

Nemko Test Report: 1L0492RUS1

Applicant: Adtran
901 Explorer Blvd.
Huntsville, AL 35806

FCC ID.: HDCTRC3202

Equipment Under Test(EUT): Tracer 2210 baseband processor with Tracer 3202
5.8 GHz Mastmount RFC

In Accordance With: **FCC Part 15, Subpart C, 15.247**
Direct Sequence Spread Spectrum Transmitters

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

Authorized By:

A handwritten signature in blue ink, appearing to read "Tom Tidwell", is written over the name of the authorized person.

Tom Tidwell, RF Group Manager

Date: 2/19/02

Total Number of Pages: 45

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

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EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Section 1. Summary of Test Results

Manufacturer: Adtran

Model No.: Tracer 2210 Baseband Processor with Tracer 3202 5.8 GHz Mastmount
RFC

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Direct Sequence Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST
SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".



NVLAP LAB CODE: 100426-0

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EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
Powerline Conducted Emissions	15.207(a)	48 dB μ V	Not Applicable
Minimum 6 dB Bandwidth	15.247(a)(2)	>500 kHz	Complies
Maximum Peak Power Output	15.247(b)(1)	<1 Watt	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	-20 dBc/100kHz	Complies
Spurious Emissions (Restricted Bands)	15.247(c)	< 74 dBuV/m Peak < 54 dBuV/m Avg	Complies
Peak Power Spectral Density	15.247(d)	+8 dBm/3kHz	Complies
Processing Gain	15.247(e)	10 dB	Complies

Footnotes:

The input voltage was varied +/- 15% from nominal during testing. No effect was noted on emission levels.

Powerline Conducted is not applicable due to the power input being Vdc.

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Band:

- ☐ 902 – 928 MHz
☐ 2400 – 2483.5 MHz
☒ 5725 – 5850 MHz

Frequency of Operation:

Fixed Channels at 5836 MHz and 5748.00 MHz

Channel Spacing:

88 MHz

User Frequency Adjustment:

Software controlled

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Description of Modification for Modification Filing

Not Applicable

Family List Ratio

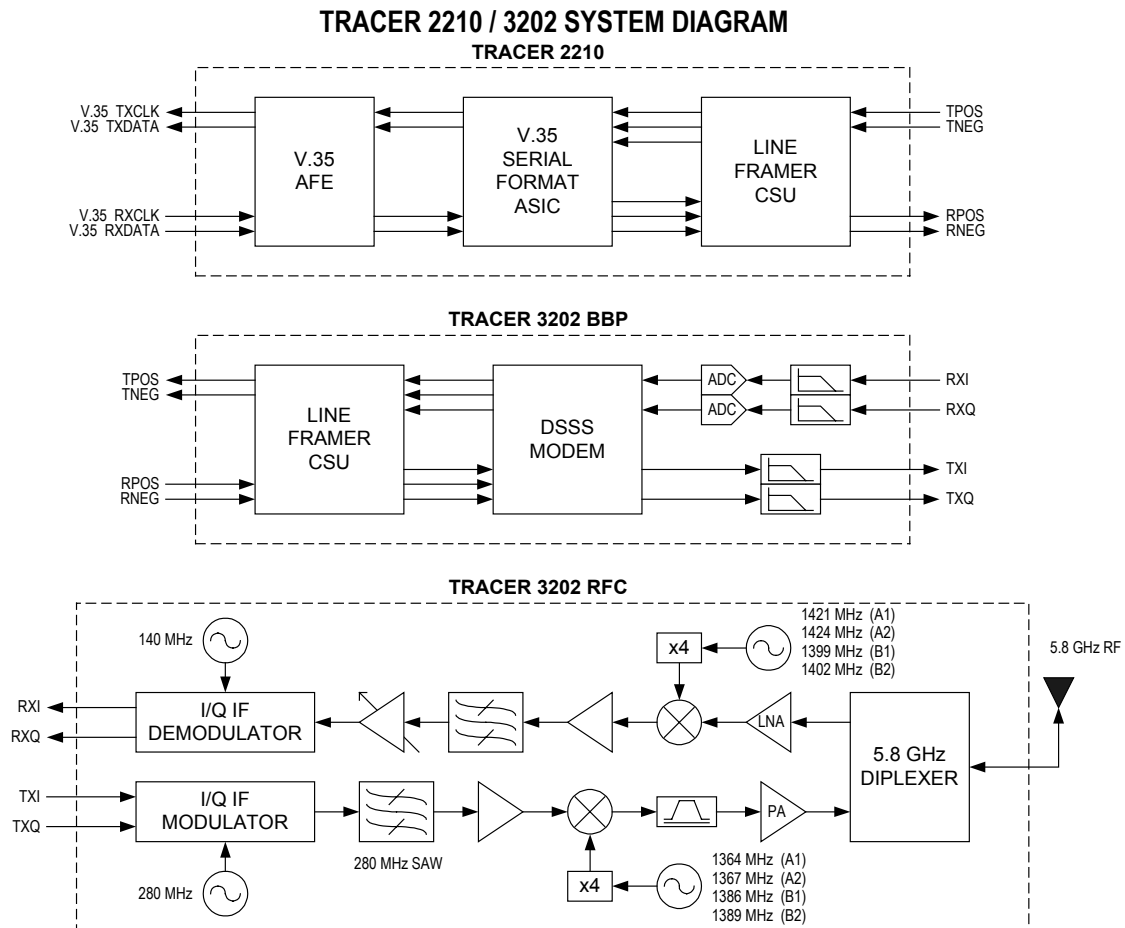
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Theory of Operation

This product provides microwave full-duplex transmission of an Nx64 ($N = 1 \dots 24$) data stream. The TRACER 2210 accepts a V.35 clock and data input and formats the data signal into a T1 format. The T1 signal is transformer-coupled onto twisted pair wire (22 – 24 AWG) along with a center-tapped 24 to 60 VDC span power signal, and transported up to a mast-mounted radio unit enclosed in a 1/4-size environmental housing. The span power is used to power the radio electronics, while the T1-formatted data signal is direct-sequence spread and used to modulate a 5.8 GHz RF carrier. The RF signal is presented at the N-type connector of the mast-mount TRACER 3202, and is connected with a 50 ohm coaxial cable to an antenna for microwave transmission in the 5.8 GHz ISM band to an identical 2210/3202 pair at the “far end” of the radio link, where the inverse signal operations are performed, resulting in recovered Nx64 clock and data signals output at the far end 2210 V.35 port.

EQUIPMENT: Tracer 2210 Baseband Processor with
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System Diagram



EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY:	DATE:

Test Results:

Complies

Measurement Data: See attached plots.

