

**SkyWay FCC Processing Gain Measurement:
Addendum B**

Processing gain measurement at 2Mbit/s data rate

**Solectek Corporation
FCC ID: KA324WAN5**

**Author: Lon Christensen
Date: March 15, 2000**

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Revision List

Revision.....	Date
Original Draft	March15,2000

B. Processing gain measurement at 2Mbit/s data rate

B.1 Minimum allowable J/S ratio

As detailed in Addendum B, the minimum allowable jamming margin (M_J) for the system is re-calculated below:

$$\begin{aligned}
 G_P &= \frac{E_s}{N_0} + M_J + L_{SYS} \geq 10\text{dB} \\
 &= 13.3\text{dB} + M_J + 2\text{dB} \geq 10\text{dB} \\
 &\quad M_J \geq -5.3\text{dB}
 \end{aligned}$$

The minimum allowable Jamming to Signal ratio (J/S) is **-5.3dB** when measured during a 2Mbit/s link.

B.2 Test Setup

The test setup is identical to the 11Mbit/s Processing gain test detailed in Section 2 of the document "Test Report of SkyWay FCC Processing Gain Measurement". The desired link will be comprised of 1530 byte frames at a data rate of 2Mbit/s.

B.3 Test result data tables

System Bandwidth = $f_{\text{center}} \pm 6\text{MHz}$ (6000kHz = 120 x 50kHz)
 System Channel = 2442MHz
 System Data Rate = 2Mbit/s

Frequency (MHz)	Frequency Offset (kHz)	J (dBm)	S (dBm)	J/S (dB)
2436.00	-120x 50	-60.0	-60.0	0.0
2436.05	-119x 50	-60.0	-60.0	0.0
2436.10	-118x 50	-59.9	-60.0	0.1
2436.15	-117x 50	-60.0	-60.0	0.0
2436.20	-116x 50	-60.0	-60.0	0.0
2436.25	-115x 50	-60.0	-60.0	0.0
2436.30	-114x 50	-59.9	-60.0	0.1
2436.35	-113x 50	-59.8	-60.0	0.2
2436.40	-112x 50	-59.5	-60.0	0.5
2436.45	-111x 50	-59.7	-60.0	0.3
2436.50	-110x 50	-59.5	-60.0	0.5
2436.55	-109x 50	-59.5	-60.0	0.5
2436.60	-108x 50	-59.6	-60.0	0.4
2436.65	-107x 50	-59.7	-60.0	0.3
2436.70	-106x 50	-59.7	-60.0	0.3
2436.75	-105x 50	-59.8	-60.0	0.2
2436.80	-104x 50	-59.9	-60.0	0.1
2436.85	-103x 50	-59.9	-60.0	0.1
2436.90	-102x 50	-60.2	-60.0	-0.2
2436.95	-101x 50	-60.2	-60.0	-0.2
2437.00	-100x 50	-60.9	-60.0	-0.9
2437.05	-99x 50	-61.1	-60.0	-1.1
2437.10	-98x 50	-61.2	-60.0	-1.2
2437.15	-97x 50	-61.4	-60.0	-1.4
2437.20	-96x 50	-61.5	-60.0	-1.5
2437.25	-95x 50	-61.6	-60.0	-1.6
2437.30	-94x 50	-61.6	-60.0	-1.6
2437.35	-93x 50	-61.4	-60.0	-1.4
2437.40	-92x 50	-61.3	-60.0	-1.3
2437.45	-91x 50	-61.2	-60.0	-1.2
2437.50	-90x 50	-60.9	-60.0	-0.9
2437.55	-89x 50	-61.0	-60.0	-1.0
2437.60	-88x 50	-61.0	-60.0	-1.0
2437.65	-87x 50	-60.9	-60.0	-0.9
2437.70	-86x 50	-61.0	-60.0	-1.0
2437.75	-85x 50	-60.9	-60.0	-0.9
2437.80	-84x 50	-60.9	-60.0	-0.9
2437.85	-83x 50	-60.9	-60.0	-0.9
2437.90	-82x 50	-61.0	-60.0	-1.0
2437.95	-81x 50	-61.2	-60.0	-1.2
2438.00	-80x 50	-61.2	-60.0	-1.2

