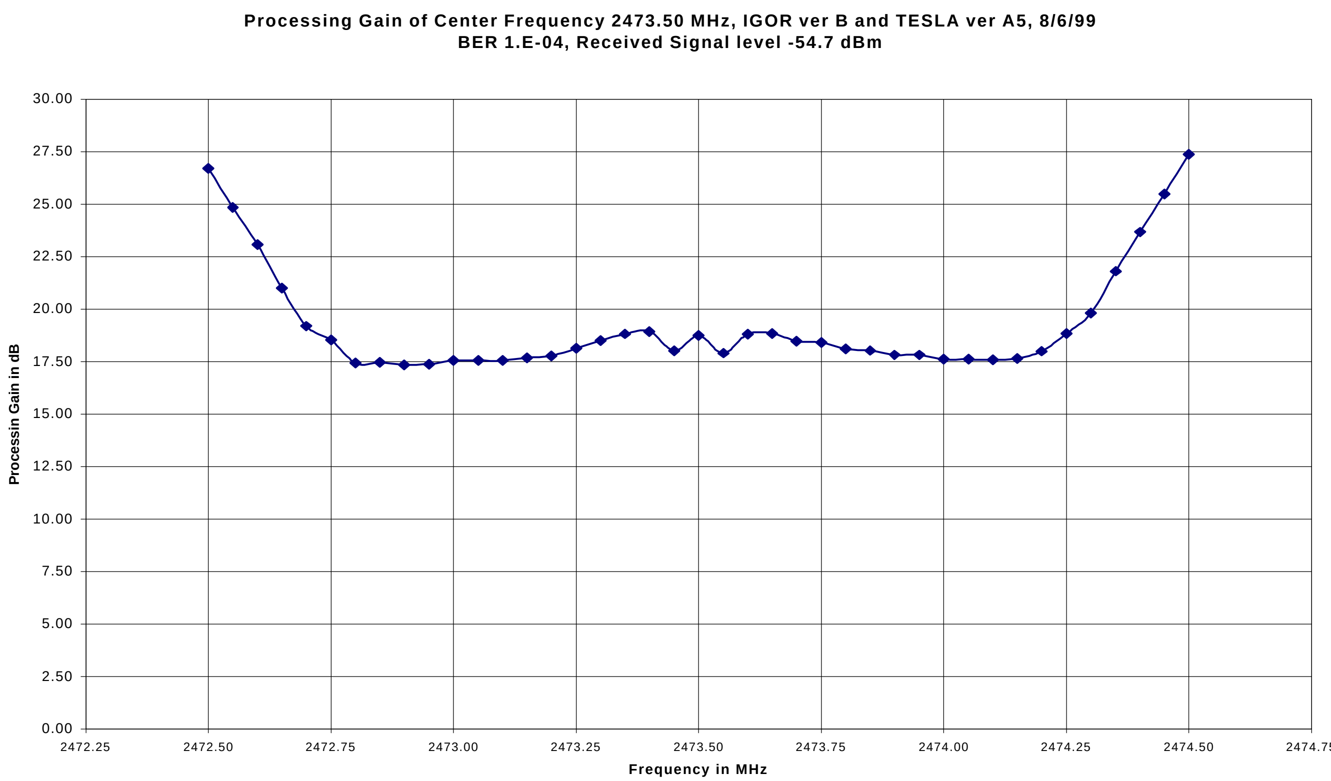



Figure 7: Processing Gain Vs Jammer Frequency at frequency 2473.50 MHz

**Conclusions**

The Siemens 240 Series with the IGOR chip set meets the 10.0 dB requirement for processing gain.
The worse case processing gain passed with a gain of 13.96 dB at the low channel frequency of
2409.95 MHz.

**6.2.6 § 15.207 Line Conducted Emissions:**

The frequency range from 450 kHz to 30 MHz was investigated to measure any AC line conducted emissions.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3, 4 and 13.

The handset operates via batteries; therefore, the line conducted emissions testing was performed with the handset in the charger in the transmit mode.