Measurement Uncertainty: +/- 1.7 dB

Not Applicable

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Section 4. Minimum 6 dB Bandwidth

NAME OF TEST: Minimum 6 dB Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: Lance Walker	DATE: November 1, 2001

Test Results: Complies.

Measurement Data: See 6 dB BW plot
Measured 6 dB bandwidth: 10.3 MHz
Channel Separation: 85 MHz (2 channels only)

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Data Plot**6 dB Bandwidth**

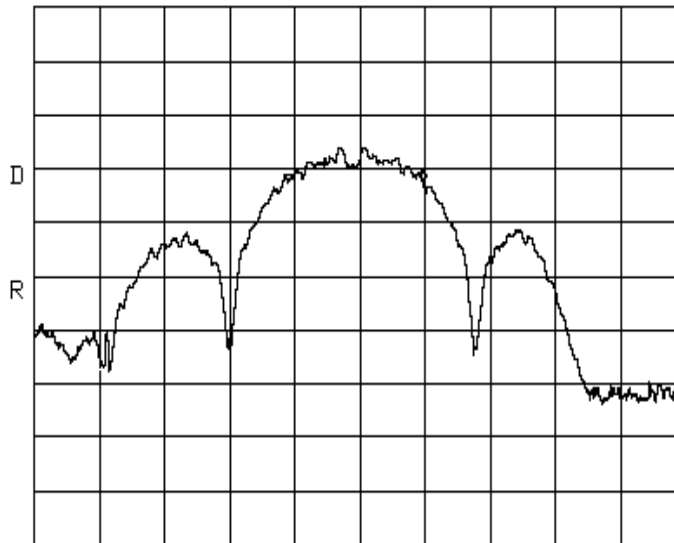
Page 1 of 2

Job No.: 1L0492R Date: 11/1/2001 Complete X
Specification: FCC15247 Temperature(°C): 22 Preliminary: _____
Tested By: Lance Walker Relative Humidity(%): 50
E.U.T.: Tracer 2210
Configuration: Normal test config with loopbacks
Sample Number: s01 and s02
Location: Lab 2 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: _____ m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1045
Filter: _____ Cable #2: _____
Receiver: 1464 Cable #3: _____
Attenuator #1: 1478 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB

ATTEN 10dB ΔMKR .17dB
RL 20.9dBm 10dB/ 10.33MHz



START 5.81167GHz STOP 5.86167GHz
*RBW 100kHz VBW 100kHz SWP 50.0ms

Notes: Channel A

EQUIPMENT: Tracer 2210 Baseband Processor with
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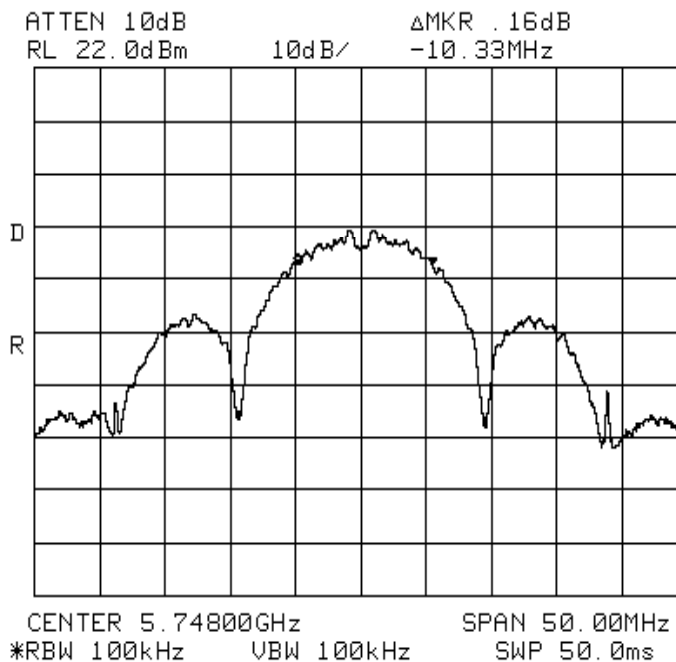
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Data Plot**6 dB Bandwidth**

Page 2 of 2
Job No.: 1L0492R Date: 11/1/2001
Specification: FCC15247 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Tracer 2210
Configuration: Normal test config with loopbacks



Notes: Channel B

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Section 5. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(1)
TESTED BY: Lance Walker	DATE: 11/05/2001

Test Results: Complies.

Channel	Frequency	Pwr (mW)	E.I.R.P. (dBm)
Plan A	5.748 GHz	100.1	20
Plan B	5.836 GHz	100.2	20

Equipment Used: 1029, 1030, and 1082

Measurement Uncertainty: +/- 0.7 dB

Temperature: 22 °C

Relative Humidity: 50 %

EQUIPMENT: Tracer 2210 Baseband Processor with
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Section 6. RF Exposure

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)
TESTED BY: Lance Walker	DATE: 11/5/2001

Test Results: Complies.

Measurement Data:



Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: 20.00 (dBm)

Maximum peak output power at antenna input terminal: 100 (mW)

Antenna gain(typical): 0 (dBi)

Maximum antenna gain: 1 (numeric)

Prediction distance: 200 (cm)

Prediction frequency: 5800 (MHz)

MPE limit for uncontrolled exposure at prediction frequency: 1 (mW/cm²)

Power density at prediction frequency: 0.000199 (mW/cm²)

Maximum allowable antenna gain: 37.0127 (dBi)

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC **PROJECT NO.:** 1L0492RUS1

Section 7. Spurious Emissions (conducted)

NAME OF TEST: Spurious Emissions (conducted)	PARA. NO.: 15.247(c)
TESTED BY: Lance Walker	DATE: 11/05/2001

Test Results: Complies.

Measurement Data: See attached plots.