Table B.1.1 - J/S values for ($f_{\text{center}} - 120 \times 50\text{kHz}$) to ($f_{\text{center}} - 80 \times 50\text{kHz}$)

System Bandwidth = $f_{\text{center}} \pm 6\text{MHz}$ (6000kHz = 120 x 50kHz)
 System Channel = 2442MHz
 System Data Rate = 2Mbit/s

2438.00	-80x 50	-61.1	-60.0	-1.1
2438.05	-79x 50	-61.3	-60.0	-1.3
2438.10	-78x 50	-61.4	-60.0	-1.4
2438.15	-77x 50	-61.4	-60.0	-1.4
2438.20	-76x 50	-61.3	-60.0	-1.3
2438.25	-75x 50	-61.4	-60.0	-1.4
2438.30	-74x 50	-61.4	-60.0	-1.4
2438.35	-73x 50	-61.4	-60.0	-1.4
2438.40	-72x 50	-61.4	-60.0	-1.4
2438.45	-71x 50	-61.4	-60.0	-1.4
2438.50	-70x 50	-61.2	-60.0	-1.2
2438.55	-69x 50	-61.2	-60.0	-1.2
2438.60	-68x 50	-61.2	-60.0	-1.2
2438.65	-67x 50	-60.8	-60.0	-0.8
2438.70	-66x 50	-60.9	-60.0	-0.9
2438.75	-65x 50	-60.9	-60.0	-0.9
2438.80	-64x 50	-60.9	-60.0	-0.9
2438.85	-63x 50	-60.9	-60.0	-0.9
2438.90	-62x 50	-61.1	-60.0	-1.1
2438.95	-61x 50	-61.3	-60.0	-1.3
2439.00	-60x 50	-61.3	-60.1	-1.2
2439.05	-59x 50	-61.3	-60.1	-1.2
2439.10	-58x 50	-61.4	-60.1	-1.3
2439.15	-57x 50	-61.5	-60.1	-1.4
2439.20	-56x 50	-61.8	-60.1	-1.7
2439.25	-55x 50	-61.8	-60.1	-1.7
2439.30	-54x 50	-61.7	-60.1	-1.6
2439.35	-53x 50	-61.5	-60.1	-1.4
2439.40	-52x 50	-61.5	-60.1	-1.4
2439.45	-51x 50	-61.9	-60.1	-1.8
2439.50	-50x 50	-62.0	-60.1	-1.9
2439.55	-49x 50	-61.8	-60.1	-1.7
2439.60	-48x 50	-61.5	-60.1	-1.4
2439.65	-47x 50	-61.1	-60.1	-1.0
2439.70	-46x 50	-60.6	-60.1	-0.5
2439.75	-45x 50	-60.7	-60.1	-0.6
2439.80	-44x 50	-60.9	-60.1	-0.8
2439.85	-43x 50	-61.2	-60.1	-1.1
2439.90	-42x 50	-61.5	-60.1	-1.4
2439.95	-41x 50	-61.7	-60.1	-1.6
2440.00	-40x 50	-61.7	-60.1	-1.6

Table B.1.2 - J/S values for ($f_{\text{center}} - 80 \times 50\text{kHz}$) to ($f_{\text{center}} - 40 \times 50\text{kHz}$)

System Bandwidth = $f_{\text{center}} \pm 6\text{MHz}$ (6000kHz = 120 x 50kHz)
 System Channel = 2442MHz
 System Data Rate = 2Mbit/s