**Line Conducted Data - (Hot Lead) Handset**

| Frequency MHz | Detector | Measured Level dBμV | Limit dBμV |
|---|---|---|---|
| 0.71 | Peak | 31.0 | 48.0 |
| 0.97 | Peak | 31.3 | 48.0 |
| 1.18 | Peak | 31.3 | 48.0 |
| 1.41 | Peak | 31.1 | 48.0 |
| 1.66 | Peak | 28.5 | 48.0 |
| 24.06 | Peak | 22.4 | 48.0 |

**Line Conducted Data - (Neutral Lead) Handset**

| Frequency MHz | Detector | Measured Level dBμV | Limit dBμV |
|---|---|---|---|
| 0.48 | Peak | 29.9 | 48.0 |
| 0.62 | Peak | 29.7 | 48.0 |
| 0.76 | Peak | 27.5 | 48.0 |
| 8.79 | Peak | 21.1 | 48.0 |
| 24.06 | Peak | 21.6 | 48.0 |

**Line Conducted Data - (Hot Lead) Base Station**

| Frequency MHz | Detector | Measured Level dBμV | Limit dBμV |
|---|---|---|---|
| 0.71 | Peak | 31.0 | 48.0 |
| 0.97 | Peak | 31.3 | 48.0 |
| 1.18 | Peak | 31.3 | 48.0 |
| 1.41 | Peak | 31.1 | 48.0 |
| 1.66 | Peak | 28.5 | 48.0 |
| 24.06 | Peak | 22.4 | 48.0 |

**Line Conducted Data - (Neutral Lead) Base Station**

| Frequency MHz | Detector | Measured Level dBμV | Limit dBμV |
|---|---|---|---|
| 0.48 | Peak | 29.9 | 48.0 |
| 0.62 | Peak | 29.7 | 48.0 |
| 0.76 | Peak | 27.5 | 48.0 |
| 1.12 | Peak | 23.3 | 48.0 |
| 8.79 | Peak | 21.1 | 48.0 |
| 24.06 | Peak | 21.6 | 48.0 |

## APPENDIX A. TEST EQUIPMENT USED:

| Reference No. | Type | Manufacturer | Model |
|---|---|---|---|
| 1 | Anechoic Chamber | EMC Test Systems | N/A |
| 2 | Wanship Open Area Test Site | CCL | N/A |
| 3 | Spectrum Analyzer | Hewlett Packard | 8568B or 8566B |
| 4 | Quasi-Peak Detector | Hewlett Packard | 8565A |
| 5 | Biconical Antenna | EMCO | 3108 or 3104P |
| 6 | Log-Periodic Antenna | EMCO | 3146 |
| 7 | Biconilog Antenna | EMCO | 3142 |
| 8 | Double Ridged Guide Antenna | EMCO | 3115 |
| 9 | Pre-Amplifier | Hewlett Packard | 8447D |
| 10 | Power Amplifier | Hewlett Packard | 8447E |
| 11 | Power Amplifier | Hewlett Packard | 8449A |
| 12 | Power Amplifier | Hewlett Packard | 8449B |
| 13 | LISN<br>Anechoic Chamber | EMCO | 3825/2 |
| 14 | LISN<br>Wanship | EMCO | 3725 |

An independent calibration laboratory following outlined calibration procedures calibrates all the equipment listed above every 12 months.

## APPENDIX B. TEST PROCEDURES:

**Line Conducted Emissions:**

The line-conducted emission from the digital apparatus was measured using a spectrum analyzer with a quasi-peak adapter for peak, quasi-peak and average readings. The quasi-peak adapter uses a bandwidth of 9 kHz, with the spectrum analyzer's resolution bandwidth set at 100 kHz, for readings in the 450 kHz to 30 MHz frequency ranges.

The line conducted emissions measurements are performed in a screen room using a (50 Ω/50 μH) Line Impedance Stabilization Network (LISN).

