Lucent Technologies
Bell Labs Innovations

WCND Utrecht B.V.

FCC ID: IMRWLPC24

TEST REPORT

Subject: **Processing Gain Lucent WaveLAN IEEE**

Ref: **FCC Rules 47 CFR Part 15, Section 5.247d**

Report Prepared by:

Maarten Visee — Name
Signature
December 11, 1997 — Date

Concurrence:

1. Director of Engineering

Bruce Tuch — Name
Signature
December 12, 199 — Date

2. Team Captain

Wilbert Smorenburg — Name
Signature
December 12, 1997 — Date

WaveLAN-II FCC Spreading Gain Measurements
FCCID: IMRWLPC24

1. Summary:

This document describes the Receiver Spreading Gain as measured for WaveLAN-II, according to Ref.[1].

2. Conclusion:

The Lucent WaveLAN-II NIC product confirms to the minimum required 10 dB processing gain, as set forth by the FCC for operation in the 2.4 GHz ISM band.

3. References:

1- Document FCC 97-114, Appendix C, Guidance on Measurements for Direct Sequence Spread Spectrum Systems.
2- Hardware Functional Specification for WaveLAN-II/PC Card type 2 extended, Doc. No. HFS-25018 Rev. C, Date 97/05/27, Source Organization Lucent Technologies WCND Utrecht.
3- Viterbi, A. J., Principles of Coherent Communications, New York, McGraw-Hill 1966.
4- Proakis, J.G., Digital Communications, New York, McGraw-Hill 1989, page 270.

4. Measurement description:

Part of the Lucent WaveLAN IEEE Network Interface Card (NIC) product FCC certification is a Processing Gain test. This test has to prove that the receiver of the tested product employs a true spread spectrum device receiver structure, taking full advantage of the direct sequence spread spectrum modulation technique.

This test proves the Receiver Processing Gain to be 10 dB or more, by monitoring the Bit Error Rate (BER) of the product under test while operating under strict specific received signal conditions.

This implies that a receiver input signal is applied to the product in the presence of a CW jammer. The CW jamming margin method as defined in Ref.[1] is used.

The test is such that it takes the theoretical calculated SNR for the applied modulation technique and specified BER as a reference. For coherent QPSK demodulation as applied in the WaveLAN IEEE product the theoretical required SNR for a BER of 10^-8 is 15 dB.

The test takes place at the product Functional Specification (Ref.[2]) specified conditions for BER rate measurements. It specifies a BER equal or better than 10^-8 at an receiver input level of -55 dBm. From reference [4], likewise as Ref.[3] consulted in Ref. [1], it is determined that for this BER the SNR (S/N)o equals 15 dB (QPSK, coherent detection).

To meet the minimum required processing gain of 10 dB, the receiver should meet the BER in the under a J/S ratio of:

10 - 15 = -5 dB.

Taking into account 2 dB implementation losses (Ref.[1]), a J/S ratio of -7 dB is calculated.

Thus, no received bit errors should be detected for a CW jammer level equal or less than:

-55 -7 = -62 dBm.

For received data errors detected while the CW jammer level is higher than -62 dBm, the J/S margin of -7 dB is exceeded, and are not taken into account.

Several methods of showing compliance to the rules are possible, from a stepped CW jammer to a continuous sweeping CW interferer. For this test the discrete stepped CW jammer method was chosen (Ref.[1]).

The measurements are performed at a 50 KHz CW raster. For each CW jammer frequency 10^8 bits are transmitted by the transmitter and received by the product under test.

Though it would be more elegant to show BER compliance for at least say ten times 10^8 transmitted/received bits, the time involved with this grows significantly. Since the CW interferer is stepped in a 50 KHz raster, covering the receiver bandwidth of 16 MHz, it is considered that the BER requirement is sufficiently met since such a multitude of measurements are taken.

The measurement time for each CW frequency is set by the transmitter message length and the number of messages transmitted per second.

For the firmware set data field length of 96 µS, which equals 192 data bits for the WaveLAN IEEE 2 Mbit/sec. data rate (unfortunately today message length is firmware limited), the number of messages that need to be transmitted for a total of 10^8 bits can be calculated.

The number of needed messages to transmit 10^8 bits equals 10^8/192 = 520833 messages.

For a Tx rate of 1.3 KHz, the measurement time is 520833*(1/1300)= 400 seconds.

4.1. Set-up:

See figure 1 for the measurement set-up. A transmitter transmitting continuously 1300 frames per is second is used as the data source for the receiver under test. The transmitter Tx mode is under external control by means of a pulse generator. The transmitted data pattern is fixed, and known at the receiver. This enables a check of the received data against the known transmitted data at the receiver side.

In addition to this signal, a CW jammer is added to the received signal at the receiver input. At the inter-connection between the RF circuits and the Digital Signal Processor (DSP)

the demodulated received RF signal is made available to an error checker. This error checker is a dedicated piece of hardware that monitors the received data, gating_out any other information that is likely to be present in the received data stream (message header, message length field, CRC field, diagnostic information field etc.). In this hardware the known transmitted data sequence and the received data sequence are compared to eachother, and possible errors are signalled to an external counter.

Both CW jammer generator and counter are under control of a Personal Computer by means of an IEEE-Instrument Control Bus. Using a dedicated test software program the PC sets the CW jammer frequency and level at the CW generator. The program controls the counter, i.e. counter start, stop, reset and read-out of the error count.

The test sequence is as follows:

The PC issues a CW frequency and output level to the CW generator, taken from an input command file. Thus the CW signal together with the transmitted data signal becomes present at the receiver input. Immediately after the counter is reset by the PC, there is a 30 second test time. For any received data error detected by the error checker hardware, the error counter is incremented by one. After these 30 seconds have elapsed, the PC reads the number of errors recorded at the counter. When no errors are detected, the PC increases the CW level by +1 dB, and the test is restarted (reset counter, measure 30 seconds, read counter value).
-When no errors are detected, the jammer level is increased by +1 dB, and the test is repeated.
-If errors are detected, the CW jammer level is lowered by 1 dB. For a more accurate measurement where 10^8 bits are being received, a 400 seconds test time is used to measure the BER. After this long test, the test data (time, frequency, CW level, #errors) is written to disc in the PC.

Any measurement for that CW frequency that is not performed due to the fact that errors were detected are stored with the numbers of errors marked as '-1'.

The test continues by raising the jammer frequency by 50 KHz and setting the CW jammer level to the start value, and the measurements are repeated as described above. Annex B shows a flowchart of this process.

