



KTL Dallas, Inc.

Safety - EMC - Telecom - ISO Guide 25

ENGINEERING TEST REPORT

**ON:
PROFESSIONAL TRANSMITTER
FCC ID: NQQPS911-9805-1**

IN ACCORDANCE WITH:

**FCC PART 15, SUBPART C, SECTION 247
DIRECT SEQUENCE TRANSMITTERS 902 - 928 MHZ**

REPORT NO.: 8L0077EUS

TESTED FOR:

**PERSONAL SECURITY & SAFETY SYSTEMS, INC.
1237 EXECUTIVE DRIVE EAST
RICHARDSON, TEXAS 75081**

TESTED BY:

**KTL DALLAS, INC.
802 N. KEALY
LEWISVILLE, TEXAS 75057-3136**



NVLAP LAB CODE: 100426-0

JANUARY 1999

This document contains 42 pages including this one.

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decisions made or actions based on this report.**

This report applies only to the items tested.

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

Section 1. Summary Of Test Results**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 FCC Part 15, Subpart C, Paragraph 15.247 for Direct Sequence Spread Spectrum Devices.

Abstract:

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
Powerline Conducted Emissions	15.207 (a)	48 dB μ V	N/A	N/A
Occupied Bandwidth	15.247 (a)(2)	\geq 500 kHz	4.5 MHz	Pass
Peak Power Output	15.247 (b)	1 Watt	50 mW	Pass
Spurious Emissions (Antenna Conducted)	15.247 (c)	-20 dBc	N/A	N/A
Spurious Emissions	15.247 (c)	Table 15.209 (a)	-18.25 Db(H) -9.08 dB(H) 72 dB μ V(V)	Pass Pass Pass
Transmitter Power Density	15.247 (d)	\leq +8 dBm	35.8 dB μ V/Hz	Pass
Processing Gain	15.247 (e)	\geq 10 dB	N/A	Not Tested

Footnotes For N/A's:

Powerline Conducted Emissions

N/A Battery Powered

Spurious Emissions (Antenna Conducted)

N/A Non-detachable Antenna

Processing Gain

Not Tested per Client's Request

Test Conditions:

Temperature: Within Standard Day Levels °C

Humidity: Within Standard Day Levels %

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

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:

Powerline Conducted Emissions was not applicable as the EUT is battery powered.

Spurious Emissions (Antenna Conducted) was not applicable as the EUT has a non-detachable antenna.

Processing Gain was not tested per the client's request.

TESTED BY:

Michael Sundstrom DATE: 12/04/98

Michael Sundstrom, Sr EMC Test Technician

TECHNICAL REVIEW:

Wes Atchison DATE: 1/19/99

Wes Atchison, Senior EMC Engineer

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section 2. General Equipment Specification

Manufacturer: Personal Security & Safety Systems

Model No.: Professional Transmitter

Serial No.: NONE

Part No.: 10-102-0000

New Submission

Production Unit

Class II Permissive Change

Pre-Production Unit

Family Listing

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Transmitter:

Power Input:	N/A	
Frequency Range:	902-928 MHz	
Turnable Bands:	FIXED	
6 dB Bandwidth:	12 MHz	
Type of Modulation	BPSK DSSS	
Data Rate:	900 bps	
Internal / External Data Source:	Internal	
Emissions Designator:	14M3GID	
Output Impedance:	50 Ohm nominal	
RF Power Output (Rated):	Single:	1 Watt
	Composite:	
Duty Cycle:	3 %	
Channel Spacing:	N/A	
Operator Selection of Operating Frequency:	NONE (fixed)	
Power Output Adjustment Capability:	Factory Set	

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EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Receiver:

N/A Transmitter only

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DIRECT SEQUENCE TRANSMITTERS

REPORT NO.: 8L0077EUS

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

Description of Modification for Modification Filing:

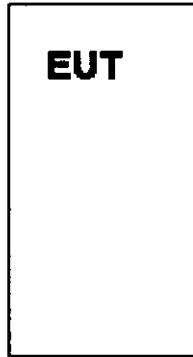
N/A

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Theory of Operation:

The Professional Transmitter is a battery powered direct sequence spread spectrum wireless location device; which operates within the 902 MHz to 928 MHz frequency band.

