

**MEMORANDUM**

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cc:

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Subject: Results of Processing Gain Tests for FCC Qualification

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## **1 INTRODUCTION**

This memo presents the results of the Processing Gain (PG) tests carried out for FCC qualification of the Cambridge Silicon Radio BC01B Bluetooth chip. The FCC states that the PG from a hybrid Bluetooth receiver must be greater than 17 dB when measured in accordance with the Continuous Wave (CW) jamming margin method. Testing of the BC01b has found the PG due to the DS section to be approximately 5 dB and the PG due to the FH part to be approximately 15 dB. It is therefore concluded that the BC01B complies with the FCC PG requirements for radio communication systems.

The rest of this paper outlines the PG measurement technique and discusses the test results. Appendix A contains a list of test equipment and Appendix B contains a printout of the measurement results.

## **2 METHOD**

### **2.1 PG Definition**

The Processing Gain from a frequency hopping communication system is derived from two parts, the FH section and the DS section. The PG due to FH is given by a simple equation and is constant. However measurement of the PG due to DS is a little more complex. One technique is to use the CW jamming margin method. This method measures PG due to DS using the following algorithm:

*A CW signal generator is stepped in 50kHz increments across the passband of the system, recording at each point the generator level required to produce the 0.1% Packet Error Rate (PER). This is the jammer level. This level is then referenced to the output power of the intended Bluetooth signal and the Jammer to Signal Ratio JSR is thus calculated. The worst 4*

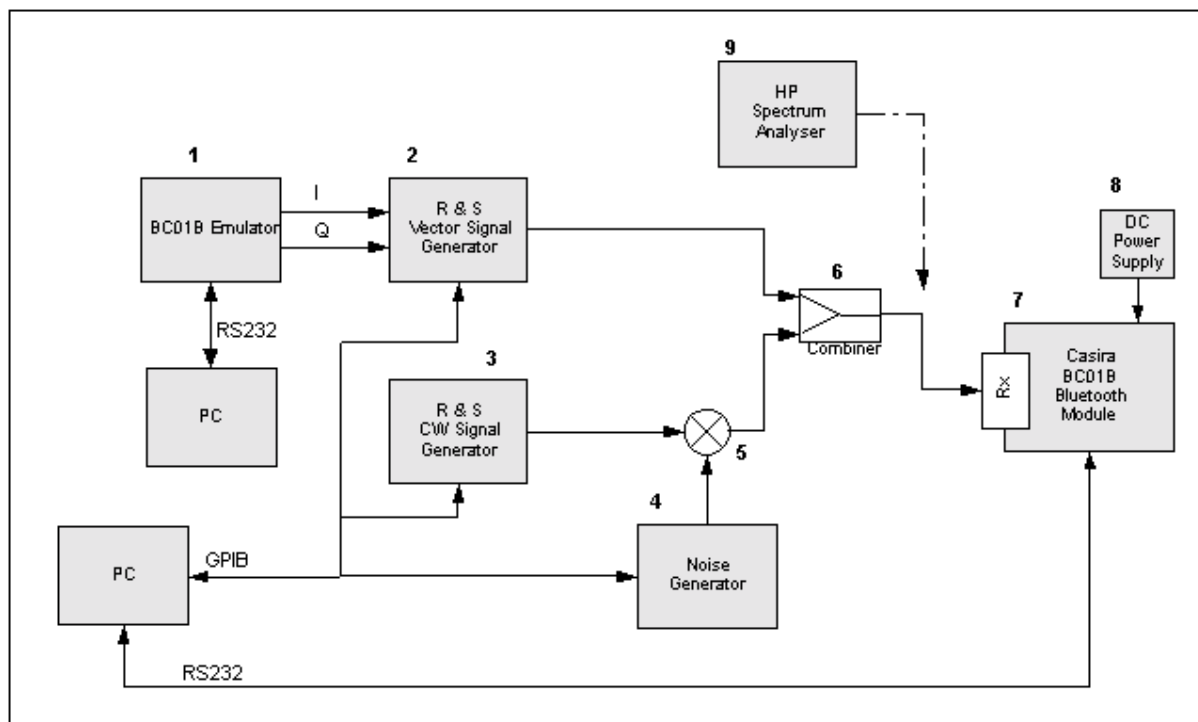
*JSR measurements are discarded and the worst remaining JSR is used to calculate the PG due to DS as follows:*

$$G_p = SNR + JSR_{\min} + L_{\text{sys}}$$

where  $G_p$  = the processing gain of the system,  $SNR$  = the signal to noise ratio required for 0.1% BER,  $JSR_{\min}$  = minimum J/S ratio and  $L_{\text{sys}}$  = system losses.