Before measurements are started, the receiver input level and CW jammer level need to be calibrated. See figure 1 for the test set-up.

4.1.1. Receiver level calibration:

First, the receiver input level is calibrated using the RF power meter. For this purpose, the transmitter output attenuator is set to 0 dB, the CW jammer level is set to -90 dBm. Using the reading from the RF power meter, the attenuator is set such that the received level is -55 dBm.

4.1.2. CW level calibration:

Stop the transmitter, dial the output attenuator to 70 dB and stop the transmitter. The CW jammer generator output level is set to 0 dBm, and the RF power meter value is read. The difference in CW output level setting and RF power meter is the attenuation of the set-up. This is the correction factor that needs to be applied once the measurements results are known.

4.1.3. Test frequency:

Channel two (2417 MHz) was used for this test.

5. Equipment used:

# needed	Item	Description
1		Portable PC with WaveLAN-II NIC, Panasonic CF-V21P, SN-3JKSM01028, for transmitter.
1		Software 'NoHermes' is <thes.exe>, 9629 bytes, 6-30-97. Test software configuration file as given in Appendix D. Used for the transmitter.
1		Portable PC with WaveLAN-II NIC, NCR 3150, SN 1-26106224, for receiver.
1		Software 'Testware V2.04' <TW.EXE>, 27826 bytes, 11-18-97, for receiver testing.
2		WaveLAN IEEE NIC.
1		PC + IEEE interface card, NCR PC6, SN 17-17039925.
1		Received error checker, wire-wrap prototype, home-built.
1		Power supply, Delta D030-1, for error checker.
1		Error counter, HP 534B, SN 2973A08980.
1		Spectrum Analyzer, HP 9592B SN 3009U00102.
1		Power Meter, Rohde & Schwarz, Millivolt meter URV5, SN 893430/070
1		Power Sensor, Rhode & Schwarz, type NRV-Z2 828.3218.02, SN 860925/005.
1		Pulse generator, HP 8112A, SN2343G01166.
1		CW jammer generator, Gigatronics 7200, SN 746604.
1		Variable attenuator, 0-70 dB, Midwest Microwave, Model 1044.
1		Fixed attenuator, 10 resp. 20 dB, Inmet Corp., model 18AH-20 and 18AH-10.
2		RF power splitter, ARRA 3-9200-2, SN 2001, SN 2003
1		Misc. IEEE cabling
1		Misc. SMA cabling
1		Misc. BNC cabling for error counter
1		RF shielded cage

6. Measurement set_up:

See Figure 1, measurement test set-up. To avoid signal leakage and unwanted interference that can disrupt the measurement, the whole test is performed within the shielded RF cage, with the exception of the transmitter with variable and fixed attenuators. These are placed outside the cage. The fixed 30 dB attenuator assembly is placed at the RF feed-through connector in the shielded cage wall.

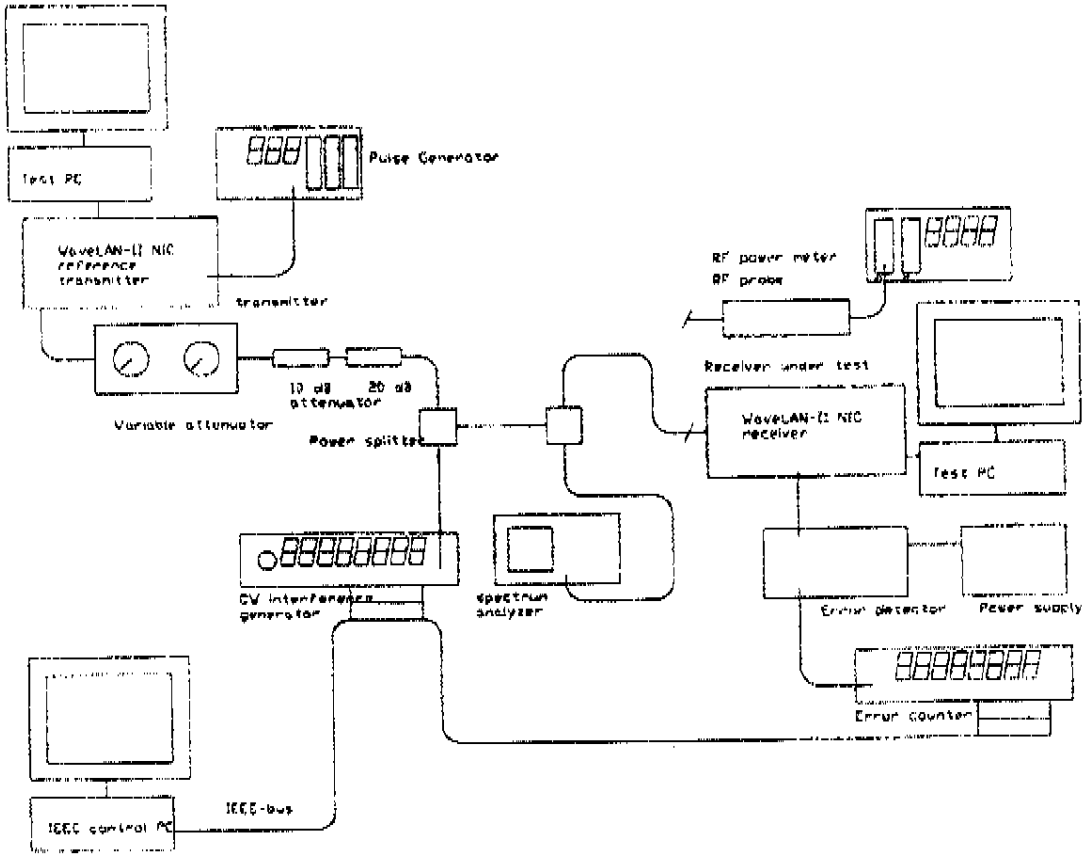

Figure 1. Measurement test set-up.

7. Measurement results:

Calibrations:

Receiver calibration: For 0 dB attenuator setting (variable and fixed = 0) the received level at the receiver input equals -3 dBm. Therefore, set the variable attenuator to 13 dB, and select the fixed attenuator for 30 dB attenuation.

CW jammer generator calibration: For a 0 dBm output level at the generator the received level at the receiver input is -8 dBm.

Spreading Gain Measurement Results:

Annex A lists the measurement results. For each frequency between Fc+/-8 MHz a BER measurement is taken.

Note that the J/S ration is given at the top of the table.

