ITS Intertek Testing Services
ETL SEMKO

January 19, 2000

Federal Communications Commission
Equipment Authorization Division
Application Processing Branch
7435 Oakland Mills Road
Columbia, MD 21046

Attention: Mr. Frank Coperich

Reference: FCC Part 15.247 Application for RFC Distribution
FCC ID: OQ4RFC001, Confirmation # EA95625
Reference #11140

Dear Frank:

This is in response to your letter of December 21, 1999 regarding the above referenced application.

Item 1
Please see attached revised pages 6 & 9 of the report.

Item 2
The theoretical processing gain is 10 x log (PN code size) = 10 x log (15) = 11.78 dB. The spreading clock rate is 1.5 MH chips/second. There are 15 chips per symbol (bit). The ADPCM data rate is 32 kBits/second. The TDD frame date rate is 100 kBits/second.

Item 3
See attached processing gain measurement configuration and calculation.

Item 4
The manufacturer of the spread spectrum chip is Level One Communications, Inc.

We hope therefore that these information will resolve the issues and this application be granted. Thank you once again for your help.

Regards,

Gaspara Lim

Enclosures

4.0 <u>Measurement Results</u>

4.1 Maximum Radiated Output Power, FCC Rules 15.247(b):

Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site.

The output power was measured using "Substitution" method. The half wave dipole was placed on the turn table at 3m distance; the fixed power was input to dipole (generator output) (ex.8.2 dBm). Maximum field strength was measured (dipole reading) (ex.83.7 dBuV). Dipole was replaced by EUT. Maximum field strength was measured again (EUT reading) (ex. 86.4 dBuV).

The EUT output power was calculated by:

EUT (ERP) = Generator Output + (EUT Reading - Dipole Reading)
= 8.2 + (86.4 - 83.7)
= 10.9 dBm
EUT (EIRP) = EUT (ERP) + 2 = 12.9 dBm

(Base Unit)		
Frequency (MHz)	Output in dBm (ERP)	Output in mWatt (ERP)
Low Channel: 902.3	17.7	58.9
Middle Channel: 913.8	18.7	74.1
High Channel: 924.5	16.1	40.7

Please see attached pages for the plots:

Plot B1a: Low Channel Output Power
Plot B1b: Middle Channel Output Power
Plot B1c: High Channel Output Power
Data Sheet - Radiated Emission (Output Power)

4.3 Maximum Power Density Reading, FCC Rule 15.247(d):

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

Output power density was measured with "Substitution" method. The half wave dipole was placed on the turn table at 3m distance; the fixed power was input to dipole (generator output) (ex.8.2 dBm). Maximum field strength was measured (dipole reading) (ex 83.7 dBuV). Dipole was replaced by EUT. Maximum field strength of power density was measured again (EUT reading) (ex 74.7 dBuV), see Plots H3a2.

The EUT output power density was calculated by:

EUT (ERP Power Density) = Generator + (EUT Reading – Dipole Reading)
= 8.2 + (74.7 - 83.7) = -0.8 dBm

EUT (EIRP Power Density) = EUT (ERP Power Density) + 2
= -0.8 + 2 = 1.2 dBm

(Base Unit)	
Frequency (MHz)	Power Density (dBm)
913.1	4.9

(Handset Unit)	
Frequency (MHz)	Power Density (dBm)
902.6	1.2

Frequency Span = 600 kHz
Sweep Time = 600 Frequency Span/3 kHz
= 200 seconds

Please see attached pages for the plots:
Plot B3a.1 - B3a.2 Low Channel Power Density
Plot B3b.1 - B3b.2 Middle Channel Power Density
Plot B3c.1 - B3c.2: High Channel Power Density
Plot H3a.1 - H3a.3 Low Channel Power Density
Plot H3b.1 - H3b.3 Middle Channel Power Density
Plot H3c.1 - H3c.3: High Channel Power Density
Radiated Emission (Output Power Density) Handset and Base

Processing Gain Measurement:
LXT810B

March 3, 1999

I. Summary

This document describes how the processing gain was measured for the Level One LXT810B digital spread spectrum telephone transceiver. Included are specifications, test setup, and test results.

II. 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 LXT810B 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 1×10^{-4} was used.
J/S = Jammer to signal ratio required to produce given error probability.
L_{sys} = System loss to due 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.