## 2.2 PG Measurement Technique

Figure 1 provides an overview of the PG measurement technique. The measurement is performed in two parts, measurement of the system SNR and measurement of  $JSR_{\min}$ .



**Figure 1: PG Measurement Technique**

The system SNR is calculated using the following algorithm. Generate Bluetooth PRBS-9 packets using a BC01B emulator (1) and a Vector Signal Generator (2). Combine this signal with white noise of a constant level, which is generated using a noise source (4) and a CW Signal Generator (3). Then vary the level of the Bluetooth signal until the BER measured by the BC01B (7) is 0.1%. The resulting SNR is the signal level divided by the Noise level.

The JSR for a given jamming frequency is calculated using the following algorithm. Generate Bluetooth PRBS-9 packets using the BC01B emulator (1) and the Vector Signal Generator (2). Combine this signal with a constant CW tone at the jamming frequency using a CW Signal Generator (5) and a combiner (6). Then vary the level of the Bluetooth signal until the PER measured by the Casira Bluetooth Module (7) is 0.1%. The resulting JSR is the signal level divided by the jamming level.

### 3 RESULTS

#### 3.1 Overview

The measurements found that the PG due to DS caused by the access code in page and inquiry mode is found to be approximately 5dB when the access code is a relatively random mixture of 1's and 0's. A random access code causes the most Inter Symbol Interference (ISI) and hence the worst PG for a hybrid system. Therefore only the results for this access code are used in the PG calculation.

The PG due to FH is given as

$$PG_{FH} = 10 \log_{10} (\text{number of frequency hops})$$

The number of hops in a Bluetooth system is 32, therefore the PG due to FH is approximately 15 dB. When this is added to the PG due to DS, the total PG for the BC01B is approximately 20 dB, above the minimum PG requirement for FCC qualification.

#### 3.2 Detailed Results

|                       |            |
|-----------------------|------------|
| Test Date:            | 17/11/00   |
| Sample Time:          | 30 seconds |
| Access Code:          | c6967e     |
| Signal Frequency:     | 2.432GHz   |
| Receiver Sensitivity: | -88.7 dBm  |
| Jammer Signal Level:  | -85.7 dBm  |
| Measured SNR:         | 18.8dB     |
| System Losses:        | 2dB        |

To calculate processing gain, ignore the worst 20% of data points and then apply the following formula:

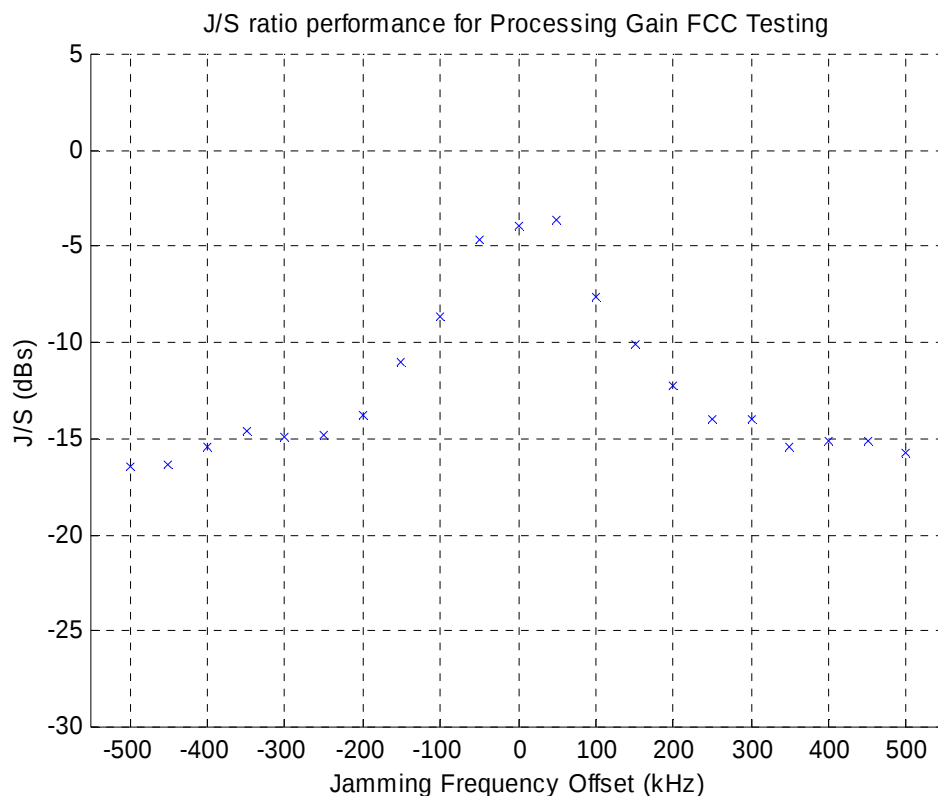
$$G_p = SNR + JSR_{\min} + L_{\text{sys}}$$