At each measurement frequency the jammer level is varied from -68 dBm to -60 dBm a the receiver input, yielding a J/S ratio of -13 to -5 dB.

As can be seen, for some measured CW jammer frequencies received data errors are detected.

Applying the rule of discarding the 20% worst-case jamming/signal points (see Ref.[1]) results in zero received errors (250 CW frequencies measured, at 45 CW frequencies a received data error was detected for a J/S ratio more than -7 dB, 45 < 20% * 250).

Therefore, a J/S ratio better or equal to -7 dB is found (CW = -62 dBm at receiver input).

Therefore the tested product complies to the required Processing Gain of 10 dB.

Annex A, FCC Spreading Gain Measurements Results, Lucent Confidential, ©1997

Annex A: Measurement results

Measurement file output name is: MEASRES.TXT
Input command file name is: INPUT.CMD
Input CW correction level: 8 dB

Number of received data errors as a function of frequency and interference level
Not measured combinations listed as "-1"

	Uncorrected interference level dialed at CW generator									Errors detected	Errors detected			
	True CW interference level at receiver input (dBm)									full test range	up to CW =< -62 dBm			
	-60	-59	-58	-57	-56	-55	-54	-53	-52					
	-68	-67	-66	-65	-64	-63	-62	-61	-60					
J/S ratio (dB)	-13	-12	-11	-10	-9	-8	-7	-6	-5			start time	stop time	date
Frequency (Hz)														
2411000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	0:52:24	0:59:07	12/1/97
2411050000	0	0	0	0	0	0	0	1	-1	Errors	0	0:41:00	0:47:42	12/1/97
2411100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	0:30:07	0:36:49	12/1/97
2411150000	0	0	0	0	0	0	1	1	-1	Errors	1	0:18:43	0:25:25	12/1/97
2411200000	1	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	0:07:49	0:14:31	12/1/97
2411250000	0	0	0	0	0	1	-1	-1	-1	Errors	1	0:00:02	0:06:44	12/1/97
2411300000	0	0	0	0	0	0	0	0	1	Errors	0	23:50:10	23:56:52	11/30/97
2411350000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	23:38:46	23:45:28	11/30/97
2411400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	23:27:22	23:34:04	11/30/97
2411450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	23:15:58	23:22:40	11/30/97
2411500000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	23:04:34	23:11:16	11/30/97
2411550000	0	0	0	0	0	0	0	0	1	Errors	0	22:53:10	22:59:53	11/30/97
2411600000	0	0	0	0	0	0	1	-1	-1	Errors	1	22:41:45	22:48:28	11/30/97
2411650000	0	0	0	0	0	0	0	0	1	Errors	0	22:31:23	22:38:06	11/30/97
2411700000	0	0	0	0	0	0	0	0	1	Errors	0	22:19:58	22:26:41	11/30/97
2411750000	0	0	0	0	0	0	0	0	1	Errors	0	22:08:34	22:15:16	11/30/97
2411800000	0	0	0	0	0	0	0	0	1	Errors	0	21:57:10	22:03:52	11/30/97
2411850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:45:46	21:52:28	11/30/97
2411900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:34:22	21:41:04	11/30/97
2411950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:22:58	21:29:40	11/30/97
2412000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:11:33	21:18:15	11/30/97
2412050000	0	0	0	0	0	0	0	0	1	Errors	0	21:00:09	21:06:51	11/30/97
2412100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:48:44	20:55:27	11/30/97

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2412150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:37:20	20:44:02	11/30/97
2412200000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:25:56	20:32:38	11/30/97
2412250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:14:32	20:21:14	11/30/97
2412300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:03:08	20:09:50	11/30/97
2412350000	0	0	0	0	1	-1	-1	-1	-1	Errors	1	19:51:43	19:58:26	11/30/97
2412400000	0	0	0	0	0	2	1	-1	-1	Errors	1	19:42:23	19:49:05	11/30/97
2412450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	19:32:01	19:38:43	11/30/97
2412500000	1	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	19:20:37	19:27:20	11/30/97
2412550000	0	1	1	-1	-1	-1	-1	-1	-1	Errors	1	19:12:50	19:19:32	11/30/97
2412600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	19:04:32	19:11:14	11/30/97
2412650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:53:08	18:59:50	11/30/97
2412700000	0	0	0	0	0	0	0	0	1	Errors	0	18:41:44	18:48:26	11/30/97
2412750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:30:20	18:37:03	11/30/97
2412800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:18:56	18:25:38	11/30/97
2412850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:07:31	18:14:13	11/30/97
2412900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	17:56:07	18:02:49	11/30/97
2412950000	0	0	0	1	1	-1	-1	-1	-1	Errors	1	17:44:43	17:51:25	11/30/97
2413000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:23:23	12:30:06	11/29/97
2413050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:34:47	12:41:29	11/29/97
2413100000	0	0	0	0	0	0	0	0	1	Errors	0	12:46:11	12:52:53	11/29/97
2413150000	0	0	0	0	0	1	-1	-1	-1	Errors	1	12:56:02	13:02:44	11/29/97
2413200000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:07:26	13:14:08	11/29/97
2413250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:16:50	13:23:32	11/29/97
2413300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:30:14	13:36:56	11/29/97
2413350000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:41:38	13:48:20	11/29/97
2413400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:53:02	13:59:44	11/29/97
2413450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:04:26	14:11:08	11/29/97
2413500000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:15:50	14:22:32	11/29/97
2413550000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:27:14	14:33:56	11/29/97
2413600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:38:38	14:45:20	11/29/97
2413650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:50:02	14:56:44	11/29/97
2413700000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:01:27	15:08:09	11/29/97
2413750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:12:51	15:19:33	11/29/97
2413800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:24:15	15:30:58	11/29/97
2413850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:35:39	15:42:21	11/29/97
2413900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:47:03	15:53:45	11/29/97
2413950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:58:27	16:05:09	11/29/97
2414000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:09:51	16:16:33	11/29/97