III. Test Setup

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

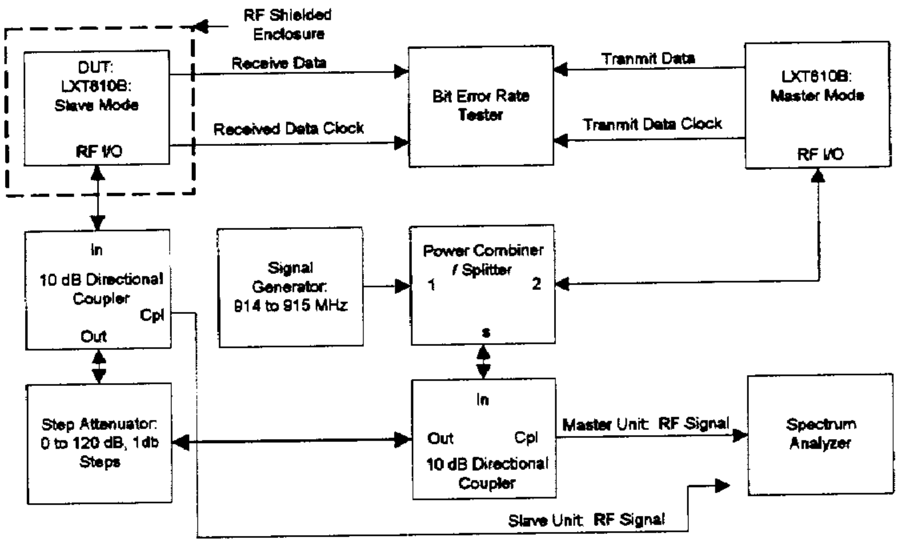

Figure 1: Processing Gain Test Setup

The following test equipment was used for this setup:

- LDB810 Demonstration system: Used LXT810B RFIC's.
- Hewlett Packard ESG D3000A Signal Generator
- Hewlett Packard HP8563E Spectrum Analyzer
- Hewlett Packard HP 8494A and HP 8496A Step Attenuators
- Mini Circuits ZFDC-10-5 10 dB Directional Coupler (2)
- Mini Circuits ZFSC-2-4 Power Combiner
- Ramsey STE-3000 Shielded Test Enclosure
- Telecommunication Techniques Corp. Firebird MC6000 Communication Analyzer (BER tester) with Lab Interface Card
- Semflex SMA cables

The LDB810 demonstration system was set up at the middle channel 915.0 MHz. The LXT810B base band 3dB bandwidth is less than 1.0 MHz; therefore, the signal generator was used to inject a C / W jammer from 914.0 MHz to 916.0 MHz in 50 kHz increments. The DUT received input power was set at -49.7 dBm. The jammer power was adjusted to achieve a bit error rate of 1x10-4 at each jammer frequency. The jammer power was recorded and the processing gain calculated for each jammer frequency from 914.0 MHz to 916.0 MHz.

IV. Test Results

The worse case processing gain was 10.0 dB for jamming frequencies of 914.40 MHz and 915.65 MHz. For all other jamming frequencies, the processing gain was greater than 10.0 dB. All of the measured test data is recorded in Figure 2:

Channel Frequency =	915.00 MHz		
Bit Error Rate =	1.00E-04		
Required S/N for BER =	11.0 dB		
System Losses =	2.0 dB		
Signal Strength at Receiver =	-49.7 dBm		
Jammer Frequency (MHz)	Jammer Power (dBm)	Jammer to Signal Ratio J / S (dB)	Processing Gain (dB)
914.00	-40.7	9.0	22.0
914.05	-42.4	7.3	20.3
914.10	-44.7	5.0	18.0
914.15	-48.7	1.0	14.0
914.20	-49.2	0.5	13.5
914.25	-49.4	0.3	13.3
914.30	-50.9	-1.2	11.8
914.35	-50.9	-1.2	11.8
914.40	-52.7	-3.0	10.0
914.45	-51.4	-1.7	11.3
914.50	-51.7	-2.0	11.0
914.55	-50.9	-1.2	11.8
914.60	-50.6	-0.9	12.1
914.65	-50.4	-0.7	12.3
914.70	-50.1	-0.4	12.6
914.75	-50.4	-0.7	12.3
914.80	-49.4	0.3	13.3
914.85	-50.6	-0.9	12.1
914.90	-50.1	-0.4	12.6
914.95	-50.6	-0.9	12.1
915.00	-50.7	-1.0	12.0
915.05	-51.4	-1.7	11.3
915.10	-50.1	-0.4	12.6
915.15	-50.4	-0.7	12.3
915.20	-49.7	0.0	13.0
915.25	-50.4	-0.7	12.3
915.30	-50.4	-0.7	12.3
915.35	-50.6	-0.9	12.1
915.40	-50.9	-1.2	11.8
915.45	-50.9	-1.2	11.8
915.50	-51.6	-1.9	11.1
915.55	-51.6	-1.9	11.1
915.60	-51.7	-2.0	11.0
915.65	-52.6	-2.9	10.1