Where  $G_p$  = Processing Gain of the module  
 $SNR$  = signal to noise ratio of the module  
 $JS_{\min}$  = minimum J/S ratio after the worst 20% of J/S samples have been discarded  
 $L_{\text{sys}}$  = System losses

A total of 20 samples were taken by stepping the jamming signal frequency offsets in 50kHz increments over the bandwidth of the receiver. The worst 4 samples were found at -500kHz, -450kHz, -400kHz and 500kHz and were discarded. The remaining minimum J/S ratio was found to be -15.4dB at an offset of +350kHz

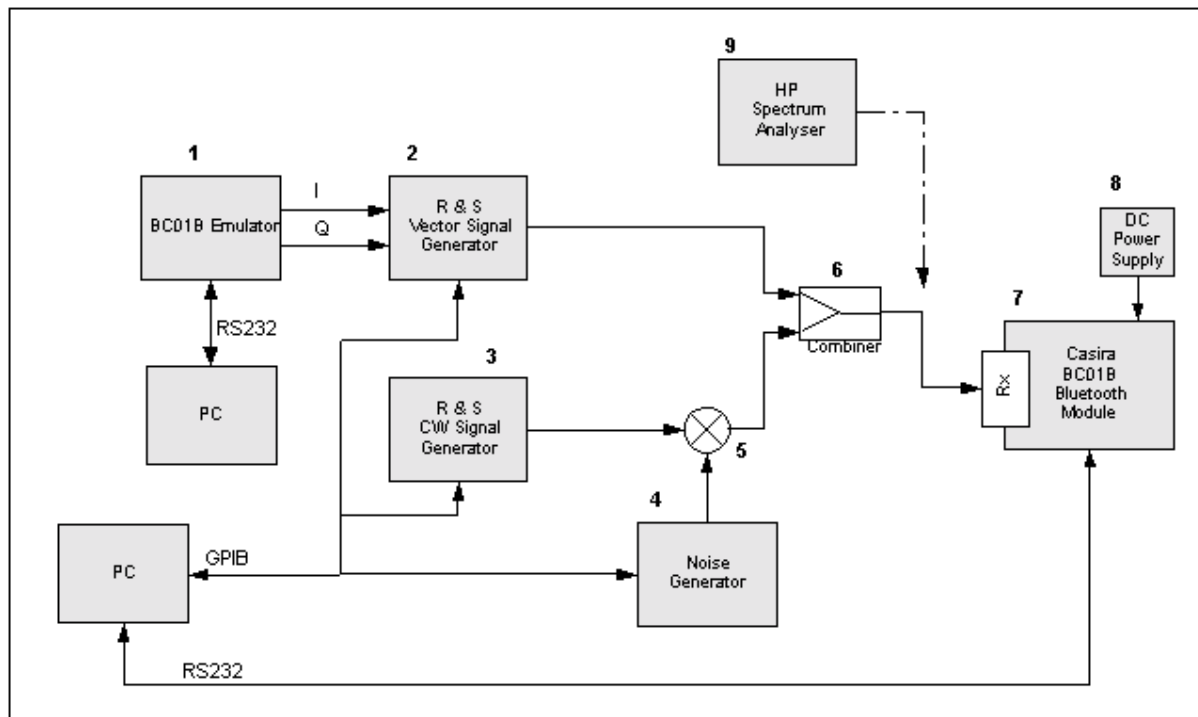
Thus, the processing gain due to direct sequence spreading in page and inquiry mode is

$$G_p = 18.8 - 15.4 + 2 = 5.4dB$$



## APPENDIX A - TEST EQUIPMENT LIST

| Reference: | Instrument Type                        | Name                   |
|------------|----------------------------------------|------------------------|
| 1          | BlueCore Emulator Board                | N/A                    |
| 2          | Vector Signal Generator                | IFR2052                |
| 3          | CW Signal Generator                    | IFR2025                |
| 4          | White Noise Generator                  | HP33120A               |
| 5          | RF Mixer                               | M8HC-7                 |
| 6          | RF Combiner                            | 6 dB loss combiner     |
| 7          | Bluetooth Motherboard and BC01B Module | Casira Development Kit |
| 8          | 5V, 4A DC Power Supply                 | N/A                    |
| 9          | Spectrum Analyser                      | HP E4405B              |