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2414050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:21:15	16:27:58	11/29/97
2414100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:32:39	16:39:21	11/29/97
2414150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:44:03	16:50:45	11/29/97
2414200000	0	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	16:51:50	16:58:32	11/29/97
2414250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	17:03:14	17:09:56	11/29/97
2414300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	17:14:38	17:21:20	11/29/97
2414350000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	17:26:02	17:32:44	11/29/97
2414400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	17:37:26	17:44:08	11/29/97
2414450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	17:48:51	17:55:34	11/29/97
2414500000	0	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	17:56:38	18:03:20	11/29/97
2414550000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:08:02	18:14:44	11/29/97
2414600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:19:26	18:26:09	11/29/97
2414650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:30:50	18:37:32	11/29/97
2414700000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:42:14	18:48:57	11/29/97
2414750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	18:53:38	19:00:20	11/29/97
2414800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	19:05:02	19:11:44	11/29/97
2414850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	19:16:26	19:23:08	11/29/97
2414900000	0	0	0	2	-1	-1	-1	-1	-1	Errors	1	19:25:15	19:31:57	11/29/97
2414950000	0	0	0	0	0	0	0	0	1	Errors	0	19:36:39	19:43:21	11/29/97
2415000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	19:48:03	19:54:45	11/29/97
2415050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	19:59:27	20:06:09	11/29/97
2415100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:10:51	20:17:34	11/29/97
2415150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:22:15	20:28:57	11/29/97
2415200000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:33:40	20:40:23	11/29/97
2415250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:45:05	20:51:48	11/29/97
2415300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	20:56:29	21:03:11	11/29/97
2415350000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:07:53	21:14:35	11/29/97
2415400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:19:17	21:26:00	11/29/97
2415450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:30:41	21:37:23	11/29/97
2415500000	0	1	1	-1	-1	-1	-1	-1	-1	Errors	1	21:38:59	21:45:42	11/29/97
2415550000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	21:50:23	21:57:05	11/29/97
2415600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	22:01:47	22:08:29	11/29/97
2415650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	22:13:11	22:19:54	11/29/97
2415700000	0	0	0	0	0	0	0	0	1	Errors	0	22:24:35	22:31:17	11/29/97
2415750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	22:35:59	22:42:41	11/29/97
2415800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	22:47:23	22:54:06	11/29/97
2415850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	22:58:47	23:05:29	11/29/97
2415900000	0	0	0	0	0	1	-1	-1	-1	Errors	1	23:08:38	23:15:21	11/29/97

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2415950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	23:20:03	23:26:46	11/29/97
2416000000	0	0	0	0	0	0	0	0	1	Errors	0	23:31:27	23:38:09	11/29/97
2416050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	23:42:51	23:49:34	11/29/97
2416100000	0	-1	-1	-1	-1	-1	-1	-1	-1	Errors	1	23:50:07	23:56:49	11/29/97
2416150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	0:01:31	0:08:13	11/30/97
2416200000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	0:12:55	0:19:37	11/30/97
2416250000	0	0	0	0	0	0	0	0	1	Errors	0	0:24:19	0:31:01	11/30/97
2416300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	0:35:43	0:42:26	11/30/97
2416350000	1	-1	-1	-1	-1	-1	-1	-1	-1	Errors	1	0:42:59	0:49:42	11/30/97
2416400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	0:54:23	1:01:05	11/30/97
2416450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	1:05:47	1:12:30	11/30/97
2416500000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	1:17:11	1:23:53	11/30/97
2416550000	0	0	0	0	0	0	0	0	1	Errors	0	1:28:35	1:35:17	11/30/97
2416600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	1:39:59	1:46:42	11/30/97
2416650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	1:51:23	1:58:05	11/30/97
2416700000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	2:02:48	2:09:31	11/30/97
2416750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	2:14:12	2:20:55	11/30/97
2416800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	2:25:36	2:32:18	11/30/97
2416850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	2:37:01	2:43:44	11/30/97
2416900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	2:48:25	2:55:07	11/30/97
2416950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	2:59:49	3:06:31	11/30/97
2417000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	3:11:13	3:17:56	11/30/97
2417050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	3:22:37	3:29:19	11/30/97
2417100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	3:34:02	3:40:45	11/30/97
2417150000	0	0	1	-1	-1	-1	-1	-1	-1	Errors	1	3:42:21	3:49:03	11/30/97
2417200000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	3:53:45	4:00:27	11/30/97
2417250000	0	0	0	0	0	0	0	0	1	Errors	0	4:05:09	4:11:51	11/30/97
2417300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	4:16:33	4:23:15	11/30/97
2417350000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	4:27:57	4:34:39	11/30/97
2417400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	4:39:21	4:46:03	11/30/97
2417450000	0	0	1	-1	-1	-1	-1	-1	-1	Errors	1	4:47:40	4:54:22	11/30/97
2417500000	0	0	0	1	1	-1	-1	-1	-1	Errors	1	4:57:00	5:03:43	11/30/97
2417550000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	5:08:24	5:15:06	11/30/97
2417600000	0	0	0	0	0	0	0	0	1	Errors	0	5:19:48	5:26:30	11/30/97
2417650000	0	0	0	0	0	0	0	0	1	Errors	0	5:31:12	5:37:54	11/30/97
2417700000	0	0	0	0	0	0	0	0	1	Errors	0	5:42:36	5:49:18	11/30/97
2417750000	0	0	0	0	0	0	0	0	1	Errors	0	5:54:00	6:00:42	11/30/97
2417800000	0	0	0	0	0	0	0	0	1	Errors	0	6:05:24	6:12:06	11/30/97

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2417850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	6:16:46	6:23:30	11/30/97
2417900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	6:28:12	6:34:55	11/30/97
2417950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	6:39:36	6:46:18	11/30/97
2418000000	0	0	0	1	-1	-1	-1	-1	-1	Errors	1	6:48:25	6:55:07	11/30/97
2418050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	6:59:49	7:06:31	11/30/97
2418100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	7:11:13	7:17:55	11/30/97
2418150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	7:22:37	7:29:19	11/30/97
2418200000	0	0	0	0	0	1	-1	-1	-1	Errors	1	7:32:30	7:39:13	11/30/97
2418250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	7:43:55	7:50:37	11/30/97
2418300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	7:55:19	8:02:01	11/30/97
2418350000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	8:06:43	8:13:25	11/30/97
2418400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	8:18:07	8:24:49	11/30/97
2418450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	8:29:31	8:36:13	11/30/97
2418500000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	8:40:55	8:47:37	11/30/97
2418550000	0	0	0	0	0	0	1	-1	-1	Errors	1	8:51:17	8:57:59	11/30/97
2418600000	0	0	0	0	0	0	1	-1	-1	Errors	1	9:01:39	9:08:22	11/30/97
2418650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	9:13:03	9:19:45	11/30/97
2418700000	0	-1	-1	-1	-1	-1	-1	-1	-1	Errors	1	9:20:19	9:27:02	11/30/97
2418750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	9:31:43	9:38:25	11/30/97
2418800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	9:43:07	9:49:49	11/30/97
2418850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	9:54:31	10:01:13	11/30/97
2418900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:05:55	10:12:37	11/30/97
2418950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:17:20	10:24:02	11/30/97
2419000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:28:44	10:35:27	11/30/97
2419050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:40:08	10:46:50	11/30/97
2419100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:51:33	10:58:16	11/30/97
2419150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:02:57	11:09:39	11/30/97
2419200000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:14:21	11:21:03	11/30/97
2419250000	0	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	11:22:08	11:28:51	11/30/97
2419300000	0	0	1	-1	-1	-1	-1	-1	-1	Errors	1	11:30:26	11:37:08	11/30/97
2419350000	0	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	11:38:13	11:44:56	11/30/97
2419400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:49:38	11:56:21	11/30/97
2419450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:01:02	12:07:44	11/30/97
2419500000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:12:27	12:19:10	11/30/97
2419550000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:23:51	12:30:33	11/30/97
2419600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:35:15	12:41:57	11/30/97
2419650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:46:39	12:53:22	11/30/97
2419700000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:58:04	13:04:46	11/30/97