2440.00	-40x 50	-61.7	-60.1	-1.6
2440.05	-39x 50	-61.9	-60.1	-1.8
2440.10	-38x 50	-62.2	-60.1	-2.1
2440.15	-37x 50	-62.2	-60.1	-2.1
2440.20	-36x 50	-62.2	-60.1	-2.1
2440.25	-35x 50	-62.3	-60.1	-2.2
2440.30	-34x 50	-62.2	-60.1	-2.1
2440.35	-33x 50	-62.0	-60.1	-1.9
2440.40	-32x 50	-61.9	-60.1	-1.8
2440.45	-31x 50	-61.8	-60.1	-1.7
2440.50	-30x 50	-61.4	-60.1	-1.3
2440.55	-29x 50	-61.4	-60.1	-1.3
2440.60	-28x 50	-61.0	-60.1	-0.9
2440.65	-27x 50	-60.9	-60.1	-0.8
2440.70	-26x 50	-60.9	-60.1	-0.8
2440.75	-25x 50	-61.0	-60.1	-0.9
2440.80	-24x 50	-61.2	-60.1	-1.1
2440.85	-23x 50	-61.3	-60.1	-1.2
2440.90	-22x 50	-61.5	-60.1	-1.4
2440.95	-21x 50	-61.7	-60.1	-1.6
2441.00	-20x 50	-61.8	-60.1	-1.7
2441.05	-19x 50	-61.7	-60.1	-1.6
2441.10	-18x 50	-61.6	-60.1	-1.5
2441.15	-17x 50	-61.5	-60.1	-1.4
2441.20	-16x 50	-61.7	-60.1	-1.6
2441.25	-15x 50	-62.1	-60.1	-2.0
2441.30	-14x 50	-62.2	-60.1	-2.1
2441.35	-13x 50	-62.0	-60.1	-1.9
2441.40	-12x 50	-61.9	-60.1	-1.8
2441.45	-11x 50	-61.7	-60.1	-1.6
2441.50	-10x 50	-61.4	-60.1	-1.3
2441.55	-9x 50	-61.6	-60.1	-1.5
2441.60	-8x 50	-61.7	-60.1	-1.6
2441.65	-7x 50	-61.9	-60.1	-1.8
2441.70	-6x 50	-62.0	-60.1	-1.9
2441.75	-5x 50	-62.1	-60.1	-2.0
2441.80	-4x 50	-62.3	-60.1	-2.2
2441.85	-3x 50	-62.4	-60.1	-2.3
2441.90	-2x 50	-62.3	-60.1	-2.2
2441.95	-1x 50	-63.1	-60.1	-3.0
2442.00	0x 50	-62.4	-60.1	-2.3

Table B.1.3 - J/S values for ($f_{\text{center}} - 40 \times 50\text{kHz}$) to ($f_{\text{center}} - 0 \times 50\text{kHz}$)

System Bandwidth = $f_{\text{center}} \pm 6\text{MHz}$ (6000kHz = 120 x 50kHz)
 System Channel = 2442MHz
 System Data Rate = 2Mbit/s