System Diagram:



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DIRECT SEQUENCE TRANSMITTERS
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EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
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N/A

Battery Operated

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: Michael Sundstrom	DATE: 11/25/98

Test Results:

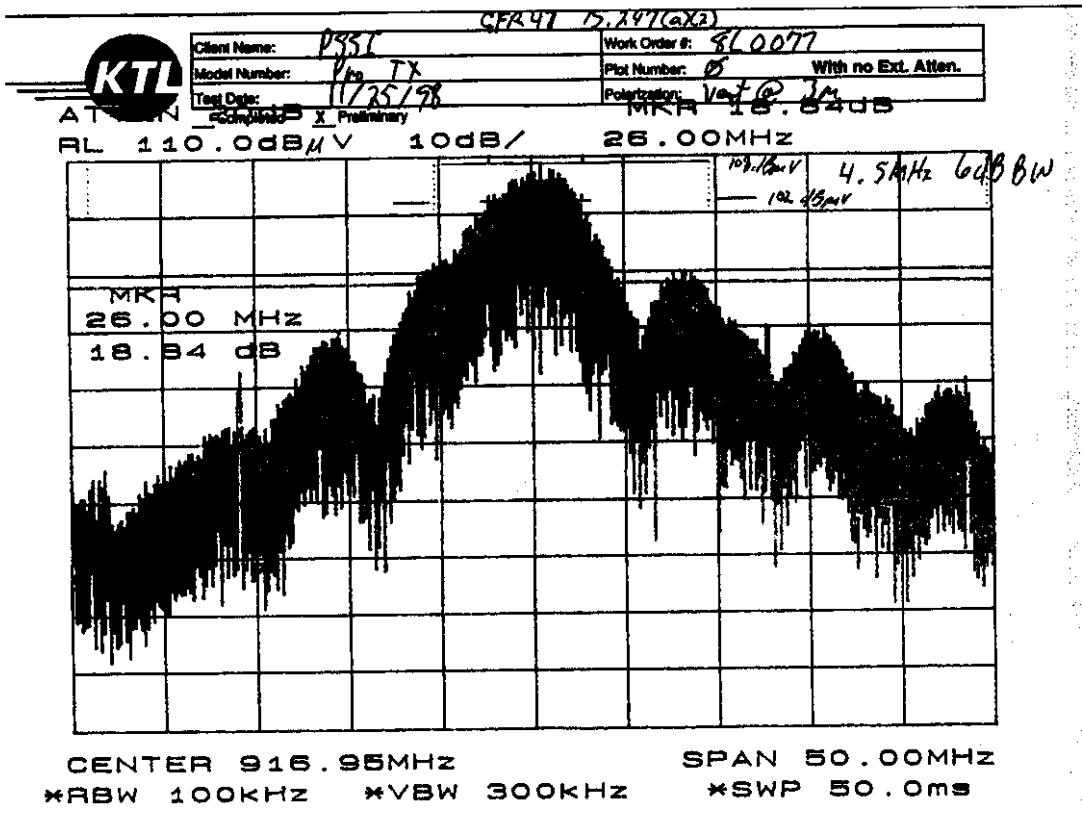
The EUT complies.

The 6 dB bandwidth is 4.5 MHz.

Measurement Data:

See attached graph on page 14.

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Occupied Bandwidth Test Data:

*EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1*

Section 5. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: Michael Sundstrom	DATE: 11/25/98

Test Results:

The EUT complies.

The maximum peak power output of the transmitter is 1.0 Watt.

Measurement Data: Detachable antenna? Yes No
If yes, state the type of non-standard connector used at the antenna port: N/A.

Directional Gain of Antenna: 0 dBi or 1 Numeric Gain

Peak Power Output: 0.05 Watts

Field Strength: 112 dB μ V/m @ 3m or 0.398 V/m @ 3 m

Measured Power Output as a Field Strength "Calculated"

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

Where:

P= Power in Watts

E= Field Strength (V/m)

R= Measurement Distance

G=Numeric Gain of Antenna

$$P = (0.4)^2 (3)^2 / (30) (1) = (0.16) (9) / 30 = 1.44 / 30 = 0.05 \text{ W or } 50 \text{ mW}$$

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

Peak Power Output:

Test Distance (meters) : 3		Range: B OATS		Receiver: 677		RBW(kHz): 1000		Detector: Peak			
Freq. (MHz)	Ant. *494	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dB μ V/m)	Ant. Facto r (dB)* *	Amp. Gain (dB)***	Cable. Factor (dB)	Field Strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.91	H	V	1.3	N/A	86	22.7	0	3.31	112	N/A	N/A

Notes:

B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole

* Re-measured using dipole antenna.