EQUIPMENT: Tracer 2210 Baseband Processor with
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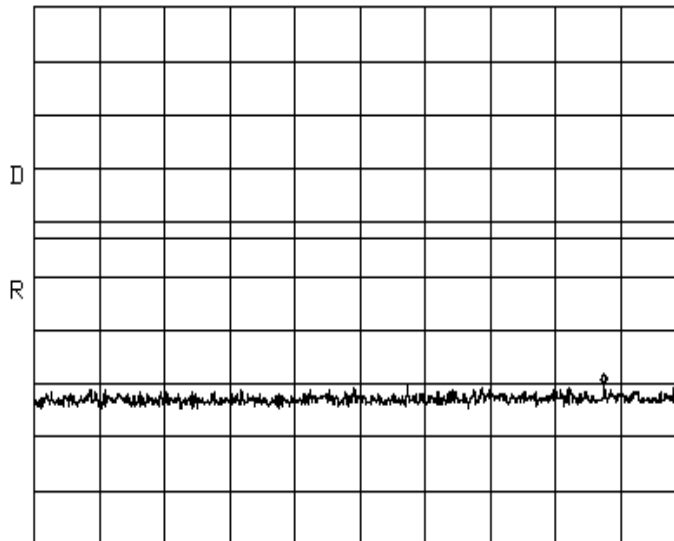
Data Plot**APSE**

Page 1 of 6 Complete X
Job No.: 1L0492R Date: 11/5/2001 Preliminary: _____
Specification: FCC15247 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%): 50
E.U.T.: Tracer 2210
Configuration: Normal
Sample Number: S01
Location: Lab 2 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1464 Cable #3: _____
Attenuator #1: 1469 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB

ATTEN 40dB MKR -28.17dBm
RL 42.0dBm 10dB/ 878.8MHz



START 30.0MHz STOP 1.0000GHz
*RBW 100kHz *VBW 300kHz SWP 250ms

Notes: Channel 1, 30 MHz - 1 GHz, marker indicates highest emission.

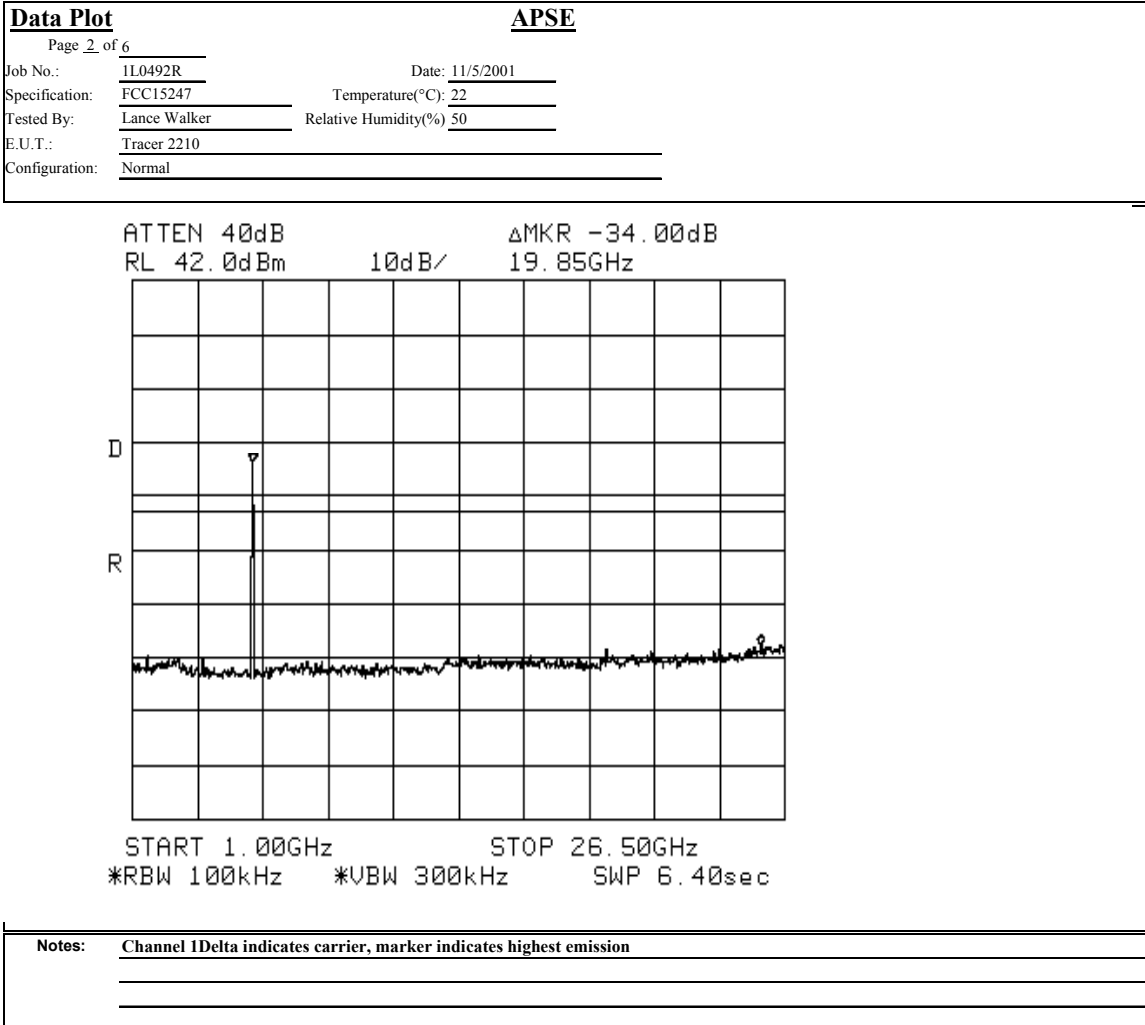
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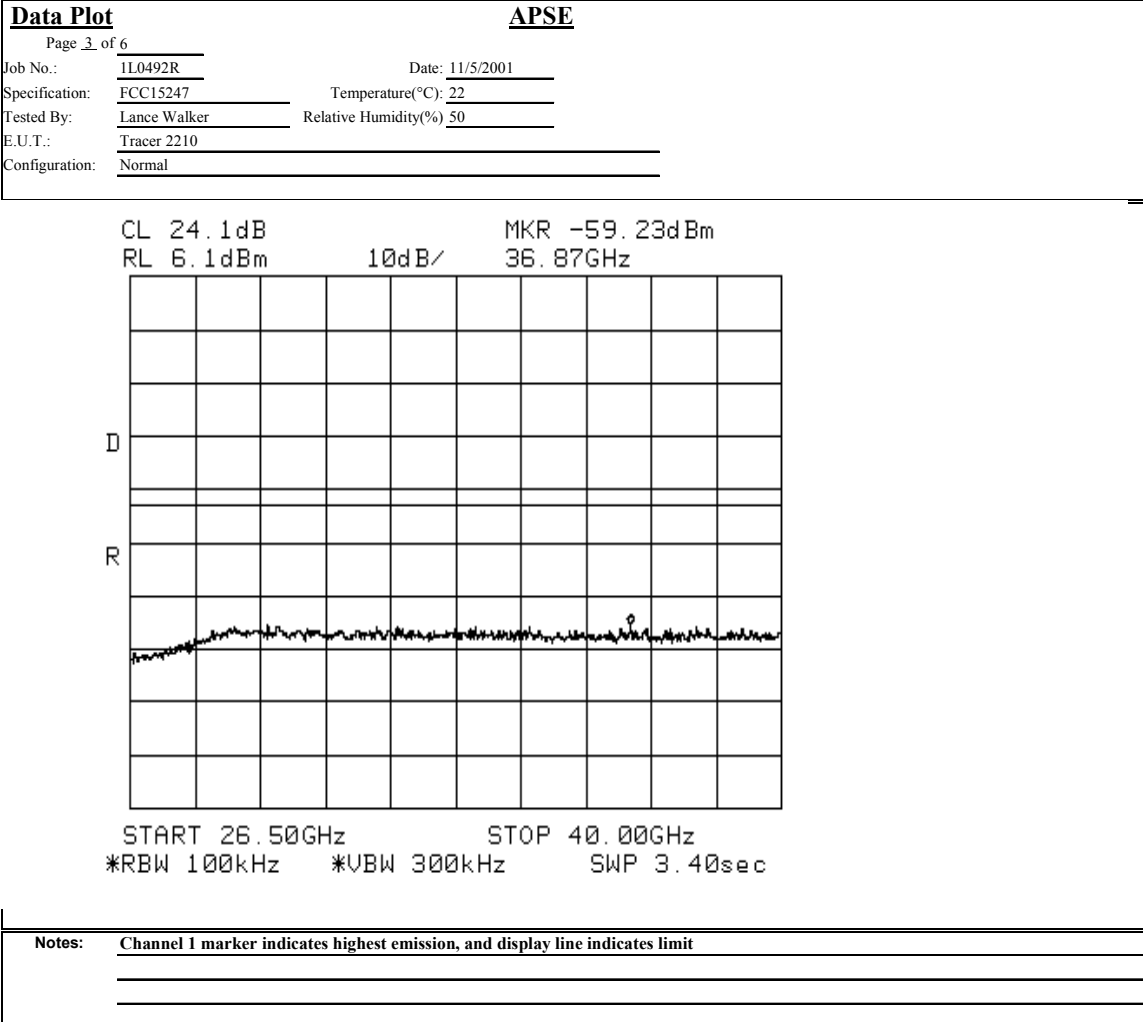
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Test Plot:		APSE
Page 4 of 6		
Job No.: 1L0492R	Date: 11/5/2001	
Specification: FCC15247	Temperature(°C): 22	
Tested By: Lance Walker	Relative Humidity(%) 50	
E.U.T.: Tracer 2210		
Configuration: Normal		