2442.00	0 x 50	-62.4	-60.1	-2.3
2442.05	+1 x 50	-62.3	-60.1	-2.2
2442.10	+2 x 50	-62.2	-60.1	-2.1
2442.15	+3 x 50	-62.1	-60.1	-2.0
2442.20	+4 x 50	-61.9	-60.1	-1.8
2442.25	+5 x 50	-61.6	-60.1	-1.5
2442.30	+6 x 50	-61.4	-60.1	-1.3
2442.35	+7 x 50	-61.2	-60.1	-1.1
2442.40	+8 x 50	-61.1	-60.1	-1.0
2442.45	+9 x 50	-61.0	-60.1	-0.9
2442.50	+10 x 50	-61.2	-60.1	-1.1
2442.55	+11 x 50	-61.8	-60.1	-1.7
2442.60	+12 x 50	-62.0	-60.1	-1.9
2442.65	+13 x 50	-62.2	-60.1	-2.1
2442.70	+14 x 50	-61.9	-60.1	-1.8
2442.75	+15 x 50	-61.7	-60.1	-1.6
2442.80	+16 x 50	-61.5	-60.1	-1.4
2442.85	+17 x 50	-61.5	-60.1	-1.4
2442.90	+18 x 50	-61.5	-60.1	-1.4
2442.95	+19 x 50	-61.3	-60.1	-1.2
2443.00	+20 x 50	-61.0	-60.2	-0.8
2443.05	+21 x 50	-60.8	-60.2	-0.6
2443.10	+22 x 50	-60.8	-60.2	-0.6
2443.15	+23 x 50	-60.7	-60.2	-0.5
2443.20	+24 x 50	-60.7	-60.2	-0.5
2443.25	+25 x 50	-60.6	-60.2	-0.4
2443.30	+26 x 50	-60.7	-60.2	-0.5
2443.35	+27 x 50	-60.7	-60.2	-0.5
2443.40	+28 x 50	-60.9	-60.2	-0.7
2443.45	+29 x 50	-61.2	-60.2	-1.0
2443.50	+30 x 50	-61.2	-60.2	-1.0
2443.55	+31 x 50	-61.5	-60.2	-1.3
2443.60	+32 x 50	-61.5	-60.2	-1.3
2443.65	+33 x 50	-61.5	-60.2	-1.3
2443.70	+34 x 50	-61.6	-60.2	-1.4
2443.75	+35 x 50	-61.6	-60.2	-1.4
2443.80	+36 x 50	-61.4	-60.2	-1.2
2443.85	+37 x 50	-61.5	-60.2	-1.3
2443.90	+38 x 50	-61.4	-60.2	-1.2
2443.95	+39 x 50	-61.2	-60.2	-1.0
2444.00	+40 x 50	-61.1	-60.2	-0.9

Table B.1.4 - J/S values for ($f_{\text{center}} + 0 \times 50\text{kHz}$) to ($f_{\text{center}} + 40 \times 50\text{kHz}$)

System Bandwidth = $f_{\text{center}} \pm 6\text{MHz}$ (6000kHz = 120 x 50kHz)
 System Channel = 2442MHz
 System Data Rate = 2Mbit/s

2444.00	+40 x 50	-61.1	-60.2	-0.9
2444.05	+41 x 50	-61.7	-60.2	-1.5
2444.10	+42 x 50	-60.7	-60.2	-0.5
2444.15	+43 x 50	-60.5	-60.2	-0.3
2444.20	+44 x 50	-60.3	-60.2	-0.1
2444.25	+45 x 50	-60.3	-60.2	-0.1
2444.30	+46 x 50	-60.4	-60.2	-0.2
2444.35	+47 x 50	-60.6	-60.2	-0.4
2444.40	+48 x 50	-60.9	-60.2	-0.7
2444.45	+49 x 50	-61.2	-60.2	-1.0
2444.50	+50 x 50	-61.0	-60.2	-0.8
2444.55	+51 x 50	-61.0	-60.2	-0.8
2444.60	+52 x 50	-61.1	-60.2	-0.9
2444.65	+53 x 50	-61.1	-60.2	-0.9
2444.70	+54 x 50	-61.4	-60.2	-1.2
2444.75	+55 x 50	-61.4	-60.2	-1.2
2444.80	+56 x 50	-61.4	-60.2	-1.2
2444.85	+57 x 50	-60.9	-60.2	-0.7
2444.90	+58 x 50	-60.9	-60.2	-0.7
2444.95	+59 x 50	-60.9	-60.2	-0.7
2445.00	+60 x 50	-60.9	-60.2	-0.7
2445.05	+61 x 50	-60.7	-60.2	-0.5
2445.10	+62 x 50	-60.7	-60.2	-0.5
2445.15	+63 x 50	-60.6	-60.2	-0.4
2445.20	+64 x 50	-60.6	-60.2	-0.4
2445.25	+65 x 50	-60.5	-60.2	-0.3
2445.30	+66 x 50	-60.5	-60.2	-0.3
2445.35	+67 x 50	-60.7	-60.2	-0.5
2445.40	+68 x 50	-60.8	-60.2	-0.6
2445.45	+69 x 50	-60.8	-60.2	-0.6
2445.50	+70 x 50	-60.8	-60.2	-0.6
2445.55	+71 x 50	-60.9	-60.2	-0.7
2445.60	+72 x 50	-60.9	-60.2	-0.7
2445.65	+73 x 50	-60.9	-60.2	-0.7
2445.70	+74 x 50	-60.8	-60.2	-0.6
2445.75	+75 x 50	-60.8	-60.2	-0.6
2445.80	+76 x 50	-60.7	-60.2	-0.5
2445.85	+77 x 50	-60.7	-60.2	-0.5
2445.90	+78 x 50	-60.7	-60.2	-0.5
2445.95	+79 x 50	-60.6	-60.2	-0.4
2446.00	+80 x 50	-60.3	-60.2	-0.1