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2419750000	0	1	1	-1	-1	-1	-1	-1	-1	Errors	1	13:06:22	13:13:04	11/30/97
2419800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:17:46	13:24:29	11/30/97
2419850000	0	0	0	0	0	0	1	1	-1	Errors	1	13:28:39	13:35:21	11/30/97
2419900000	0	0	1	-1	-1	-1	-1	-1	-1	Errors	1	13:36:57	13:43:40	11/30/97
2419950000	0	0	0	0	1	1	-1	-1	-1	Errors	1	13:46:48	13:53:30	11/30/97
2420000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:58:12	14:04:54	11/30/97
2420050000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:09:36	14:16:19	11/30/97
2420100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:21:01	14:27:43	11/30/97
2420150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:32:25	14:39:07	11/30/97
2420200000	0	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	14:40:12	14:46:55	11/30/97
2420250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:51:36	14:58:18	11/30/97
2420300000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:03:00	15:09:43	11/30/97
2420350000	0	0	0	1	-1	-1	-1	-1	-1	Errors	1	15:11:49	15:18:31	11/30/97
2420400000	0	0	0	0	0	2	1	-1	-1	Errors	1	15:22:11	15:28:53	11/30/97
2420450000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:33:36	15:40:19	11/30/97
2420500000	0	0	0	0	0	0	0	0	1	Errors	0	15:45:00	15:51:43	11/30/97
2420550000	0	0	0	0	0	0	0	0	1	Errors	0	15:56:24	16:03:06	11/30/97
2420600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:07:48	16:14:31	11/30/97
2420650000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:19:12	16:25:54	11/30/97
2420700000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:30:36	16:37:18	11/30/97
2420750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:42:00	16:48:42	11/30/97
2420800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	16:53:24	17:00:06	11/30/97
2420850000	0	0	0	0	0	0	1	-1	-1	Errors	1	17:03:48	17:10:29	11/30/97
2420900000	0	0	0	1	-1	-1	-1	-1	-1	Errors	1	17:12:35	17:19:17	11/30/97
2420950000	0	0	0	0	0	0	0	0	1	Errors	0	17:23:59	17:30:41	11/30/97
2421000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	17:35:23	17:42:05	11/30/97
2421050000	0	0	0	0	0	0	0	0	1	Errors	0	8:28:04	8:34:46	12/1/97
2421100000	0	0	0	0	0	1	1	-1	-1	Errors	1	8:36:28	8:45:09	12/1/97
2421150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	8:49:50	8:56:32	12/1/97
2421200000	0	0	0	0	1	1	-1	-1	-1	Errors	1	8:59:41	9:06:23	12/1/97
2421250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	9:11:05	9:17:48	12/1/97
2421300000	0	0	0	0	0	0	0	0	1	Errors	0	9:22:29	9:29:11	12/1/97
2421350000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	9:33:54	9:40:36	12/1/97
2421400000	0	0	0	0	0	0	0	0	2	Errors	0	9:45:18	9:52:01	12/1/97
2421450000	0	0	0	0	0	0	0	0	1	Errors	0	9:56:42	10:03:24	12/1/97
2421500000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:08:06	10:14:49	12/1/97
2421550000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:19:30	10:26:12	12/1/97
2421600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:30:54	10:37:36	12/1/97

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2421650000	0	0	1	-1	-1	-1	-1	-1	-1	Errors	1	10:39:13	10:45:56	12/1/97
2421700000	0	-1	-1	-1	-1	-1	-1	-1	-1	Errors	1	10:46:29	10:53:11	12/1/97
2421750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	10:57:54	11:04:36	12/1/97
2421800000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:09:18	11:16:01	12/1/97
2421850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:20:42	11:27:24	12/1/97
2421900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:32:06	11:38:49	12/1/97
2421950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:43:30	11:50:12	12/1/97
2422000000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	11:54:54	12:01:36	12/1/97
2422050000	0	0	0	1	1	-1	-1	-1	-1	Errors	1	12:04:15	12:10:58	12/1/97
2422100000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:15:39	12:22:21	12/1/97
2422150000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:27:03	12:33:45	12/1/97
2422200000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:38:28	12:45:11	12/1/97
2422250000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	12:49:52	12:56:34	12/1/97
2422300000	1	1174	-1	-1	-1	-1	-1	-1	-1	Errors	1	12:57:39	13:04:22	12/1/97
2422350000	0	0	0	0	0	1	-1	-1	-1	Errors	1	13:07:30	13:14:12	12/1/97
2422400000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:18:54	13:25:36	12/1/97
2422450000	0	0	0	0	0	0	0	0	1	Errors	0	13:30:18	13:37:01	12/1/97
2422500000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	13:41:43	13:48:26	12/1/97
2422550000	1	1	-1	-1	-1	-1	-1	-1	-1	Errors	1	13:49:30	13:56:13	12/1/97
2422600000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:00:55	14:07:37	12/1/97
2422650000	0	0	0	0	0	0	0	1	-1	Errors	0	14:11:48	14:18:30	12/1/97
2422700000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:23:12	14:29:55	12/1/97
2422750000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:34:36	14:41:18	12/1/97
2422800000	0	0	0	0	0	0	0	1	-1	Errors	0	14:45:29	14:52:11	12/1/97
2422850000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	14:56:53	15:03:36	12/1/97
2422900000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:08:18	15:15:01	12/1/97
2422950000	0	0	0	0	0	0	0	0	0	OK, 0 errors	0	15:19:42	15:26:25	12/1/97
2423000000	0	0	0	0	0	0	0	0	1	Errors	0	15:31:07	15:37:50	12/1/97
											45			
											18.7500%			
											< 20% so OK!			