## APPENDIX B - TEST RESULTS

Timestamp: 14:42.43, 16/11/2000

Signal Freq = 2.432 GHz

Jammer Level = -85.7 dBm

Jammer Offset = -500 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -68.7 dBm | BER = 0.03% | PER = 0.01% | SER1 = 0.01% | SER2 = 0.01% |
| Level = -70.7 dBm | BER = 0.32% | PER = 0.79% | SER1 = 0.79% | SER2 = 0.79% |
| Level = -69.7 dBm | BER = 0.11% | PER = 0.18% | SER1 = 0.18% | SER2 = 0.18% |
| Level = -68.7 dBm | BER = 0.04% | PER = 0.03% | SER1 = 0.02% | SER2 = 0.02% |
| Level = -69.2 dBm | BER = 0.06% | PER = 0.05% | SER1 = 0.05% | SER2 = 0.05% |
| Level = -69.7 dBm | BER = 0.11% | PER = 0.16% | SER1 = 0.16% | SER2 = 0.16% |
| Level = -69.5 dBm | BER = 0.09% | PER = 0.11% | SER1 = 0.11% | SER2 = 0.11% |
| Level = -69.3 dBm | BER = 0.07% | PER = 0.05% | SER1 = 0.05% | SER2 = 0.05% |

J/S = -16.50 dB (SER = 0.05%)

Signal Freq = 2.432 GHz

Jammer Level = -85.7 dBm

Jammer Offset = -450 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -69.2 dBm | BER = 0.06% | PER = 0.05% | SER1 = 0.05% | SER2 = 0.05% |
| Level = -71.2 dBm | BER = 0.84% | PER = 1.72% | SER1 = 1.69% | SER2 = 1.69% |
| Level = -70.2 dBm | BER = 0.26% | PER = 0.40% | SER1 = 0.40% | SER2 = 0.40% |
| Level = -69.2 dBm | BER = 0.07% | PER = 0.06% | SER1 = 0.06% | SER2 = 0.06% |
| Level = -69.7 dBm | BER = 0.12% | PER = 0.18% | SER1 = 0.18% | SER2 = 0.18% |
| Level = -69.5 dBm | BER = 0.09% | PER = 0.14% | SER1 = 0.14% | SER2 = 0.14% |
| Level = -69.3 dBm | BER = 0.07% | PER = 0.08% | SER1 = 0.08% | SER2 = 0.08% |

J/S = -16.40 dB (SER = 0.08%)

Signal Freq = 2.432 GHz

Jammer Level = -85.7 dBm

Jammer Offset = -400 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -69.3 dBm | BER = 0.04% | PER = 0.02% | SER1 = 0.02% | SER2 = 0.02% |
| Level = -71.3 dBm | BER = 0.44% | PER = 0.72% | SER1 = 0.71% | SER2 = 0.71% |
| Level = -70.3 dBm | BER = 0.13% | PER = 0.11% | SER1 = 0.11% | SER2 = 0.11% |
| Level = -69.3 dBm | BER = 0.04% | PER = 0.01% | SER1 = 0.01% | SER2 = 0.01% |
| Level = -69.8 dBm | BER = 0.08% | PER = 0.03% | SER1 = 0.02% | SER2 = 0.02% |
| Level = -70.3 dBm | BER = 0.13% | PER = 0.10% | SER1 = 0.10% | SER2 = 0.10% |

J/S = -15.40 dB (SER = 0.10%)