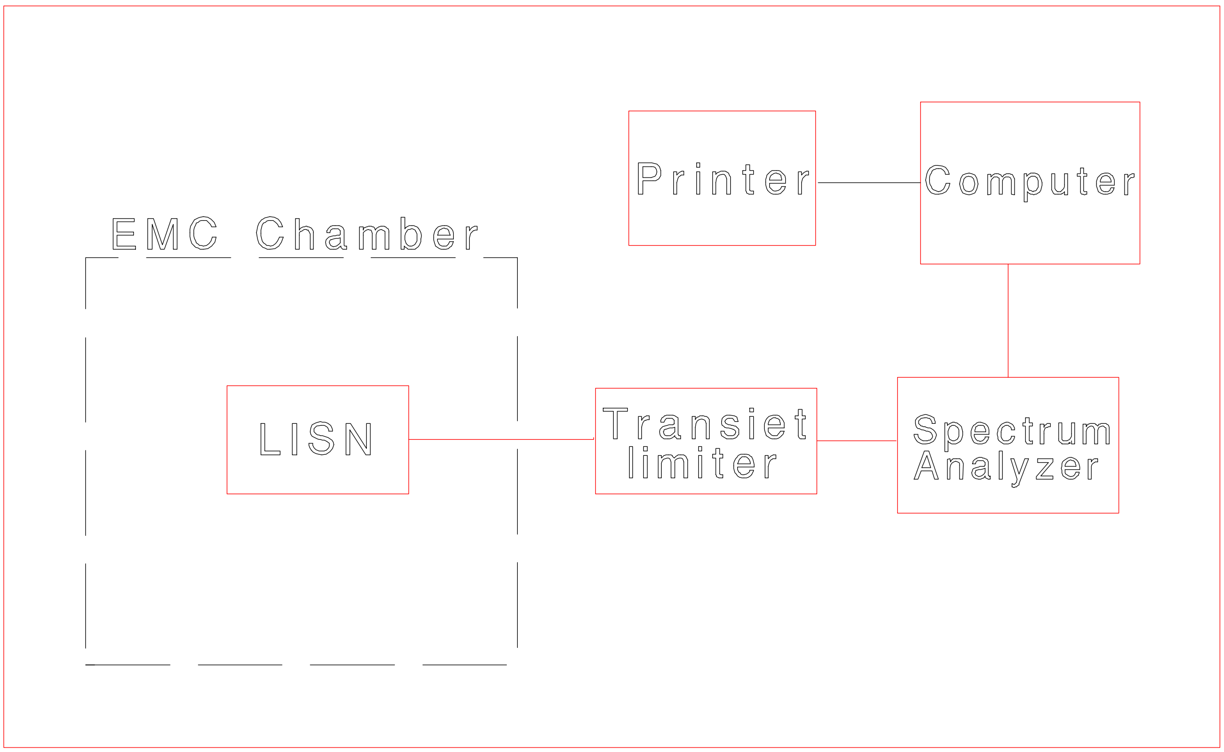
Where mains flexible power cords are longer than 1 m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

Where the EUT is a collection of digital apparatus with each digital apparatus having its own power cord, the point of connection for the LISN is determined from the following rules:

a) Each power cord, which is terminated in a mains supply plug, shall be tested separately.
b) Power cords, which are not specified by the manufacturer to be connected via a host unit, shall be tested separately.
c) Power cords which are specified by the manufacturer to be connected via a host unit or other power supplying equipment shall be connected to that host unit and the power cords of that host unit connected to the LISN and tested.

Desktop digital apparatus are placed on a non-conducting table at least 80 cm from the metallic floor. The equipment is placed a minimum of 40 cm from all walls. Floor standing equipment is placed directly on the earth grounded floor.