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Annex B: FCC processing gain description

APPENDIX C

FEDERAL COMMUNICATIONS COMMISSION

Equipment Authorization Division
7435 Oakland Mills Road
Columbia, MD 21046
Telephone: (301) 725-1585
Facsimile: (301) 344-2050

Guidance on Measurements for Direct Sequence Spread Spectrum Systems

Part 15 of the FCC Rules provides for operation of direct sequence spread spectrum transmitters. Examples of devices that operate under these rules include radio local area networks, cordless telephones, wireless cash registers, and wireless inventory tracking systems.

The Commission frequently receives requests for guidance as to how to perform measurements to demonstrate compliance with the technical standards for such systems. No formal measurement procedure has been established for determining compliance with the technical standards. Such tests are to be performed following the general guidance in Section 15.31 of the FCC Rules and using good engineering practice. The following provides information on the measurement techniques the Commission has accepted in the past for equipment authorization purposes. Alternative techniques may be acceptable upon consultation and approval by the Commission staff. The information is organized according to the pertinent FCC rule sections.

Section 15.31(m): This rule specifies the number of operating frequencies to be examined for tunable equipment.

Section 15.207: Power line conducted emissions. If the unit is AC powered, an AC power line conducted test is also required per this rule.

Section 15.247(a)(2): Bandwidth. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span >> RBW.

Section 15.247(b): Power output. This is an RF conducted test. Use a direct connection between the antenna port of the transmitter and the spectrum analyzer, through suitable attenuation. Set the RBW > 6 dB bandwidth of the emission or use a peak power meter.

Section 15.247(c): Spurious emissions. The following tests are required :

(1) RF antenna conducted test: Set RBW = 100 kHz, Video bandwidth (VBW) > RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band *as measured with a 100 kHz RBW.*

(2) Radiated emission test: Applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp (and possibly a high-pass filter) is necessary for this measurement. For measurements above 1 GHz, set RBW = 1 MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation, use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See Section 15.35(b)

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and (e).

Section 15.247(d): Power spectral density. Locate and zoom in on emission peak(s) within the passband. Set RBW = 3 kHz, VBW > RBW, sweep = (SPAN/3 kHz) e.g., for a span of 1.5 MHz, the sweep should be $1.5 \times 10^6 \div 3 \times 10^3 = 500$ seconds. The peak level measured must be no greater than +8 dBm. If external attenuation is used, don't forget to add this value to the reading. Use the following guidelines for modifying the power spectral density measurement procedure when necessary.

- For devices with spectrum line spacing greater than 3 kHz no change is required.
- For devices with spectrum line spacing equal to or less than 3 kHz, the resolution bandwidth must be reduced below 3 kHz until the individual lines in the spectrum are resolved. The measurement data must then be normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band (in linear power units) to determine compliance.
- If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.8 dB for correction to 3 kHz.
- Should all the above fail or any controversy develop regarding accuracy of measurement, the Laboratory will use the HP 89440A Vector Signal Analyzer for final measurement unless a clear showing can be made for a further alternate.

Section 15.247(e): Processing Gain. The Processing Gain may be measured using the CW jamming margin method. Figure 1 shows the test configuration. The test consists of stepping a signal generator in 50 kHz increments across the passband of the system. At each point, the generator level required to produce the recommended Bit Error Rate (BER) is recorded. This level is the jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. Discard the worst 20% of the J/S data points. The lowest remaining J/S ratio is used when calculating the Processing Gain.

In a practical system, there are always implementation losses which degrade the performance below that of an optimal theoretical system of the same type. Losses occur due to non-optimal filtering, lack of equalization, LO phase noise, "corner cutting in digital processing", etc. Total losses in a system, including transmitter and receiver, should be assumed to be no more than 2 dB.

The signal to noise ratio for an ideal non-coherent receiver is calculated from:

(1) $Pe = \frac{1}{2}e^{(-1/2)(S/N)o}$

where : Pe = probability of error (BER)
$(S/N)o$ = the required signal to noise ratio at the receiver output for a given received signal quality

This is an example. You should use the equation (or curve) dictated by your demodulation scheme.

Ref.: Viterbi, A. J. Principles of Coherent Communications, (New York: McGraw-Hill 1966), Pg. 207

Using equation (1) shown above, calculate the signal to noise ratio required for your chosen BER. This value and the measured J/S ratio are used in the following equation to calculate the Processing Gain (Gp) of the system.

$$Gp=(S/N)o+Mj+Lsys$$

where: $(S/N)o$ = Signal to noise ratio

Annex B, FCC Spreading Gain Measurements Results,
FCC Processing Gain Description,
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Mj = J/S ratio
L_{SYS} = System losses.

Ref.: Dixon, R., Spread Spectrum Systems (New York: Wiley, 1984), Chapter 1.

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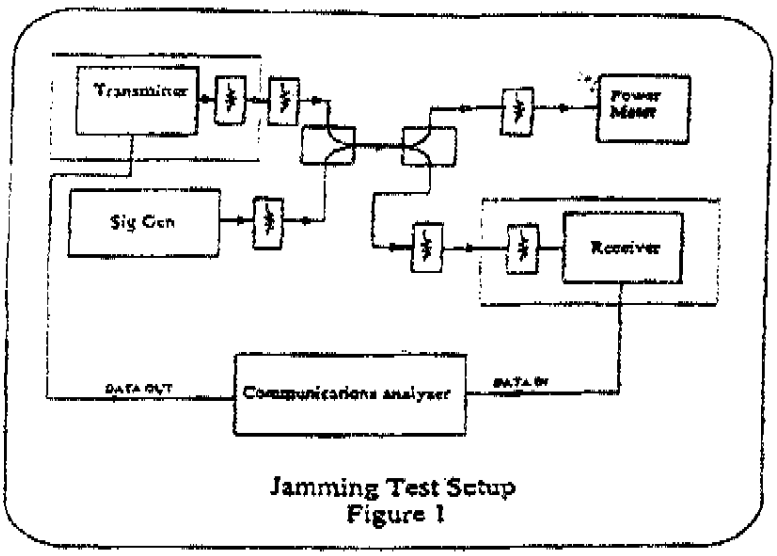
FCC Processing Gain Description,
Lucent Confidential, ©1997



Jamming Test Setup
Figure 1

ALTERNATIVE TEST PROCEDURES

If antenna conducted tests cannot be performed on this device, radiated tests to show compliance with the various conducted requirements of Section 15.247 are acceptable. As stated previously, a pre-amp must be used in making the following measurements.