ATTEN 40dB MKR -28.17dBm
RL 42.0dBm 10dB/ 757.5MHz

START 30.0MHz STOP 1.0000GHz
*RBW 100kHz *VBW 300kHz SWP 250ms

Notes:	Channel 2 30 MHz to 1 GHz marker indicates highest emission

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1



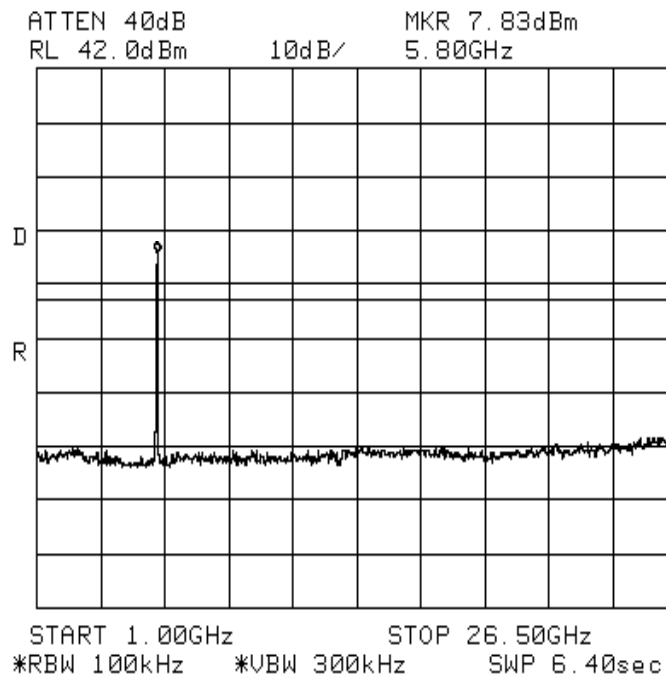
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Test Plot:**APSE**

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Job No.: 1L0492R Date: 11/5/2001
Specification: FCC15247 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%) 50
E.U.T.: Tracer 2210
Configuration: Normal



Notes: Channel 2, 1 GHz - 26.5 GHz, marker indicates carrier, display line indicates limit.

EQUIPMENT: Tracer 2210 Baseband Processor with
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Test Plot:		APSE
Page 6 of 6		
Job No.: 1L0492R	Date: 11/5/2001	
Specification: FCC15247	Temperature(°C): 22	
Tested By: Lance Walker	Relative Humidity(%) 50	
E.U.T.: Tracer 2210		
Configuration: Normal		

CL 24.1dB

MR -59.40dBm

RL 6.1dBm

10dB/

29.09GHz

START 26.50GHz

STOP 40.00GHz

*RBW 100kHz

*VBW 300kHz

SWP 3.40sec

Notes:	Channel 2, marker indicates highest emission and display indicates limit.

EQUIPMENT: Tracer 2210 Baseband Processor with
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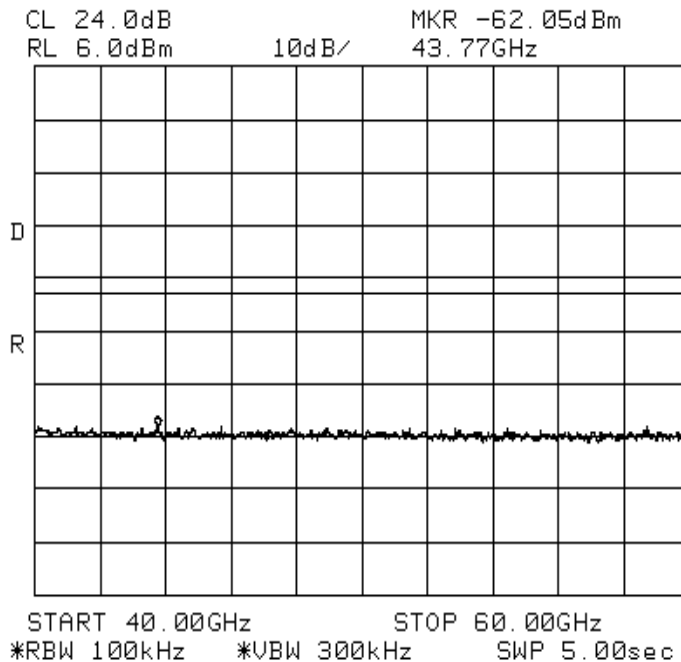
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Nemko Dallas, Inc.**Data Plot****APSE**