Table B.1.5 - J/S values for ($f_{\text{center}} + 40 \times 50\text{kHz}$) to ($f_{\text{center}} + 80 \times 50\text{kHz}$)

System Bandwidth = $f_{\text{center}} \pm 6\text{MHz}$ (6000kHz = 120 x 50kHz)
 System Channel = 2442MHz
 System Data Rate = 2Mbit/s

2446.00	+80 x 50	-60.3	-60.2	-0.1
2446.05	+81 x 50	-60.3	-60.2	-0.1
2446.10	+82 x 50	-60.2	-60.2	0.0
2446.15	+83 x 50	-60.2	-60.2	0.0
2446.20	+84 x 50	-60.3	-60.2	-0.1
2446.25	+85 x 50	-60.5	-60.2	-0.3
2446.30	+86 x 50	-60.5	-60.2	-0.3
2446.35	+87 x 50	-60.6	-60.2	-0.4
2446.40	+88 x 50	-60.6	-60.2	-0.4
2446.45	+89 x 50	-60.7	-60.2	-0.5
2446.50	+90 x 50	-60.8	-60.2	-0.6
2446.55	+91 x 50	-61.2	-60.2	-1.0
2446.60	+92 x 50	-61.2	-60.2	-1.0
2446.65	+93 x 50	-61.3	-60.2	-1.1
2446.70	+94 x 50	-61.3	-60.2	-1.1
2446.75	+95 x 50	-61.4	-60.2	-1.2
2446.80	+96 x 50	-61.2	-60.2	-1.0
2446.85	+97 x 50	-61.1	-60.2	-0.9
2446.90	+98 x 50	-61.0	-60.2	-0.8
2446.95	+99 x 50	-60.8	-60.2	-0.6
2447.00	+100 x 50	-60.5	-60.3	-0.2
2447.05	+101 x 50	-60.0	-60.3	0.3
2447.10	+102 x 50	-59.6	-60.3	0.7
2447.15	+103 x 50	-59.4	-60.3	0.9
2447.20	+104 x 50	-59.3	-60.3	1.0
2447.25	+105 x 50	-59.2	-60.3	1.1
2447.30	+106 x 50	-59.2	-60.3	1.1
2447.35	+107 x 50	-59.1	-60.3	1.2
2447.40	+108 x 50	-59.1	-60.3	1.2
2447.45	+109 x 50	-59.4	-60.3	0.9
2447.50	+110 x 50	-59.2	-60.3	1.1
2447.55	+111 x 50	-59.3	-60.3	1.0
2447.60	+112 x 50	-59.4	-60.3	0.9
2447.65	+113 x 50	-59.4	-60.3	0.9
2447.70	+114 x 50	-59.5	-60.3	0.8
2447.75	+115 x 50	-59.7	-60.3	0.6
2447.80	+116 x 50	-59.8	-60.3	0.5
2447.85	+117 x 50	-59.8	-60.3	0.5
2447.90	+118 x 50	-59.8	-60.3	0.5
2447.95	+119 x 50	-59.9	-60.3	0.4
2448.00	+120 x 50	-60.0	-60.3	0.3

Table B.1.6 - J/S values for ($f_{\text{center}} + 80 \times 50\text{kHz}$) to ($f_{\text{center}} + 120 \times 50\text{kHz}$)

B.4 Summary J/S values

All the J/S values measured at the 2Mbit/s data rate are collected in Table B.2 and sorted in ascending order. The lowest 20% of the points are then discarded.