** Includes cable loss when amplifier is not used.

*** Includes cable loss.

() Denotes failing emission level.

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DIRECT SEQUENCE TRANSMITTERS

REPORT NO.: 8L0077EUS

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

Section 6. Spurious Emissions (Antenna Conducted)

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

N/A

Non-detachable Antenna

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section 7. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(c)
TESTED BY: Michael Sundstrom	DATES: 11/25/98, 12/04/98, 12/04/98

Test Results:

The EUT complies.

Test # RE 3 (30 MHz to 300 MHz)

The worst-case emission level is 19.39 dB μ V/m at 114.390 MHz at a distance of 3 meters on the Vertical polarization. This is 24.11 dB below the quasi-peak specification limit of 43.5 dB μ V/m.

Test # RE 4 (300 MHz to 1 GHz)

The worst-case emission level is 38.67 dB μ V/m at 960.480 MHz at a distance of 3 meters on the Horizontal polarization. This is 15.33 dB below the quasi-peak specification limit of 54 dB μ V/m.

Test # MW 3 (1 GHz to 10 GHz)

The worst-case microwave radiated emission is 72 dB μ V/m at 1.82 GHz at a distance of 3 meters at the Vertical polarization. This is 20 dB below the measured carrier.

Measurement Data:

See test data on pages 21, 22, and 24.

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Test Data - Radiated Emissions (PEAK) Test # RE-3 (30 MHz to 300 MHz)

Emission Frequency (MHz)	Ant. Pol. (H/V)	Ant. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	CR/SL Delta (dB)	Pass Fail Marginal	Notes
40.480	V	20.0	100	13	2.67	25.0	20.67	107.8	-87.13	Pass	QP 100
114.390	V	10.0	20.0	10.7	3.58	24.9	19.39	43.5	-24.11	Pass	QP 100 15.205
143.000	V	10.0	20.0	12.6	3.99	24.8	11.75	107.8	-96.05	Pass	(BB) QP 100
171.380	V	10.0	16.0	13	3.99	24.8	18.21	43.5	-25.29	Pass	QP 100 15.205
252.130	V	0.0	20.0	14.9	5.54	24.7	15.78	46	-30.22	Pass	QP 100 15.205
33.750	H	0.0	31.0	13.5	2.25	25.0	21.75	95.8	-74.05	Pass	
120.000	H	0.0	20.0	11.4	3.58	24.9	10.11	43.5	-33.39	Pass	NOISE FLOOR 15.205
280.000	H	0.0	20.0	17.5	5.54	24.7	18.38	46	-27.62	Pass	NOISE FLOOR 15.205
33.750	H	10.0	18.0	13.5	2.25	25.0	18.75	95.8	-77.05	Pass	QP 100
120.000	H	10.0	12.0	11.4	3.58	24.9	12.11	43.5	-31.39	Pass	QP 100 NOISE FLOOR 15.205
280.000	H	10.0	10.0	17.5	5.54	24.7	18.38	46	-27.62	Pass	QP 100 NOISE FLOOR 15.205

Scanned 30MHz to 300MHz

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Test Data - Radiated Emissions (PEAK) TEST # RE 4 (300 MHz to 1 GHz)