Page 1 of 8
 Job No.: 1L0492R Date: 11/5/2001 Complete X
 Specification: FCC15247 Temperature(°C): 22 Preliminary: _____
 Tested By: Lance Walker Relative Humidity(%): 50
 E.U.T.: Tracer 2210
 Configuration: Normal
 Sample Number: S01
 Location: Lab 2 RBW: Refer to plots Measurement
 Detector Type: Peak VBW: Refer to plots Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
 Pre-Amp: _____ Cable #1: 1082
 Filter: _____ Cable #2: _____
 Receiver: 1464 Cable #3: _____
 Attenuator #1: _____ Cable #4: _____
 Attenuator #2: _____ Mixer: _____
 Additional equipment used: _____
 Measurement Uncertainty: +/-1.7 dB



Notes: Channel 1 marker indicates highest emission

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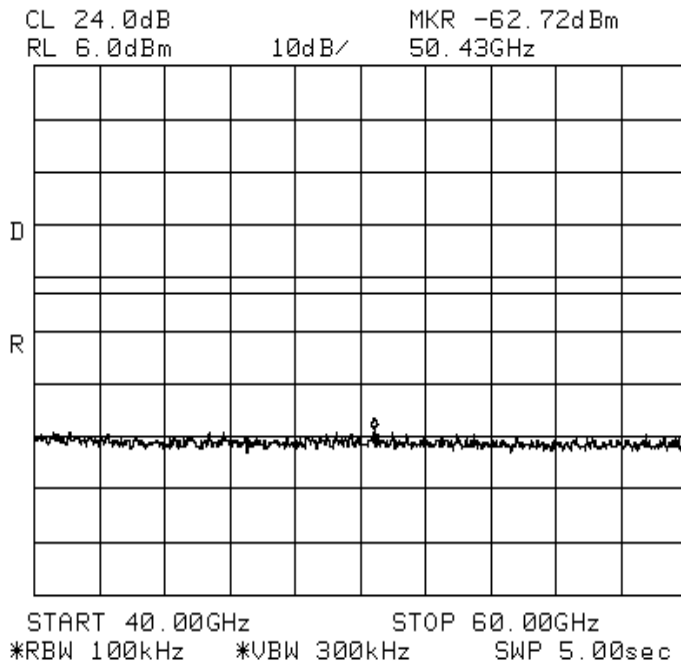
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Data Plot**APSE**

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Job No.:	1L0492R	Date:	11/5/2001
Specification:	FCC15247	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	50
E.U.T.:	Tracer 2210		
Configuration:	Normal		



Notes: Channel 2 marker indicates highest emission display line indicates limit

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Section 8. Spurious Emissions (radiated)

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (c)
TESTED BY: Lance Walker	DATE: 12/4/2001

Test Results: Complies.

Measurement Data: See attached table.

EQUIPMENT: Tracer 2210 Baseband Processor with
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Radiated EmissionsPage 1 of 1

Job No.: 1L0492R Date: 12/4/01
Specification: CFR 47, Part 15 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%): 50
E.U.T.: Tracer 2210
Configuration: Full Power Tx
Sample Number: S01
Location: AC 3 RBW: 1 MHz
Detector Type: Average VBW: 10 Hz

Test Equipment Used

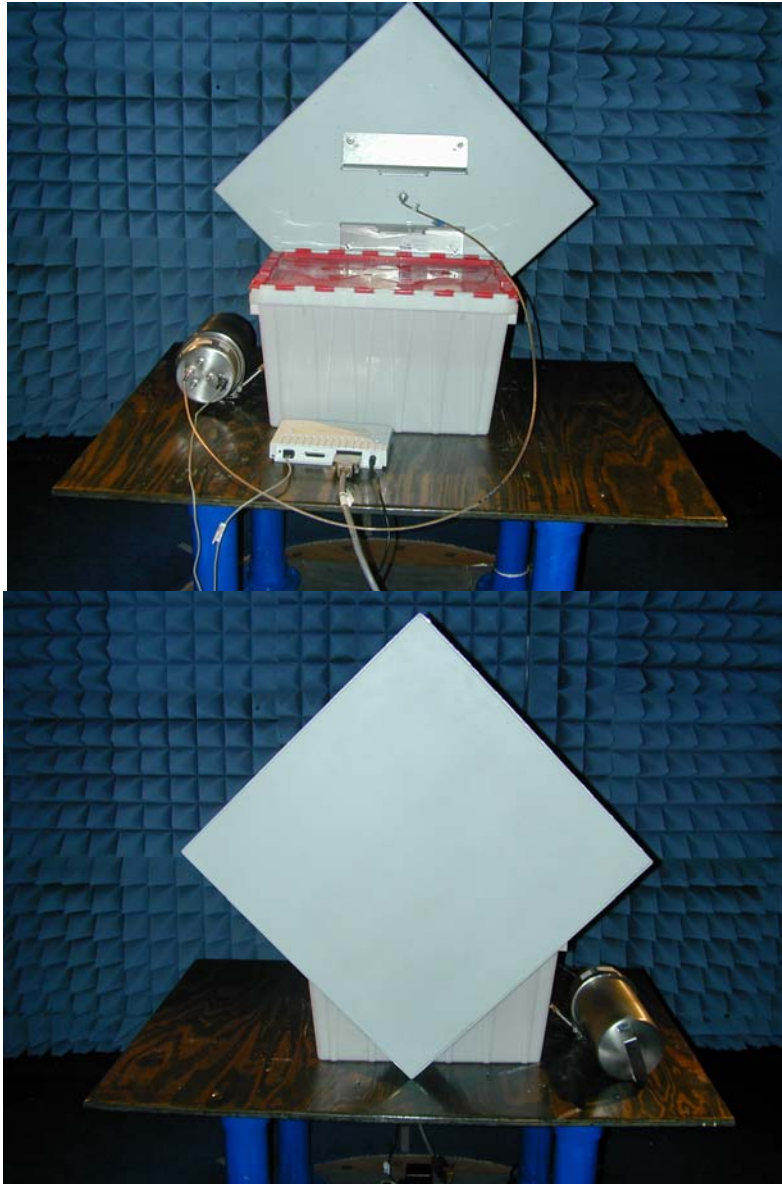
Antenna: 1304 Directional Coupler: #N/A
Pre-Amp: 1016 Cable #1: 1484
Filter: #N/A Cable #2: 1485
Receiver: 1464 Cable #3: 1082
Attenuator #1: #N/A Cable #4: #N/A
Attenuator #2: #N/A Mixer: 989
Additional equipment used: 0984
Measurement Uncertainty: +/- 3.6 dB