The remaining lowest J/S measurement is **-1.8dB**.

					Table 6
-1.6	-1.9	-3.0	-2.3	-1.5	-1.2
-1.6	-1.8	-2.3	-2.2	-1.2	-1.1
-1.5	-1.7	-2.3	-2.1	-1.2	-1.1
-1.4	-1.7	-2.2	-2.1	-1.2	-1.0
-1.4	-1.7	-2.2	-2.0	-1.0	-1.0
-1.3	-1.6	-2.2	-1.9	-0.9	-1.0
-1.2	-1.6	-2.1	-1.8	-0.9	-0.9
-1.2	-1.6	-2.1	-1.8	-0.9	-0.8
-1.2	-1.4	-2.1	-1.7	-0.8	-0.6
-1.2	-1.4	-2.1	-1.6	-0.8	-0.6
-1.1	-1.4	-2.1	-1.5	-0.7	-0.5
-1.0	-1.4	-2.0	-1.4	-0.7	-0.4
-1.0	-1.4	-2.0	-1.4	-0.7	-0.4
-1.0	-1.4	-1.9	-1.4	-0.7	-0.3
-1.0	-1.4	-1.9	-1.4	-0.7	-0.3
-0.9	-1.4	-1.9	-1.4	-0.7	-0.2
-0.9	-1.4	-1.8	-1.3	-0.7	-0.1
-0.9	-1.4	-1.8	-1.3	-0.7	-0.1
-0.9	-1.4	-1.8	-1.3	-0.6	-0.1
-0.9	-1.4	-1.8	-1.3	-0.6	0.0
-0.9	-1.3	-1.7	-1.3	-0.6	0.0
-0.2	-1.3	-1.7	-1.2	-0.6	0.3
-0.2	-1.3	-1.6	-1.2	-0.6	0.3
0.0	-1.3	-1.6	-1.2	-0.5	0.4
0.0	-1.2	-1.6	-1.1	-0.5	0.5
0.0	-1.2	-1.6	-1.1	-0.5	0.5
0.0	-1.2	-1.6	-1.0	-0.5	0.5
0.0	-1.2	-1.6	-1.0	-0.5	0.6
0.1	-1.2	-1.5	-1.0	-0.5	0.7
0.1	-1.1	-1.5	-1.0	-0.5	0.8
0.1	-1.1	-1.4	-0.9	-0.4	0.9
0.1	-1.1	-1.4	-0.9	-0.4	0.9
0.2	-1.0	-1.3	-0.8	-0.4	0.9
0.2	-0.9	-1.3	-0.7	-0.4	0.9
0.3	-0.9	-1.3	-0.6	-0.3	1.0
0.3	-0.9	-1.2	-0.6	-0.3	1.0
0.3	-0.9	-1.1	-0.5	-0.3	1.1
0.4	-0.8	-0.9	-0.5	-0.2	1.1
0.5	-0.8	-0.9	-0.5	-0.1	1.1
0.5	-0.6	-0.8	-0.5	-0.1	1.2
0.5	-0.5	-0.8	-0.4	-0.1	1.2

Table B.2 - J/S Values sorted in ascending order

B.5 Measured processing gain

Summary of processing gain figures:

$$E_s/N_0 = 13.3\text{dB} \text{ (Required energy per symbol - to - noise ratio)}$$

$$M_J = -1.8\text{dB} \text{ (Jamming margin, or J/S ratio)}$$

$$L_{\text{SYS}} = 2\text{dB} \text{ (System implementation loss)}$$

These values are used to determine the processing gain:

$$\begin{aligned} G_p &= 13.3\text{dB} + (-1.8\text{dB}) + 2\text{dB} \\ &= 13.5\text{dB} \end{aligned}$$

13.5dB of processing gain falls within the acceptable FCC limits required under part 15.247(e) rules.