Signal Freq = 2.432 GHz

Jammer Level = -85.7 dBm

Jammer Offset = -350 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -70.3 dBm | BER = 0.05% | PER = 0.01% | SER1 = 0.01% | SER2 = 0.01% |
| Level = -72.3 dBm | BER = 0.88% | PER = 1.67% | SER1 = 1.64% | SER2 = 1.64% |
| Level = -71.3 dBm | BER = 0.19% | PER = 0.10% | SER1 = 0.10% | SER2 = 0.10% |
| Level = -70.3 dBm | BER = 0.06% | PER = 0.01% | SER1 = 0.01% | SER2 = 0.01% |
| Level = -70.8 dBm | BER = 0.09% | PER = 0.04% | SER1 = 0.04% | SER2 = 0.04% |
| Level = -71.3 dBm | BER = 0.17% | PER = 0.12% | SER1 = 0.12% | SER2 = 0.12% |

Level = -71.1 dBm BER = 0.13% PER = 0.05% SER1 = 0.05% SER2 = 0.05%

J/S = -14.60 dB (SER = 0.05%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = -300 kHz

Level = -71.1 dBm BER = 0.03% PER = 0.15% SER1 = 0.15% SER2 = 0.15%  
Level = -69.1 dBm BER = 0.00% PER = 0.00% SER1 = 0.00% SER2 = 0.00%  
Level = -70.1 dBm BER = 0.01% PER = 0.00% SER1 = 0.00% SER2 = 0.00%  
Level = -71.1 dBm BER = 0.03% PER = 0.19% SER1 = 0.19% SER2 = 0.19%  
Level = -70.6 dBm BER = 0.02% PER = 0.04% SER1 = 0.04% SER2 = 0.04%  
Level = -70.8 dBm BER = 0.02% PER = 0.09% SER1 = 0.09% SER2 = 0.09%

J/S = -14.90 dB (SER = 0.09%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = -250 kHz

Level = -70.8 dBm BER = 0.00% PER = 0.03% SER1 = 0.02% SER2 = 0.02%  
Level = -72.8 dBm BER = 0.05% PER = 2.34% SER1 = 2.29% SER2 = 2.29%  
Level = -71.8 dBm BER = 0.01% PER = 0.33% SER1 = 0.33% SER2 = 0.33%  
Level = -70.8 dBm BER = 0.00% PER = 0.03% SER1 = 0.03% SER2 = 0.03%  
Level = -71.3 dBm BER = 0.01% PER = 0.11% SER1 = 0.11% SER2 = 0.11%  
Level = -71.1 dBm BER = 0.00% PER = 0.11% SER1 = 0.11% SER2 = 0.11%  
Level = -70.9 dBm BER = 0.00% PER = 0.03% SER1 = 0.03% SER2 = 0.03%

J/S = -14.80 dB (SER = 0.03%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = -200 kHz

Level = -70.9 dBm BER = 0.00% PER = 0.00% SER1 = 0.00% SER2 = 0.00%  
Level = -72.9 dBm BER = 0.00% PER = 0.34% SER1 = 0.34% SER2 = 0.34%  
Level = -71.9 dBm BER = 0.00% PER = 0.07% SER1 = 0.07% SER2 = 0.07%  
Level = -72.4 dBm BER = 0.00% PER = 0.15% SER1 = 0.15% SER2 = 0.15%  
Level = -72.2 dBm BER = 0.00% PER = 0.12% SER1 = 0.12% SER2 = 0.12%  
Level = -72.0 dBm BER = 0.00% PER = 0.05% SER1 = 0.05% SER2 = 0.05%

J/S = -13.80 dB (SER = 0.07%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = -150 kHz

Level = -71.9 dBm BER = 0.00% PER = 0.00% SER1 = 0.00% SER2 = 0.00%  
Level = -73.9 dBm BER = 0.00% PER = 0.03% SER1 = 0.02% SER2 = 0.02%  
Level = -75.9 dBm BER = 0.01% PER = 0.83% SER1 = 0.82% SER2 = 0.82%  
Level = -74.9 dBm BER = 0.00% PER = 0.16% SER1 = 0.16% SER2 = 0.16%  
Level = -73.9 dBm BER = 0.00% PER = 0.03% SER1 = 0.02% SER2 = 0.02%  
Level = -74.4 dBm BER = 0.00% PER = 0.08% SER1 = 0.07% SER2 = 0.07%  
Level = -74.9 dBm BER = 0.00% PER = 0.18% SER1 = 0.18% SER2 = 0.18%