Emission Frequency (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	CRSL Delta (dB)	Pass Fail Marginal	Notes
325.500	V	0.0	18.0	13.5	6.08	14.7	22.91	46	-23.09	Pass	15.205 N.F.
325.500	V	0.0	9.0	13.5	6.08	14.7	13.91	46	-32.09	Pass	QP 151 15.205 N.F.
327.785	V	0.0	18.0	13.5	6.08	14.7	22.91	46	-23.09	Pass	15.205 N.F.
327.785	V	0.0	9.0	13.5	6.08	14.7	13.91	46	-32.09	Pass	QP 151 15.205 N.F.
330.000	V	0.0	18.0	13.5	6.08	14.7	22.91	46	-23.09	Pass	15.205 N.F.
330.000	V	0.0	9.0	13.5	6.08	14.7	13.91	46	-32.09	Pass	QP 151 15.205 N.F.
332.600	V	0.0	25.0	13.5	6.08	14.7	29.91	46	-16.09	Pass	15.205
332.600	V	0.0	9.0	13.5	6.08	14.7	13.91	46	-32.09	Pass	QP 151 15.205
410.000	V	0.0	21.0	15.9	7.08	14.7	29.29	46	-16.71	Pass	15.205
410.000	V	0.0	9.0	15.9	7.08	14.7	17.29	46	-28.71	Pass	QP 151 15.205
960.500	V	0.0	30.0	23.06	11.13	14.5	49.67	54	-4.33	Pass	15.205
960.500	V	0.0	18.0	23.06	11.13	14.5	37.67	54	-16.33	Pass	QP 151 15.205
961.500	V	0.0	31.0	23.06	11.13	14.5	50.67	54	-3.33	Pass	15.205
961.500	V	0.0	18.0	23.06	11.13	14.5	37.67	54	-16.33	Pass	QP 151 15.205
300.100	H	0.0	18.0	13.5	6.08	14.7	22.91	95.8	-72.89	Pass	N.F.
300.100	H	0.0	9.0	13.5	6.08	14.7	13.91	95.8	-81.89	Pass	QP 151 N.F.
697.500	H	0.0	20.0	20.73	8.85	14.6	34.94	95.8	-60.86	Pass	
697.500	H	0.0	10.0	20.73	8.85	14.6	24.94	95.8	-70.86	Pass	QP 151
759.600	H	0.0	40.0	22.85	9.63	14.6	57.92	95.8	-37.88	Pass	
759.600	H	0.0	19.0	22.85	9.63	14.6	36.92	95.8	-58.88	Pass	QP 151
774.000	H	0.0	18.0	23.6	9.63	14.6	36.67	95.8	-59.13	Pass	N.F.
774.000	H	0.0	9.0	23.6	9.63	14.6	27.67	95.8	-68.13	Pass	QP 151 N.F.
776.000	H	0.0	18.0	23.85	9.63	14.6	36.92	95.8	-58.88	Pass	N.F.
776.000	H	0.0	9.0	23.85	9.63	14.6	27.92	95.8	-67.88	Pass	QP 151 N.F.
779.500	H	0.0	18.0	23.85	9.63	14.6	36.92	95.8	-58.88	Pass	N.F.
779.500	H	0.0	9.0	23.85	9.63	14.6	27.92	95.8	-67.88	Pass	QP 151 N.F.
790.200	H	0.0	18.0	24.6	9.63	14.6	37.67	95.8	-58.13	Pass	N.F.
790.200	H	0.0	9.0	24.6	9.63	14.6	28.67	95.8	-67.13	Pass	QP 151 N.F.
883.770	H	0.0	18.0	24.72	10.41	14.7	38.46	95.8	-57.34	Pass	N.F.
883.770	H	0.0	9.0	24.72	10.41	14.7	29.46	95.8	-66.34	Pass	QP 151 N.F.
916.700	H	0.0	94.0	25.15	11.13	14.5	115.76	46	69.76	Fail	Fundamental
916.700	H	0.0	81.0	25.15	11.13	14.5	102.76	46	56.76	Fail	QP 151 Fundamental
960.480	H	0.0	30.0	23.06	11.13	14.5	49.67	54	-4.33	Pass	15.205
960.480	H	0.0	19.0	23.06	11.13	14.5	38.67	54	-15.33	Pass	QP 151 15.205
916.700	V	0.0	106.0	25.15	11.13	14.5	127.76	46	81.76	Fail	Fundamental
916.700	V	0.0	94.0	25.15	11.13	14.5	115.76	46	69.76	Fail	QP 151 Fundamental
Peak Power											
RBW = 3kHz VBW = 10kHz											
Sweep = 100 sec.											
Span = 300kHz											
916.700	V	0.0	86.3	25.15	11.13	14.5	108.09	46	62.09	Fail	Fundamental
Scanned 300MHz to 1GHz											

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

Test Data – Microwave Radiated Emissions Test # MW 3 (1 GHz to 10 GHz)

Freq. (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Conver. Factor	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	Pol.	Comments:
1.82	40	28.2	3.31	0	0	72	92	V	
2.8	10	30.8	4.23	0	0	45	54	V	N.F. 15.205
6	2	35.3	6.37	0	0	44	54	V	N.F.
9	3	37.7	8.13	0	0	49	54	V	N.F. 15.205
1.82	17	28.2	3.31	0	0	49	76	H	
3	9	30.8	4.23	0	0	44	54	H	N.F.
6	3	35.3	6.37	0	0	45	54	H	N.F.
9	4	37.7	8.13	0	0	50	54	H	N.F. 15.205
0.91	86	22.7	3.31	0	0	112	N/A	V	Fundamental
0.91	70	22.7	3.31	0	0	96	N/A	H	Fundamental
							Scanned 1GHz to 10GHz		

Legend:

N.F. = Noise Floor reading

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

Section 8. Transmitter Power Density

NAME OF TEST: Transmitter Power Density	PARA. NO.: 15.247(d)
TESTED BY: Michael Sundstrom	DATE: 12/04/98

Test Results:**The EUT complies.****Measurement Data:**

See attached graph on page 27.

