FCC Certification Test Report

FCC Certification Test Report
for
ADTRAN, Inc.
HDCTRC4206

September 30, 2002

Prepared for:

ADTRAN, Inc.
901 Explorer Blvd
Huntsville, AL 35806

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
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FCC Certification Test Report
for the
ADTRAN, Inc.
TRACER
Transceiver 4206
FCC ID: HDCTRC4206

WLL JOB# 7154

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Abstract

This report has been prepared on behalf of ADTRAN, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Direct Spread Spectrum Transceiver under Part 15.247 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a ADTRAN, Inc. TRACER DSSS 4206.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The ADTRAN, Inc. TRACER DSSS 4206 complies with the limits for a Direct Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The ADTRAN, Inc. TRACER DSSS 4206 Spread Spectrum System complies with the limits for a Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	ADTRAN, Inc. 901 Explorer Blvd Huntsville, AL 35806
Purchase Order Number:	418022
Quotation Number:	60123

1.4 Test Dates

Testing was performed from July 2, 2002 to August 12, 2002.

1.5 Test and Support Personnel

Washington Laboratories, LTD	James Ritter

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
Cm	centimeter
CW	Continuous Wave
DB	decibel
Dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
K	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
M	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
Rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

ADTRAN Part #	Product Name/Description
12804206L1A	Tracer 4206 Plan A
12804206L1B	Tracer 4206 Plan B

Top Assembly #:	12804206L1A and B
Sub Assembly #(s):	2280003-20, 2280018-6
Circuit Board #(s):	5280003-20, 2280018-6

The 12804206L1 (Tracer 4206 Radio) is a digital radio device that accepts four 1.544 Mb/sec T1 signal and transports it over a wireless carrier. A pair of these radios forms a wireless transport for T1 digital services in the 5.8 GHz Industrial, Scientific and Medical (ISM) radio band. The 12804206L1 provides the network, antenna, and control/status interface to the customer. The T1 interfaces are network timed. No internal timing is available.

The Tracer 4206 operates in the 5734-5833 MHz band using direct sequence spread spectrum transmission. Two channels are available: “A” and “B”. The channels are determined by internal cable routing on the transmit module during manufacture.

I/O Ports and Cables available on the TRACER 4206 DS3 Radio:

#	Signal/ Port Name	Signal/ Port Type	Cable Type	NOTES
1	T1A	I/O	Unshielded	100 ohm impedance
2	T1B	I/O	Unshielded	100 ohm impedance
3	T1C	I/O	Unshielded	100 ohm impedance
4	T1D	I/O	Unshielded	100 ohm impedance
5	RS232	I/O	Shielded 25 wire	VT100
6	ALARM	Control	Unshielded TP	Alarm contacts, no active signals
7	ANTENNA	I/O	Shielded Coax	50 ohm impedance, 5.8 GHz signal only
8	TEST	Output	Unshielded TP	¼ inch stereo jack, X/Y Constellation plot
9	RSSI	Output	Unshielded wire	Mono jack, Receive Signal Strength
10	TX PWR	Output	Unshielded wire	Mono jack, Transmit Power
11	GND	Output	Unshielded wire	Mono jack, Circuit ground

EX:	HDSL Loop 1	Span Pwr-I/O	Twisted Pair	137V Span Voltage

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	ADTRAN, Inc.
FCC ID Number	HDCTRC4206
EUT Name:	Spread Spectrum Transceiver
Model:	4206
FCC Rule Parts:	§15.247
Frequency Range:	5734 MHz – 5833MHz
Maximum Output Power:	19.6 dBm (conducted)
Modulation:	Digital (QPSK)
Bandwidth:	5.73 MHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	6
Power Output Level	Fixed
Antenna Type	Parabolic Dish
Frequency Tolerance:	N/A
Emission Type(s):	N/A
Interface Cables:	None
Power Source & Voltage:	48 Vdc

The TRACER DSSS 4206 contains the following sources:

Frequency (MHz)	Description
50.432	Master clock of digital transmit and receive. (XO 25ppm)
1.544	T1 rate clock for framer operation.
12.000	RF Reference XO
280.000	IF XO
5732.813	RF Center frequency for Channel A Bandplan 1
1398.203	RX LO Reference, Channel A Bandplan 1
1363.203	TX LO Reference, Channel A Bandplan 1
5748.438	RF Center frequency for Channel A Bandplan 2
1402.110	RX LO Reference, Channel A Bandplan 2
1367.110	TX LO Reference, Channel A Bandplan 2
5764.063	RF Center frequency for Channel A Bandplan 3
1406.016	RX LO Reference, Channel A Bandplan 3

Frequency (MHz)	Description
1371.016	TX LO Reference, Channel A Bandplan 3
5779.688	RF Center frequency for Channel A Bandplan 4
1409.922	RX LO Reference, Channel A Bandplan 4
1374.922	TX LO Reference, Channel A Bandplan 4
5795.313	RF Center frequency for Channel B Bandplan 1
1413.828	RX LO Reference, Channel B Bandplan 1
1378.828	TX LO Reference, Channel B Bandplan 1
5810.938	RF Center frequency for Channel B Bandplan 2
1417.735	RX LO Reference, Channel B Bandplan 2
1382.735	TX LO Reference, Channel B Bandplan 2
5826.563	RF Center frequency for Channel B Bandplan 3
1421.641	RX LO Reference, Channel B Bandplan 3
1386.641	TX LO Reference, Channel B Bandplan 3
5842.188	RF Center frequency for Channel B Bandplan 4
1425.547	RX LO Reference, Channel B Bandplan 4
1390.547	TX LO Reference, Channel B Bandplan 4

2.2 Test Configuration

The EUT was configured with an external power adapter, loopback connections on Channels A and B, unshielded wires connected to the alarm I/O, and a 50 Ohm coaxial cable connected to the antenna port.

The EUT firmware was set up to provide continuous random data for Direct Sequence modulation to the output connector.

Two “Plans” are available: “A” and “B”. Each “Plan” has three channels. Changing between the plans is accomplished by switching the internal cables. The channels are then programmed within the plan.

2.3 Testing Algorithm

The TRACER DSSS 4206 was operated continuously by firmware test sequence that provided a modulated RF data stream to the output port.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia,

MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ±2.3 dB.

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

Total Uncertainty = $(A^2 + B^2 + C^2)^{1/2}/(n-1)$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, total uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2}$ = ±2.3 dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Manufacturer	Model/Type	Function	Serial Number	Calibration Due
HP	8568B	Spectrum Analyzer	2634A02888	7/03/03
HP	85650A	Quasi-Peak Adapter	3303A01786	7/05/03
Solar	8012-50-R-24BNC	LISN	8379493	8/15/02
ARA	LPB-2520	BiconiLog Antenna	1044	6/19/03
HP	85685A	RF Preselector	3221A01395	5/17/03