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
11.496	30.8	38.5	6.8	35.3	40.8	54	-13.2	Ch 1 H NF
22.992	33.2	18.0	3.1	49	5.3	54	-48.7	Ch 1 H NF
40.236	28.8	18.5	0	0	47.3	54	-6.7	Ch 1 H NF
45.984	22.1	23.2	0	0	45.3	54	-8.7	Ch 1 H NF
51.732	21.8	23.5	0	0	45.3	54	-8.7	Ch 1 H NF
57.48	21.5	23.7	0	0	45.2	54	-8.8	Ch 1 H NF
11.496	30.8	38.5	6.8	35.3	40.8	54	-13.2	Ch 1 V NF
22.992	33.2	18.0	3.1	49	5.3	54	-48.7	Ch 1 V NF
40.236	28.8	18.5	0	0	47.3	54	-6.7	Ch 1 V NF
45.984	22.1	23.2	0	0	45.3	54	-8.7	Ch 1 V NF
51.732	21.8	23.5	0	0	45.3	54	-8.7	Ch 1 V NF
57.48	21.5	23.7	0	0	45.2	54	-8.8	Ch 1 V NF
11.672	31.9	38.5	6.8	35.3	41.9	54	-12.1	Ch 2 H NF
40.852	22.2	18.5	0	0	40.7	54	-13.3	Ch 2 H NF
46.688	22.2	23.2	0	0	45.4	54	-8.6	Ch 2 H NF
52.524	21.7	23.5	0	0	45.2	54	-8.8	Ch 2 H NF
58.360	21.6	23.7	0	0	45.3	54	-8.7	Ch 2 H NF
11.672	31.9	38.5	6.8	35.3	41.9	54	-12.1	Ch 2 V NF
40.852	22.2	18.5	0	0	40.7	54	-13.3	Ch 2 V NF
46.688	22.2	23.2	0	0	45.4	54	-8.6	Ch 2 V NF
52.524	21.7	23.5	0	0	45.2	54	-8.8	Ch 2 V NF
58.360	21.6	23.7	0	0	45.3	54	-8.7	Ch 2 V NF

Notes: checked all the way up to tenth harmonic Noise Floor only

EQUIPMENT: Tracer 2210 Baseband Processor with
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Radiated Photographs (Worst Case Configuration)



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Section 9. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: Lance Walker	DATE: 11/05/2001

Test Results: Complies.

Measurement Data: See attached plots.

EQUIPMENT: Tracer 2210 Baseband Processor with
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Data Plot

Page 1 of 2

Job No.: 1L0491R Date: 11/5/2001
Specification: FCC15247 Temperature(°C): 22
Tested By: Lance Walker Relative Humidity(%): 50
E.U.T.: Tracer 2210
Configuration: Normal
Sample Number: S01
Location: Lab 2 RBW: Refer to plots
Detector Type: Peak VBW: Refer to plots

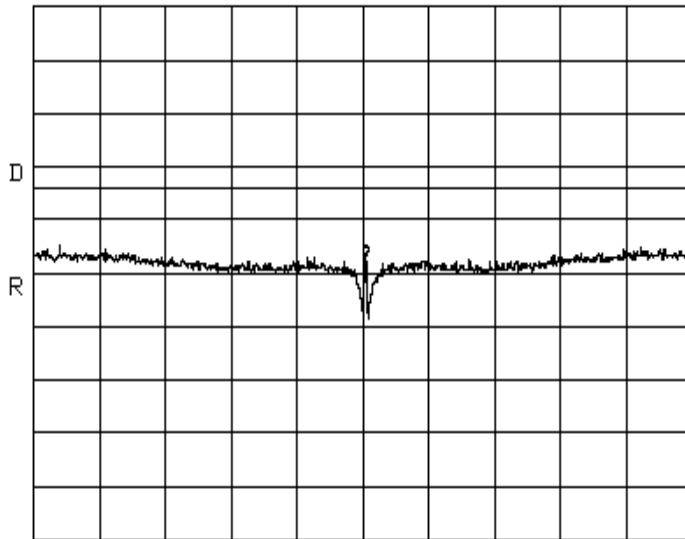
Complete X
Preliminary: _____

Measurement
Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1082
Filter: _____ Cable #2: _____
Receiver: 1464 Cable #3: _____
Attenuator #1: 1469 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB

ATTEN 40dB MKR -4.67dBm
RL 42.0dBm 10dB/ 5.748010GHz



CENTER 5.748000GHz SPAN 2.000MHz
*RBW 3.0kHz VBW 3.0kHz *SWP 700sec

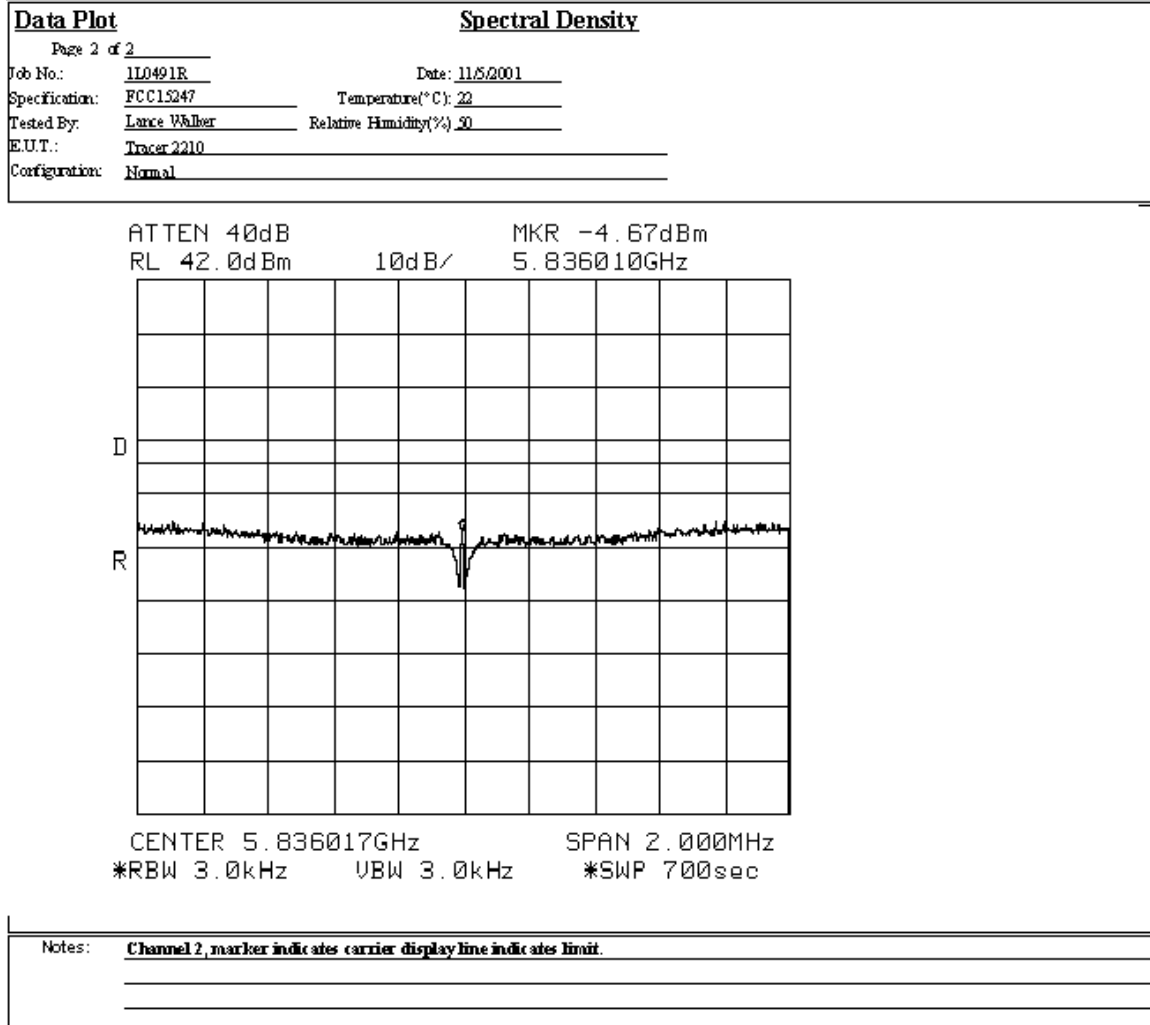
Notes: Channel 1 marker indicates carrier and display line indicates limit.