Received Signal: 35.8 dB μ V/m/Hz

Antenna Factor: 25.15 dB

Cable Loss: 11.13 dB

Pre Amp Gain: 14.5 dB

Corrected Field Strength: 60.28 dB μ V/m/HzMeasured Reading: 60.28 dB μ V/m/Hz

BW Correction: 34.77 dB

Corrected reading: 95.05 dB μ V/m/3kHz(Log)-1(Corrected reading / 20) 56558.8 μ V/m/3kHz(56558.8 μ V/m/3kHz)/(1X10)6 0.057 V/m/3kHz**Power Output as a Field Strength "Calculated"**

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

Where:

P= Power in Watts

E= Field Strength (V/m)

R= Measurement Distance

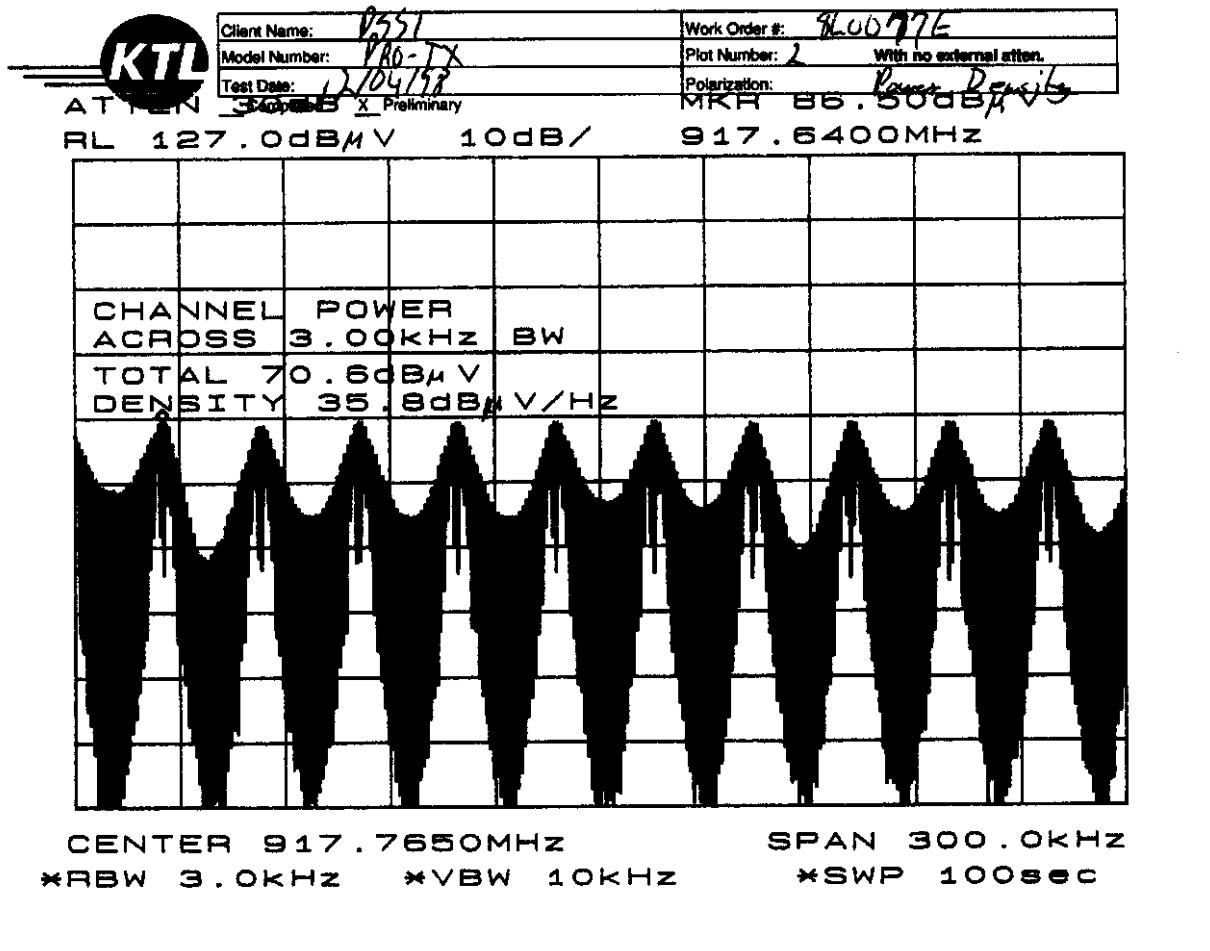
G=Numeric Gain of Antenna

$$P = (0.057)^2 (3)^2 / (30) (1) = (0.003) (9) / 30 = 0.29 / 30 = 0.001 \text{ W or } 1.0 \text{ mW}$$

$$1.0 \text{ mW} = 0 \text{ dBm}$$

$$\text{Compare: } (0 \text{ dBm}) - (+8 \text{ dBm limit}) = (-8 \text{ dB}) \text{ below limit}$$

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Transmitter Power Density Data

KTL Dallas, Inc.

CFR 47, PART 15, SUBPART C, SECTION 247
DIRECT SEQUENCE TRANSMITTERS
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EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section 9. Processing Gain

NAME OF TEST: Processing Gain	PARA. NO.: 15.247(e)
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Not tested per Client Request

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section 10. Test Equipment List

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

<u>KTL ID</u>	<u>Nomenclature</u>	<u>Manufacturer Model Number</u>	<u>Serial Number</u>	<u>Calibration Date</u>
C1A	A O.A.T.S. Cable Set			04/03/98
CF01	Storm Cable (7.7 meters)			04/28/98
100	Polarad Receiver	Rohde & Schwarz ESV	872149/28	10/07/98