Level = -74.7 dBm BER = 0.00% PER = 0.10% SER1 = 0.10% SER2 = 0.10%

J/S = -11.00 dB (SER = 0.10%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = -100 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -74.7 dBm | BER = 0.00% | PER = 0.00% | SER1 = 0.00% | SER2 = 0.00% |
| Level = -76.7 dBm | BER = 0.00% | PER = 0.05% | SER1 = 0.05% | SER2 = 0.05% |
| Level = -78.7 dBm | BER = 0.01% | PER = 2.05% | SER1 = 2.01% | SER2 = 2.01% |
| Level = -77.7 dBm | BER = 0.00% | PER = 0.30% | SER1 = 0.30% | SER2 = 0.30% |
| Level = -76.7 dBm | BER = 0.00% | PER = 0.06% | SER1 = 0.06% | SER2 = 0.06% |
| Level = -77.2 dBm | BER = 0.00% | PER = 0.13% | SER1 = 0.12% | SER2 = 0.12% |
| Level = -77.0 dBm | BER = 0.00% | PER = 0.08% | SER1 = 0.07% | SER2 = 0.07% |

J/S = -8.70 dB (SER = 0.07%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = -50 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -77.0 dBm | BER = 0.00% | PER = 0.00% | SER1 = 0.00% | SER2 = 0.00% |
| Level = -79.0 dBm | BER = 0.00% | PER = 0.00% | SER1 = 0.00% | SER2 = 0.00% |
| Level = -81.0 dBm | BER = 0.01% | PER = 0.05% | SER1 = 0.05% | SER2 = 0.05% |
| Level = -83.0 dBm | BER = 0.16% | PER = 0.73% | SER1 = 0.72% | SER2 = 0.72% |
| Level = -82.0 dBm | BER = 0.03% | PER = 0.26% | SER1 = 0.26% | SER2 = 0.26% |
| Level = -81.0 dBm | BER = 0.01% | PER = 0.06% | SER1 = 0.06% | SER2 = 0.06% |
| Level = -81.5 dBm | BER = 0.02% | PER = 0.13% | SER1 = 0.13% | SER2 = 0.13% |
| Level = -81.3 dBm | BER = 0.02% | PER = 0.11% | SER1 = 0.11% | SER2 = 0.11% |
| Level = -81.1 dBm | BER = 0.04% | PER = 0.06% | SER1 = 0.06% | SER2 = 0.06% |

J/S = -4.60 dB (SER = 0.06%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = +0 kHz

|                   |             |              |               |               |
|-------------------|-------------|--------------|---------------|---------------|
| Level = -68.7 dBm | BER = 0.00% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -70.7 dBm | BER = 0.00% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -72.7 dBm | BER = 0.00% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -74.7 dBm | BER = 0.00% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -76.7 dBm | BER = 0.00% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -78.7 dBm | BER = 0.00% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -80.7 dBm | BER = 0.01% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -82.7 dBm | BER = 0.04% | PER = 0.04%  | SER1 = 0.03%  | SER2 = 0.03%  |
| Level = -84.7 dBm | BER = 7.51% | PER = 48.26% | SER1 = 27.11% | SER2 = 28.05% |
| Level = -83.7 dBm | BER = 0.31% | PER = 1.01%  | SER1 = 0.86%  | SER2 = 0.86%  |
| Level = -82.7 dBm | BER = 0.05% | PER = 0.24%  | SER1 = 0.18%  | SER2 = 0.18%  |
| Level = -81.7 dBm | BER = 0.01% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -82.2 dBm | BER = 0.02% | PER = 0.13%  | SER1 = 0.10%  | SER2 = 0.10%  |
| Level = -82.0 dBm | BER = 0.02% | PER = 2.31%  | SER1 = 2.24%  | SER2 = 2.24%  |
| Level = -81.8 dBm | BER = 0.02% | PER = 0.06%  | SER1 = 0.05%  | SER2 = 0.05%  |

J/S = -3.90 dB (SER = 0.05%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = +50 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -81.8 dBm | BER = 0.11% | PER = 0.02% | SER1 = 0.02% | SER2 = 0.02% |
| Level = -83.8 dBm | BER = 0.68% | PER = 2.16% | SER1 = 1.82% | SER2 = 1.82% |
| Level = -82.8 dBm | BER = 0.28% | PER = 0.35% | SER1 = 0.29% | SER2 = 0.29% |
| Level = -81.8 dBm | BER = 0.09% | PER = 0.02% | SER1 = 0.02% | SER2 = 0.02% |
| Level = -82.3 dBm | BER = 0.15% | PER = 0.25% | SER1 = 0.22% | SER2 = 0.22% |
| Level = -82.1 dBm | BER = 0.12% | PER = 0.09% | SER1 = 0.07% | SER2 = 0.07% |