1) Calculate the transmitter's peak power using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where: E is the measured maximum field strength in V/m utilizing the widest available RBW.
G is the numeric gain of the transmitting antenna over an isotropic radiator.
d is the distance in meters from which the field strength was measured.
P is the power in watts for which you are solving:

$$P = \frac{(Ed)^2}{30G}$$

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FCC Processing Gain Description,
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3) Measure the power spectral density as follows:

A. Tune the analyzer to the highest point of the maximized fundamental emission. Reset the analyzer to a RBW = 3 kHz, VBW > RBW, span = 300 kHz, sweep = 100 sec.

B. From the peak level obtained in (A), derive the field strength, E, by applying the appropriate antenna factor, cable loss, pre-amp gain, etc. Using the equation listed in (1), calculate a power level for comparison to the +8 dBm limit.

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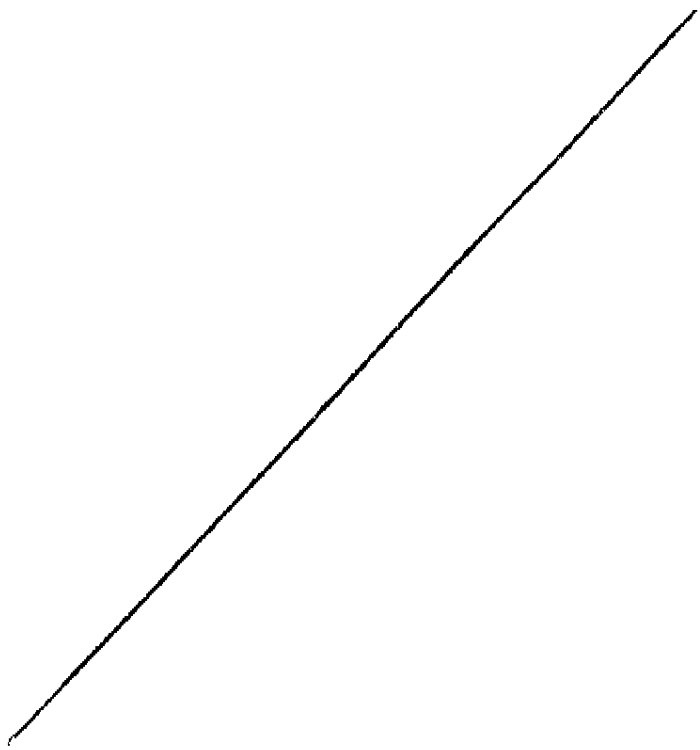
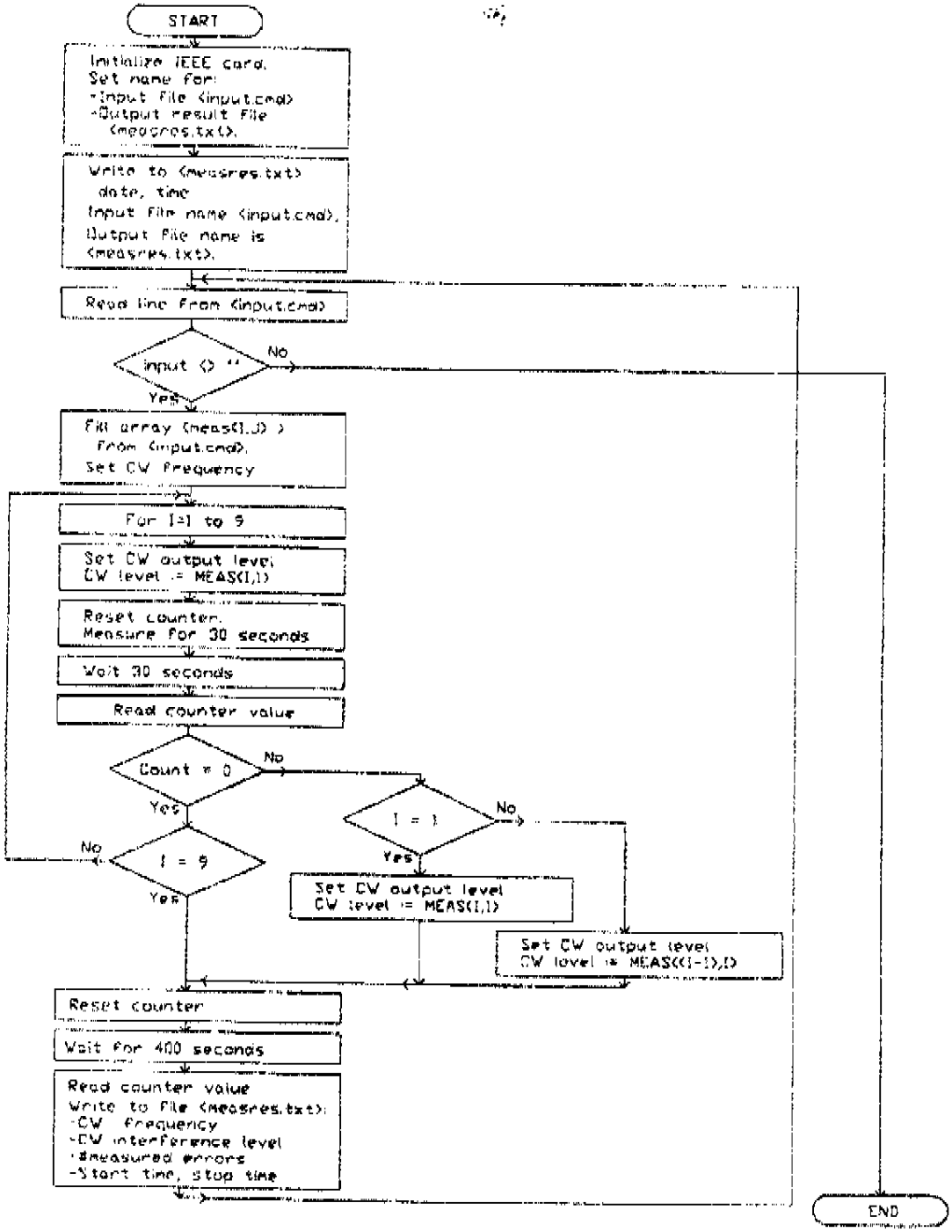
FCC Processing Gain Description,
Lucent Confidential, ©1997