151	Receiver (20-1000 MHz)	Rohde & Schwarz ESVS 30	843710/0001	03/04/98
182	Limiter	Fischer FCC45013-1.2	NSN	02/27/98
201	Biconical Antenna (30 MHz - 300 MHz)	A.H. Systems SAS200/542	235	01/17/98
241	Biconical Antenna (30 MHz - 300 MHz)	International Compliance Corporation BCON-30300	212	11/17/98
398	Preamplifier, 25dB (30 MHz - 1.5 GHz)	ICC LNA25	398	06/18/98
408	Low Noise Amplifier	International Compliance Corporation LN22	N/A	04/27/98
494	Horn Antenna	A.H. Systems SAS-200/571	162	04/29/98
660(a)	Spectrum Analyzer	Hewlett Packard 8567A	2541A00109	01/06/98
660(b)	Display Unit	Hewlett Packard 85662A	2542A10537	01/06/98
660(c)	Quasi-Peak Adapter	Hewlett Packard 85650A	2551A00608	01/06/98
664	Antenna, Log Periodic	EMCO 3146	1753	01/24/98

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Test Equipment List (Continued):

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

<u>KTL ID</u>	<u>Nomenclature</u>	<u>Manufacturer Model Number</u>	<u>Serial Number</u>	<u>Calibration Date</u>
677	Receiver (1 - 18 GHz)	Electro Metrics EMC 50	185	08/26/98
850	Log Periodic Antenna	A.H. Systems SAS-200/510	821	01/24/98
G2624	Spectrum Analyzer	HP 8563E	3551A04428	10/05/98
		SITE A O.A.T.S. (OPEN AREA TEST SITE) 10 Meter Site		
	Turntable, 4 foot	RF Consultants (Automated)		CNR
	Antenna Mast, 4 Meter	EMCO Part # 1050 (Automated)		CNR
		SITE B O.A.T.S. (OPEN AREA TEST SITE) 10 Meter Site		
	Turntable Flush Mounted, Metal Covered, 8 Foot	RF Consultants Model AT-8 (Automated)		CNR
	Antenna Mast, 4 Meter	ICC (Automated)		CNR

LEGEND:

CNR = CALIBRATION NOT REQUIRED

N/A = NOT APPLICABLE

CBU = CALIBRATED BEFORE USE

KTL Dallas, Inc.