J/S = -3.60 dB (SER = 0.07%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = +100 kHz

|                   |             |              |               |               |
|-------------------|-------------|--------------|---------------|---------------|
| Level = -82.1 dBm | BER = 1.55% | PER = 15.88% | SER1 = 13.44% | SER2 = 13.51% |
| Level = -80.1 dBm | BER = 0.28% | PER = 5.78%  | SER1 = 5.47%  | SER2 = 5.47%  |
| Level = -78.1 dBm | BER = 0.03% | PER = 0.09%  | SER1 = 0.09%  | SER2 = 0.09%  |

J/S = -7.60 dB (SER = 0.09%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = +150 kHz

|                   |             |              |               |               |
|-------------------|-------------|--------------|---------------|---------------|
| Level = -78.1 dBm | BER = 0.41% | PER = 13.58% | SER1 = 11.96% | SER2 = 12.16% |
| Level = -76.1 dBm | BER = 0.09% | PER = 0.42%  | SER1 = 0.42%  | SER2 = 0.42%  |
| Level = -74.1 dBm | BER = 0.00% | PER = 0.00%  | SER1 = 0.00%  | SER2 = 0.00%  |
| Level = -75.1 dBm | BER = 0.01% | PER = 0.02%  | SER1 = 0.02%  | SER2 = 0.02%  |
| Level = -76.1 dBm | BER = 0.04% | PER = 0.41%  | SER1 = 0.41%  | SER2 = 0.41%  |
| Level = -75.6 dBm | BER = 0.03% | PER = 0.10%  | SER1 = 0.10%  | SER2 = 0.10%  |

J/S = -10.10 dB (SER = 0.10%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = +200 kHz

|                   |             |             |              |              |
|-------------------|-------------|-------------|--------------|--------------|
| Level = -75.6 dBm | BER = 0.26% | PER = 7.53% | SER1 = 7.00% | SER2 = 7.00% |
| Level = -73.6 dBm | BER = 0.02% | PER = 0.17% | SER1 = 0.17% | SER2 = 0.17% |
| Level = -71.6 dBm | BER = 0.00% | PER = 0.00% | SER1 = 0.00% | SER2 = 0.00% |
| Level = -72.6 dBm | BER = 0.00% | PER = 0.03% | SER1 = 0.03% | SER2 = 0.03% |
| Level = -73.6 dBm | BER = 0.02% | PER = 0.14% | SER1 = 0.14% | SER2 = 0.14% |
| Level = -73.1 dBm | BER = 0.01% | PER = 0.04% | SER1 = 0.04% | SER2 = 0.04% |
| Level = -73.3 dBm | BER = 0.01% | PER = 0.05% | SER1 = 0.05% | SER2 = 0.05% |
| Level = -73.5 dBm | BER = 0.03% | PER = 0.09% | SER1 = 0.09% | SER2 = 0.09% |

J/S = -12.20 dB (SER = 0.09%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = +250 kHz

Level = -73.5 dBm BER = 0.25% PER = 3.58% SER1 = 3.46% SER2 = 3.46%  
 Level = -71.5 dBm BER = 0.01% PER = 0.03% SER1 = 0.03% SER2 = 0.03%  
 Level = -72.5 dBm BER = 0.06% PER = 0.57% SER1 = 0.57% SER2 = 0.57%  
 Level = -72.0 dBm BER = 0.02% PER = 0.12% SER1 = 0.12% SER2 = 0.12%  
 Level = -71.5 dBm BER = 0.01% PER = 0.04% SER1 = 0.04% SER2 = 0.04%  
 Level = -71.7 dBm BER = 0.01% PER = 0.05% SER1 = 0.05% SER2 = 0.05%  
 Level = -71.9 dBm BER = 0.02% PER = 0.10% SER1 = 0.10% SER2 = 0.10%

J/S = -14.00 dB (SER = 0.05%)

Signal Freq = 2.432 GHz  
 Jammer Level = -85.7 dBm  
 Jammer Offset = +300 kHz

Level = -71.7 dBm BER = 0.08% PER = 0.10% SER1 = 0.10% SER2 = 0.10%

J/S = -14.00 dB (SER = 0.10%)