Annex C, FCC Spreading Gain Measurements Results,
Flow Chart IEEE control program,
Lucent Confidential, ©1997

Annex C: Flow-Chart IEEE control program



Annex D, FCC Spreading Gain Measurements Results, `NoHermes Configuration File', Lucent Confidential, ©1997

Below is the configuration file for the test software `NoHermes' listed for an 2 MBit/sec Tx rate.

```
;
;NOHERMES configuration file for FCC receiver spreading gain
;test, Nov 19, '97.
;Make register 42h, IDACtrim register Bh for NoHermes testboard <FCC_1>.
;Use ext. HP8112A pulse generator for Txenable generation,
;per = 770 uS, DC=97 %, HIL=1.90 V, LOL=-0.1 V.
;Receiver use A model with A-WMAC, using Testware TW software
;Monitor with Wire-Wrap board and counter the Rx
;for received error bits.
;Make sure the transmitter has the fixed data pattern!
;Use OEM Tx mode, PLCP      (address 39h) = 01h),
;and file length  PLCPLEN0 (address 3Ah, lsb, 00h),
;                 PLCPLEN1 (address 3Bh, msb, 04h),
;                 PLCPSERV (        3Ch,      00h),
;                 PLCPSIGN (        3Dh,      14h),
;                 PLCPSYNC (        3Eh,      80h),
; Default clock low to high in the middle of the data
; Default enable, active high to low at start of data,
; low to high at the end of the data.
; First out bit is the left one of the string

; Setting up the Theseus
; Always start with a 1  this indicates a Write operation.

; Default clock low to high in the middle of the data
; Default enable, active high to low at start of data,
; low to high at the end of the data.

;  Lutindx  address  00
MMI: 1000000000000000

;  Lutdata  address  01
MMI: 1000000100000000

;  Lutmax/min address  02
MMI: 1000001011110011

;  Lutfinal  address  03
MMI: 1000001110101101

;  Lutgain  address  04
MMI: 1000010001100000

;  Maxsar  address  05
MMI: 1000010100000100

;  Tblank  address  06
MMI: 1000011000001010

;  Textblank address  07
MMI: 1000011100010010

;  Trfblank  address  08
MMI: 1000100000001010

;  Tmeas  address  09
MMI: 1000100100010110

;  Textmeas  address  0A
MMI: 1000101000101100
```

Annex D, FCC Spreading Gain Measurements Results,
'NoHermes Configuration File',
Lucent Confidential, ©1997

```
; Nummeas address 0B
MMI: 1000101100000100

; Tfast address 0C
MMI: 1000110000100000

; Tslow address 0D
MMI: 1000110110000000

; Hystcomp address 0E
MMI: 1000111000000000

; PCEN address 10
MMI: 1001000000000001

; DAC step address 11
MMI: 1001000100000001

; VG DAC address 12
MMI: 1001001001100011

; Ref DAC address 13
MMI: 1001001101100100

; Comppol address 14
MMI: 1001010000000001

; Edetthr address 20
MMI: 1010000001000101

; Cdetthr address 21
MMI: 1010000101000101

; Dfrthr address 22
MMI: 1010001001000111

; Mimdlvl address 23
MMI: 1010001100000110

; Huntdlvl address 24
MMI: 1010010000000011

; Sifs address 25
MMI: 1010010100001010

; Maxrxtime address 26
MMI: 1010011001001000

; Huntmode address 27
MMI: 1010011100000000

; Sacken address 28
MMI: 1010100000000000

; Sacklen address 29
MMI: 1010100100000000

; Noantdiv address 2A
MMI: 1010101000000000

; Ignserv address 2B
MMI: 1010101100000000

; Endropdlvl address 2C
```

Annex D, FCC Spreading Gain Measurements Results,
'NoHermes Configuration File',
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```
MMI: 1010110000000110

; Txcallsign0 address 30
MMI: 1011000000000000

; Txcallsign1 address 31
MMI: 1011000100000000

; Txcallsign2 address 32
MMI: 1011001000000000

; Txcallsign3 address 33
MMI: 1011001100000000

; Txcallsign4 address 34
MMI: 1011010000000000

; Txcallsign5 address 35
MMI: 1011010100000000

; Txcallsign6 address 36
MMI: 1011011000000000

; Txcallsign7 address 37
MMI: 1011011100000000

; Rx/Tx Cen address 38
MMI: 1011100000000000

; Plcpen address 39
MMI: 1011100100000001

; Plcpen0 address 3A
MMI: 1011101000000000

; Plcpen1 address 3B
MMI: 1011101100000011

; Plcpserv address 3C
MMI: 1011110000000000

; Plcpsign address 3D
MMI: 1011110100010100

; Plcpsync address 3E
MMI: 1011111010000000

; Boosten address 3F
MMI: 1011111100000000

; Cpthr address 40
MMI: 1100000001010000

; Cwthr address 41
MMI: 1100000100100111

; Trim IDAC address 42
MMI: 1100001000001011

; Trim Q DAC address 43
MMI: 1100001100000100

; Level compadres 44
MMI: 1100010001000000
```

Annex D, FCC Spreading Gain Measurements Results,
'NoHermes Configuration File',
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```
;    AD on/off address  45
MMI: 1100010100000000

;    Scr/sfd off address  70
MMI: 1111000000000000

;   IQ pat/IQ test address  71
MMI: 1111000100000000

;   AGC address  72
MMI: 1111001010111111

;   Antsel address  73
MMI: 1111001100000000

;    Anlp address  74
MMI: 1111010000000000

;    ETset/adten address  75
MMI: 1111010100000000

;    Da digen/ten address  76
MMI: 1111011000000000

;    Da test address  77
MMI: 1111011100000000

;    Theseus enable address  7F
MMI: 1111111110000000

; Programming of the 1630 on 352 MHz
; Main divider
GPSIO0: 0011101000000110100111
GPSIO0: 1011111100000000010111

;  Programming of the 1021 on 2065 MHz resulting in 2417 MHz Fo
;  For 2417-352=2065 MHz, = (811)h
GPSIO1:    0000000000000000000001

;  Main divider coeff 2100
;  For 2065
;         (0  0  8   1   1)h last 4 bits is synthesizer register address
;          -...----...----...
GPSIO1:    0000010000000100010100

;reference divider  22
GPSIO1:    0000000000000101100101
```