CFR 47, PART 15, SUBPART C, SECTION 247
DIRECT SEQUENCE TRANSMITTERS
REPORT NO.: 8L0077EUS
ANNEX A

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

ANNEX A

TEST METHODOLOGIES

EQUIPMENT: Professional Transmitter

FCC ID: NQQPS911-9805-1

Section A1. Powerline Conducted Emissions

Test Method - Powerline Conducted Emissions

PARA. NO.: 15.207(a)

Test Conditions: Standard Temperature and Humidity
Standard Test Voltage

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: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section A2. Occupied Bandwidth**Test Method - Occupied Bandwidth****PARA. NO.: 15.247(a)(2)**

Test Conditions: Standard Temperature and Humidity
Standard Test Voltage

Minimum Standard: The minimum bandwidth shall be at least 500 kHz.

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: 100 kHz
VBW: 100 kHz
Span: >RBW
LOG dB/div.: 2 dB
Sweep: Auto

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: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section A3. Peak Power Output

Test Method - Peak Power Output

PARA. NO.: 15.247(b)

Test Conditions: Standard Temperature and Humidity
 Standard Test Voltage

Minimum Standard: The maximum peak power output 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.

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.

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

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: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section A4. Spurious Emissions at Antenna Terminal

Test Method - Spurious Emissions at Antenna Terminal

PARA. NO.: 15.247(c)

Test Conditions: Standard Temperature and Humidity
 Standard Test Voltage

Minimum Standard: In any 100 kHz bandwidth outside the 902 - 928 MHz bands, 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 (μ 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.

Method Of Measurement:

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

Marker: Peak of fundamental emission

Marker Δ: Peak of highest spurious level above 928 MHz

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

Marker: Peak of fundamental emission

Marker Δ: Peak of highest spurious level below 902 MHz

30 MHz - 10th Harmonic Plot

RBW: 100 kHz

VBW: 300 kHz

Sweep: Auto

Display line: -20 dBc

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: Professional Transmitter
FCC ID: NQQPS911-9805-1

Section A5. Radiated Spurious Emissions

Test Method - Radiated Spurious Emissions

PARA. NO.: 15.247(c)

Test Conditions: Standard Temperature and Humidity
 Standard Test Voltage

Minimum Standard: In any 100kHz bandwidth outside the 902 - 928 MHz bands 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 (μ 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.

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: Professional Transmitter

FCC ID: NQQPS911-9805-1

Section A6. Transmitter Power Density**Test Method - Transmitter Power Density****PARA. NO.: 15.247(d)**

Test Conditions: Standard Temperature and Humidity
Standard Test Voltage

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: Professional Transmitter**FCC ID: NQQPS911-9805-1***Section A9. Processing Gain****Test Method - Processing Gain****PARA. NO.: 15.247(e)**

Test Conditions: Standard Temperature and Humidity
Standard Test Voltage

Minimum Standard: The processing gain shall be at least 10 dB.

Method Of Measurement: The CW jamming margin method is 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 is determined by measuring the jamming margin of the E.U.T. and using the following formula:

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

For a receiver using non-coherent detection the value $(S/N)_{out}$ 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 $(S/N)_{out}$

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.

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

Measurement performed at 915 MHz.

KTL Dallas, Inc.

CFR 47, PART 15, SUBPART C, SECTION 247
DIRECT SEQUENCE TRANSMITTERS
REPORT NO.: 8L0077EUS
ANNEX B

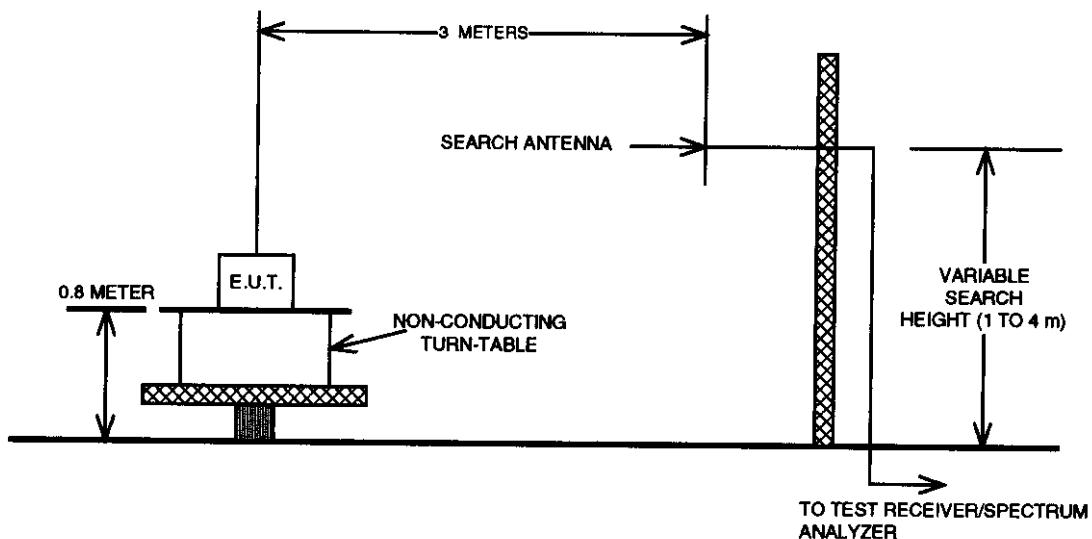
EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