Signal Freq = 2.432 GHz  
 Jammer Level = -85.7 dBm  
 Jammer Offset = +350 kHz

Level = -71.7 dBm BER = 0.25% PER = 1.43% SER1 = 1.41% SER2 = 1.41%  
 Level = -69.7 dBm BER = 0.02% PER = 0.03% SER1 = 0.02% SER2 = 0.02%  
 Level = -70.7 dBm BER = 0.08% PER = 0.14% SER1 = 0.14% SER2 = 0.14%  
 Level = -70.2 dBm BER = 0.03% PER = 0.74% SER1 = 0.74% SER2 = 0.74%  
 Level = -69.7 dBm BER = 0.02% PER = 0.02% SER1 = 0.02% SER2 = 0.02%  
 Level = -69.9 dBm BER = 0.02% PER = 0.03% SER1 = 0.02% SER2 = 0.02%  
 Level = -70.1 dBm BER = 0.03% PER = 0.03% SER1 = 0.03% SER2 = 0.03%  
 Level = -70.3 dBm BER = 0.03% PER = 0.06% SER1 = 0.06% SER2 = 0.06%  
 Level = -70.5 dBm BER = 0.06% PER = 0.13% SER1 = 0.13% SER2 = 0.13%

J/S = -15.40 dB (SER = 0.06%)

Signal Freq = 2.432 GHz  
 Jammer Level = -85.7 dBm  
 Jammer Offset = +400 kHz

Level = -70.3 dBm BER = 0.07% PER = 0.05% SER1 = 0.05% SER2 = 0.05%  
 Level = -72.3 dBm BER = 1.28% PER = 4.62% SER1 = 4.42% SER2 = 4.42%  
 Level = -71.3 dBm BER = 0.24% PER = 0.48% SER1 = 0.47% SER2 = 0.47%  
 Level = -70.3 dBm BER = 0.06% PER = 0.06% SER1 = 0.06% SER2 = 0.06%  
 Level = -70.8 dBm BER = 0.12% PER = 0.15% SER1 = 0.15% SER2 = 0.15%  
 Level = -70.6 dBm BER = 0.11% PER = 0.08% SER1 = 0.08% SER2 = 0.08%

J/S = -15.10 dB (SER = 0.08%)

Signal Freq = 2.432 GHz  
 Jammer Level = -85.7 dBm  
 Jammer Offset = +450 kHz

Level = -70.6 dBm BER = 0.17% PER = 0.11% SER1 = 0.11% SER2 = 0.11%  
 Level = -68.6 dBm BER = 0.01% PER = 0.00% SER1 = 0.00% SER2 = 0.00%  
 Level = -69.6 dBm BER = 0.04% PER = 0.00% SER1 = 0.00% SER2 = 0.00%

Level = -70.6 dBm BER = 0.17% PER = 0.08% SER1 = 0.07% SER2 = 0.07%  
Level = -71.6 dBm BER = 0.60% PER = 0.70% SER1 = 0.69% SER2 = 0.69%  
Level = -71.1 dBm BER = 0.31% PER = 0.30% SER1 = 0.29% SER2 = 0.29%  
Level = -70.6 dBm BER = 0.19% PER = 0.11% SER1 = 0.11% SER2 = 0.11%  
Level = -70.1 dBm BER = 0.09% PER = 0.03% SER1 = 0.02% SER2 = 0.02%  
Level = -70.3 dBm BER = 0.10% PER = 0.05% SER1 = 0.05% SER2 = 0.05%  
Level = -70.5 dBm BER = 0.16% PER = 0.06% SER1 = 0.06% SER2 = 0.06%  
Level = -70.7 dBm BER = 0.20% PER = 0.05% SER1 = 0.05% SER2 = 0.05%  
Level = -70.9 dBm BER = 0.26% PER = 0.15% SER1 = 0.15% SER2 = 0.15%

J/S = -15.10 dB (SER = 0.07%)

Signal Freq = 2.432 GHz  
Jammer Level = -85.7 dBm  
Jammer Offset = +500 kHz

Level = -68.7 dBm BER = 0.01% PER = 0.00% SER1 = 0.00% SER2 = 0.00%  
Level = -70.7 dBm BER = 0.12% PER = 0.19% SER1 = 0.19% SER2 = 0.19%  
Level = -69.7 dBm BER = 0.03% PER = 0.01% SER1 = 0.01% SER2 = 0.01%  
Level = -70.2 dBm BER = 0.07% PER = 0.12% SER1 = 0.12% SER2 = 0.12%  
Level = -70.0 dBm BER = 0.04% PER = 0.06% SER1 = 0.06% SER2 = 0.06%

J/S = -15.70 dB (SER = 0.06%)