915.70	-52.4	-2.7	10.3
915.75	-50.7	-1.0	12.0
915.80	-49.7	0.0	13.0
915.85	-49.1	0.6	13.6
915.90	-45.9	3.8	16.8
915.95	-43.6	6.1	19.1
916.00	-41.6	8.1	21.1

Figure 2: Processing Gain Measurements

The processing gain Vs jammer frequency is shown in Figure 3:

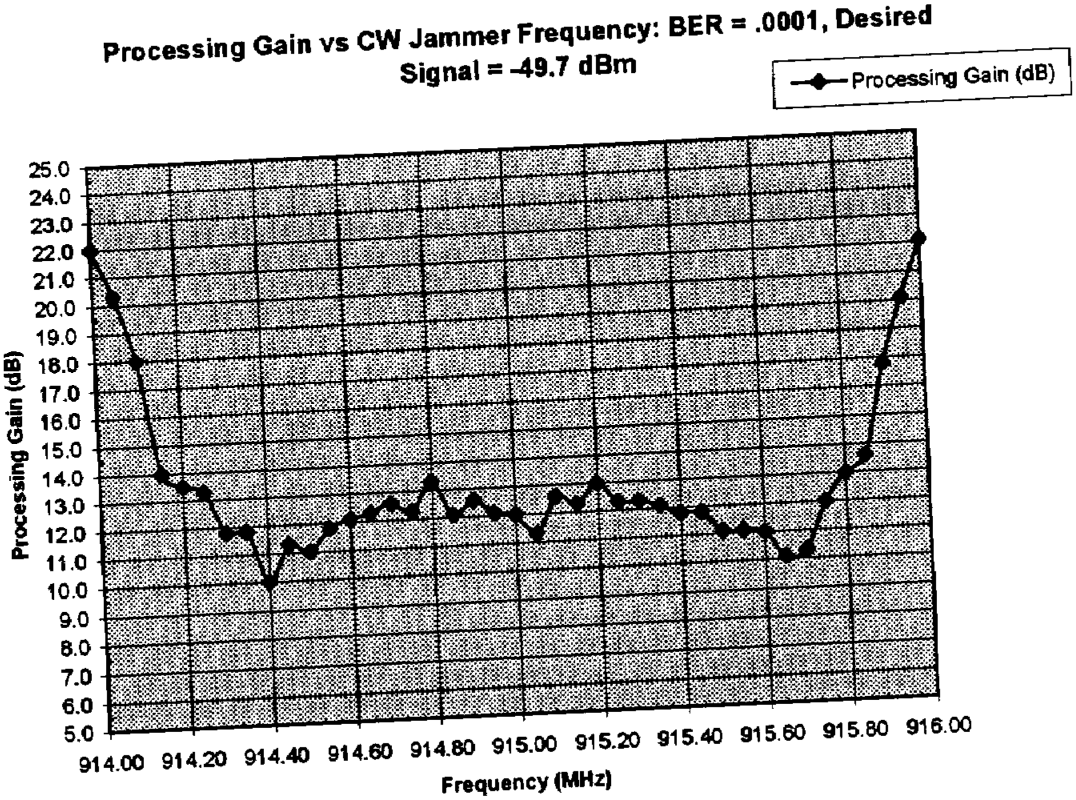

Figure 3: Processing Gain Vs Jammer Frequency

V. Conclusions

The LXT810B meets the 10.0 dB requirement for processing gain. The worse case processing gain of 10 dB was only seen at 914.40 MHz and 915.65 MHz. The FCC allows the worst 20% of the data to be ignored.