## Line Conducted Emissions Test




**Radiated Spurious Emissions:**

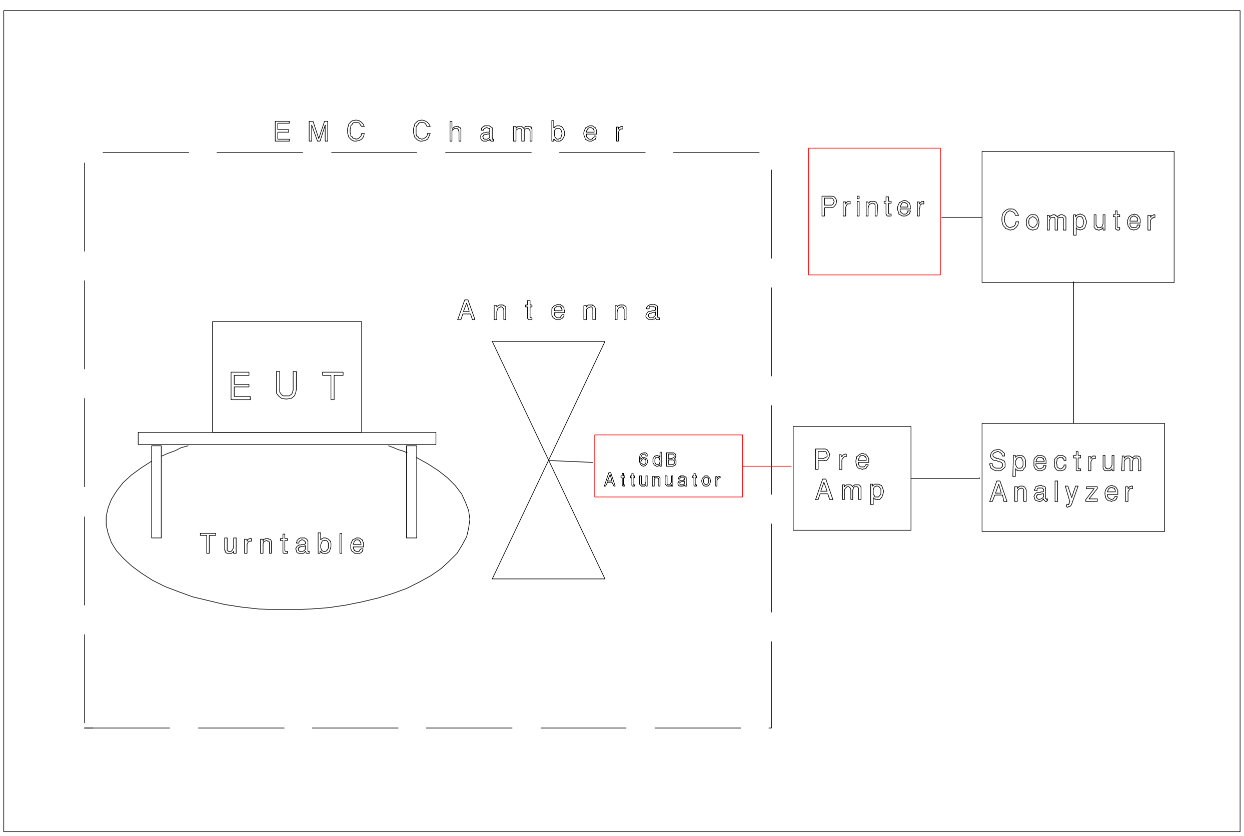
The radiated emission from the transmitter was measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings. A preamplifier with a fixed gain of 30 dB was used to increase the sensitivity of the measuring instrumentation.

A Biconilog antenna was used to measure the frequency range of 30 to 1000 MHz and a Double Ridge Guide Horn antenna was used to measure the frequency range 1 GHz to 10 GHz, at a distance of 3 meters from the EUT. The readings obtained by these antennas are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors.

The configuration of the transmitter was varied to find the maximum radiated emission. The EUT was connected to the peripherals listed in Section 2.4 via the interconnecting cables listed in Section 2.5. These interconnecting cable were manipulated manually by a technician to obtain worst case radiated emissions. The digital apparatus was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there were multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

Transmitters are measured on a non-conducting table one-meter above the ground plane. The table is placed on a turntable which is level with the ground plane. The turntable has slip rings, which supply AC power to the digital apparatus. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

## Radiated Emissions Test



**FCC Sections 15.247 Peak Transmit Power, Emission Bandwidth and Spurious Emissions**

The EUT was directly connected to the spectrum analyzer via the antenna output port as shown in the block diagram below.

The measurements were performed on three channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum, one near the middle of the spectrum and one near the top of the spectrum.

The spectrum analyzer’s resolution bandwidth and video bandwidth were set as follows:

**Peak Transmit Power**

RBW = 1 MHz
VBW = 3 MHz

**Emission Bandwidth**

RBW = 100 kHz
VBW = 300 kHz

**Spurious Emissions (Antenna Conducted)**

RBW = 100 kHz – 10 MHz to 1000 MHz
VBW = 300 kHz

**Spurious Emissions (Radiated)**

**Peak Detection**

RBW = 100 kHz – 30 MHz to 1 GHz
VBW = 300 kHz

RBW = 1 MHz – 1 GHz to 25 GHz
VBW = 3 MHz

**Average Detection**

RBW = 1 MHz – 1 GHz to 25 GHz
VBW = 10 Hz

**Test Configuration Block Diagram**