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Section 10. Minimum Processing Gain

NAME OF TEST: Minimum Processing Gain	PARA. NO.: 15.247(e)
TESTED BY: N/A	DATE: N/A

Test Results: Complies

Measurement Data: See separate attached data.

EQUIPMENT: Tracer 2210 Baseband Processor with
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Section 11. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/01/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/01
1650	12-18 GHz BP Filter	#N/A #N/A	#N/A	12/06/01
1029	PEAK POWER METER	HP 8900D	3303U0012	03/12/01
1030	PEAK POWER SENSOR	HP 84811A	2539A03573	03/12/01
1465	10 db Attenuator DC 8.0 Ghz	Midwest Microwave 292/10db	NONE	CBU
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU
1470	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU
984	HORN ANTENNA	MILLITECH NONE	NONE	CNR
989	HARMONIC MIXER	Hewlett Packard 11970U	2332A00116	01/00/00

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

ANNEX A - TEST DETAILS

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
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Minimum Standard: The R.F. that is conducted back onto the AC power line on any frequency within the band 0.45 to 30 MHz shall not exceed 250 μ V (48 dB μ V) across 50 ohms.

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: Minimum 6 dB Bandwidth	PARA. NO.: 15.247(a)(2)
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Minimum Standard: The minimum 6 dB bandwidth shall be at least 500 kHz

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: Maximum Peak Output Power	PARA. NO.: 15.247(b)(1)
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Minimum Standard: The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Calculation Of EIRP For Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)
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Minimum Standard: Systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines stipulated in 1.1307(b)(1) of CFR 47.

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: Spurious Emissions(conducted)

PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m @ 3m}$)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.

Method Of Measurement:

30 MHz - 10th harmonic plot

RBW: 100 kHz

VBW: 300 kHz

Sweep: Auto

Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level above center frequency.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: Radiated Spurious Emissions PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: Transmitter Power Density

PARA. NO.: 15.247(d)

Minimum Standard: The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

Method Of Measurement: The spectrum analyzer is set as follows:

RBW: 3 kHz

VBW: >3 kHz

Span: => measured 6 dB bandwidth

Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is 1500/3 = 500 sec.

LOG dB/div.: 2 dB

Note: For devices with spectrum line spacing ≤ 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

For Devices With Integral Antenna:

For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Number of channels tested:

Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

NAME OF TEST: Processing Gain	PARA. NO.: 15.247(e)
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Minimum Standard: The processing gain shall be at least 10 dB.

Method Of Measurement: The CW jamming margin method was used to determine the processing gain. A CW signal generator is stepped across the passband of the receiver in 50 kHz increments. At each point the signal generator level required to obtain the recommended bit error rate is recorded. The jammer to signal ratio (J/S) is then calculated. The worst 20% of the J/S points is discarded. The lowest remaining J/S ratio is used to calculate the processing gain.

Calculation Of Processing Gain:

The processing gain was determined by measuring the jamming margin of the E.U.T. and using the following formula:

$$\text{Jamming Margin} = G_p - (S/N)_{\text{out}} - L_{\text{sys}}$$

For a receiver using non-coherent detection the value $(S/N)_{\text{out}}$ is calculated using the formula:

$P_e = (1/2)\text{EXP}\{-E/2N_o\}$ where P_e is the probability of error (minimum Bit Error Rate required for proper operation).

E/N_o is $(S/N)_{\text{out}}$

for example, for a bit error rate of 10^{-4} a S/N ratio of 12.3 dB is required.

L_{sys} (system losses) is assumed to be 2 dB.

$$\text{Therefore } G_p = M_j + (S/N)_{\text{out}} + L_{\text{sys}}$$

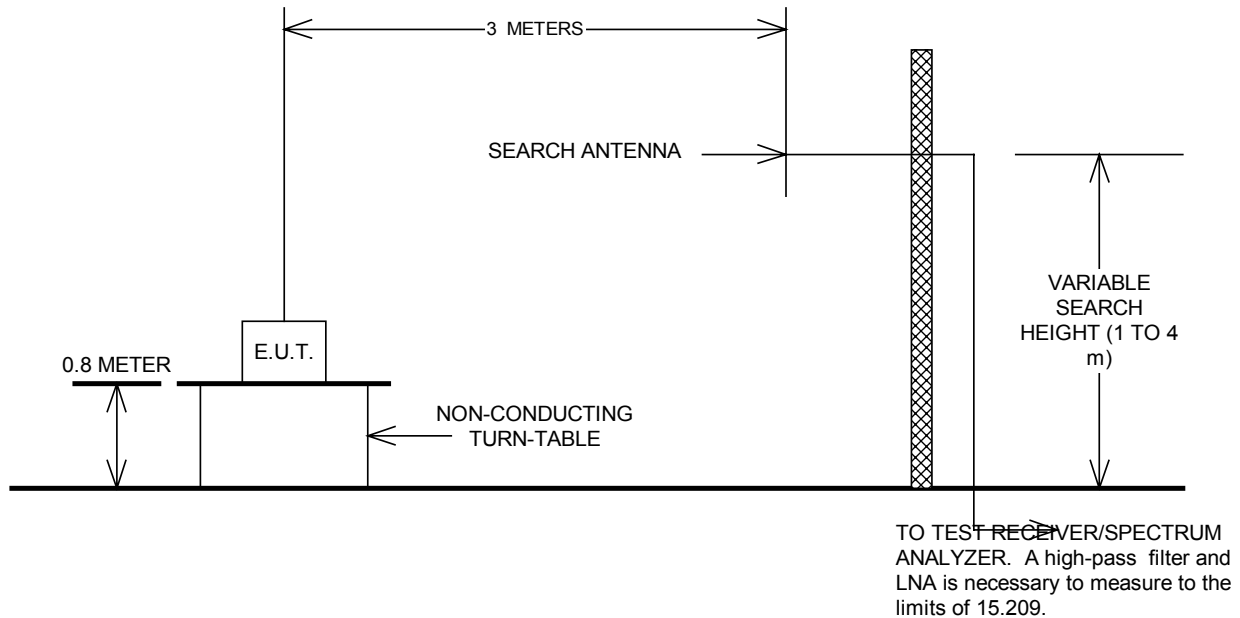
Measurement performed at a channel in the center of the operating band of the EUT.