ANNEX B

BLOCK DIAGRAMS

EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Test Site For Radiated Emissions



Below 1 GHz

Peak detector.
RBW = 100 kHz

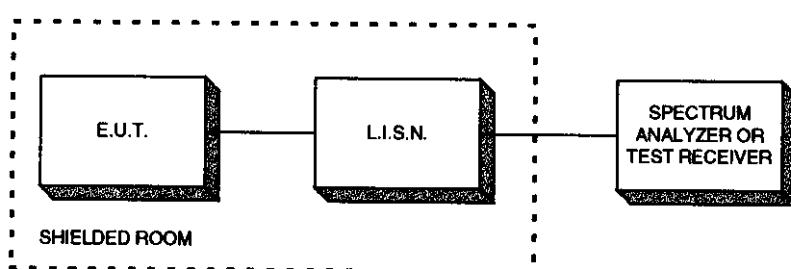
Above 1 GHz For Peak Emission Levels

Peak detector
RBW = 1 MHz
VBW = >RBW

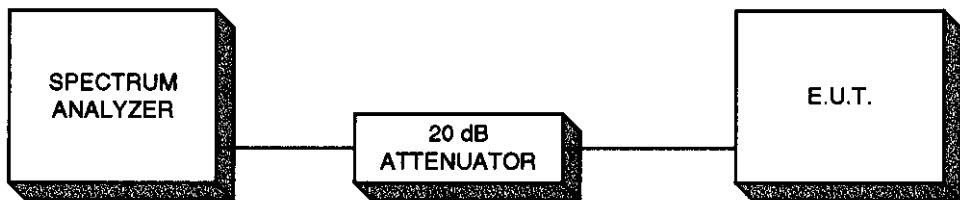
Above 1 GHz For Average Emission Levels

Peak detector
RBW = 1 MHz
VBW = 10 Hz

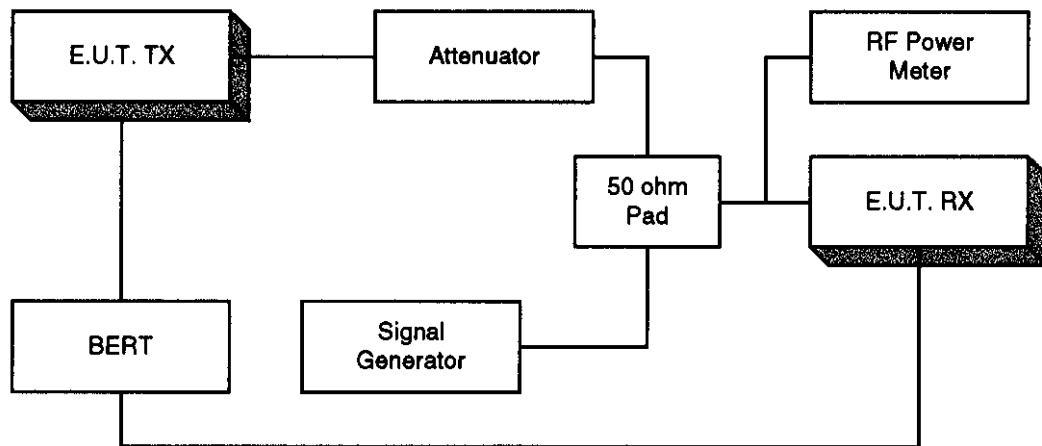
Conducted Emissions



EQUIPMENT: Professional Transmitter
FCC ID: NQQPS911-9805-1

Transmitter Power Density & Peak Power At Antenna Terminals

If the E.U.T. has an integral (non-detachable) antenna, the above test is performed as a radiated measurement and the result is reported as EIRP.

Processing Gain

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