EQUIPMENT: Tracer 2210 Baseband Processor with
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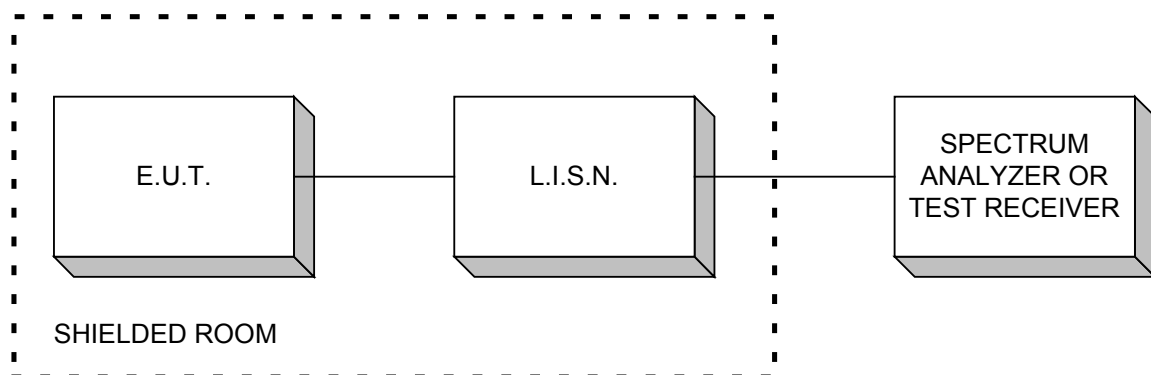
ANNEX B - TEST DIAGRAMS

EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Test Site For Radiated Emissions

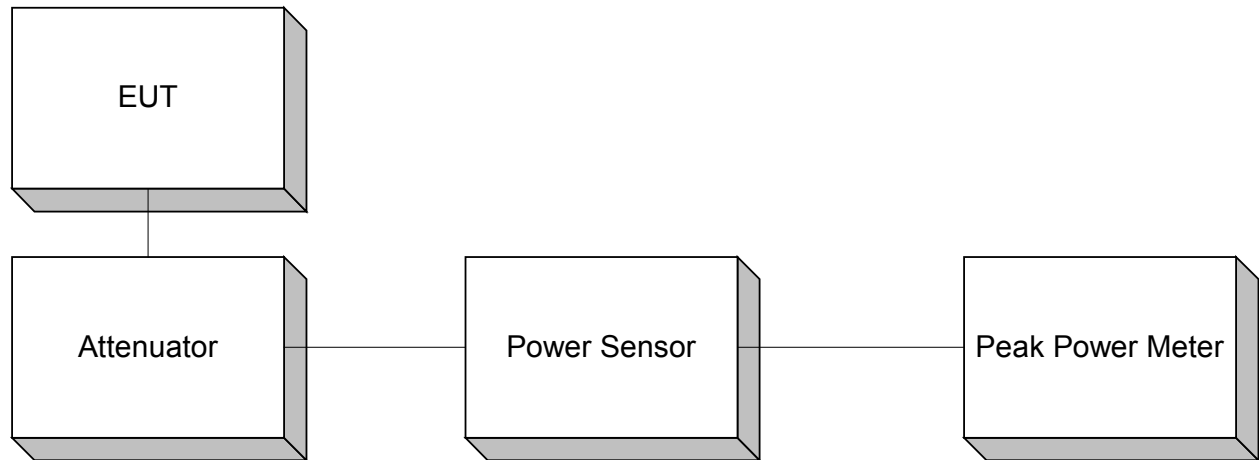


Conducted Emissions



EQUIPMENT: Tracer 2210 Baseband Processor with
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Peak Power At Antenna Terminals

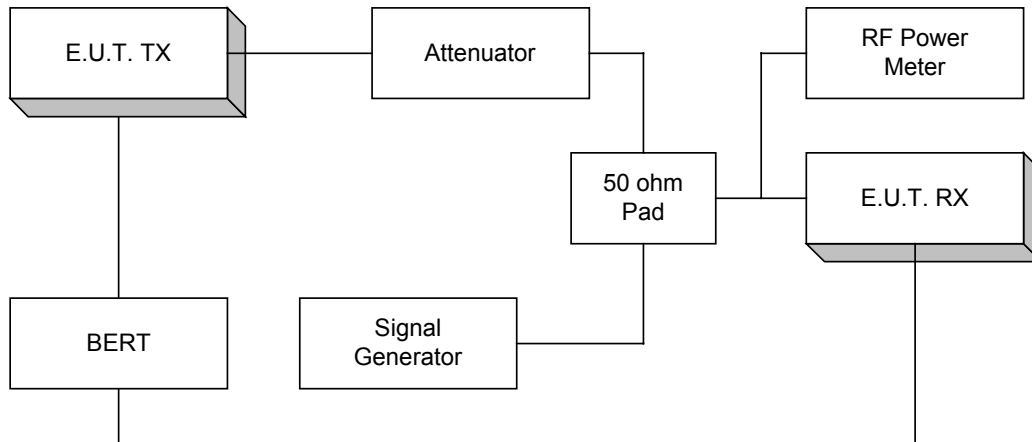


**Minimum 6 dB Bandwidth
Peak Power Spectral Density
Spurious Emissions (conducted)**



EQUIPMENT: Tracer 2210 Baseband Processor with
Tracer 3202 5.8 GHz Mastmount RFC PROJECT NO.: 1L0492RUS1

Processing Gain



NOTE: This is a typical setup. The setup may vary slightly since many devices have BER test functions built into the device.