

KTL Test Report: 9R02282

Applicant: Digital Security Controls Ltd.
3301 Langstaff Road
Vaughn, Ontario
L4K 4L2

**Equipment Under Test:
(E.U.T.)** Wireless 929 Spread Spectrum Transmitter

FCC ID: F5300SS929

In Accordance With: **FCC Part 15, Subpart C**
Direct Sequence Transmitters 902 - 928 MHz

Tested By: KTL Ottawa Inc.
3325 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Authorized By:

R. Grant, Wireless Group Manager

Date:

Total Number of Pages: 21

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

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EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Section 1. Summary Of Test Results

Manufacturer: Digital Security Controls Ltd.
Model No.: Wireless 929 Spread Spectrum Transmitter
Serial No.: None
Date Received In Laboratory: February 24, 2000
KTL Identification No.: Item #2

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.

- | | | | | | | |
|---|----------------------------|-------------------------------------|---------------------|----------------|--------------------------|----------------|
| <input checked="" type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit | | | |
| <input type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | Pre-Production Unit | | | |
| <table border="1"><tr><td>D</td><td>S</td><td>S</td></tr></table> | D | S | S | Equipment Code | <input type="checkbox"/> | Family Listing |
| D | S | S | | | | |

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: 100351-0

TESTED BY: _____ DATE: _____
Glen Westwell, Technologist

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EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Summary Of Test Data

| NAME OF TEST | PARA. NO. | SPEC. | RESULT |
|----------------------------------|------------------|---------------------|---------------|
| Occupied Bandwidth | 15.247 (a)(2) | ≥500 kHz | Complies |
| Peak Power Output | 15.247 (b) | 1 watt | Complies |
| Spurious Emissions (Radiated) | 15.247 (c) | Table 15.209 (a) | Complies |
| Transmitter Power Density | 15.247 (d) | ≤ +8 dBm | Complies |
| Processing Gain | 15.247 (e) | ≥ 10 dB | Complies |

Footnotes For N/A's:

Test Conditions:

Indoor Temperature: 24 °C
 Humidity: 20 %

Outdoor Temperature: 3 °C
 Humidity: 18 %

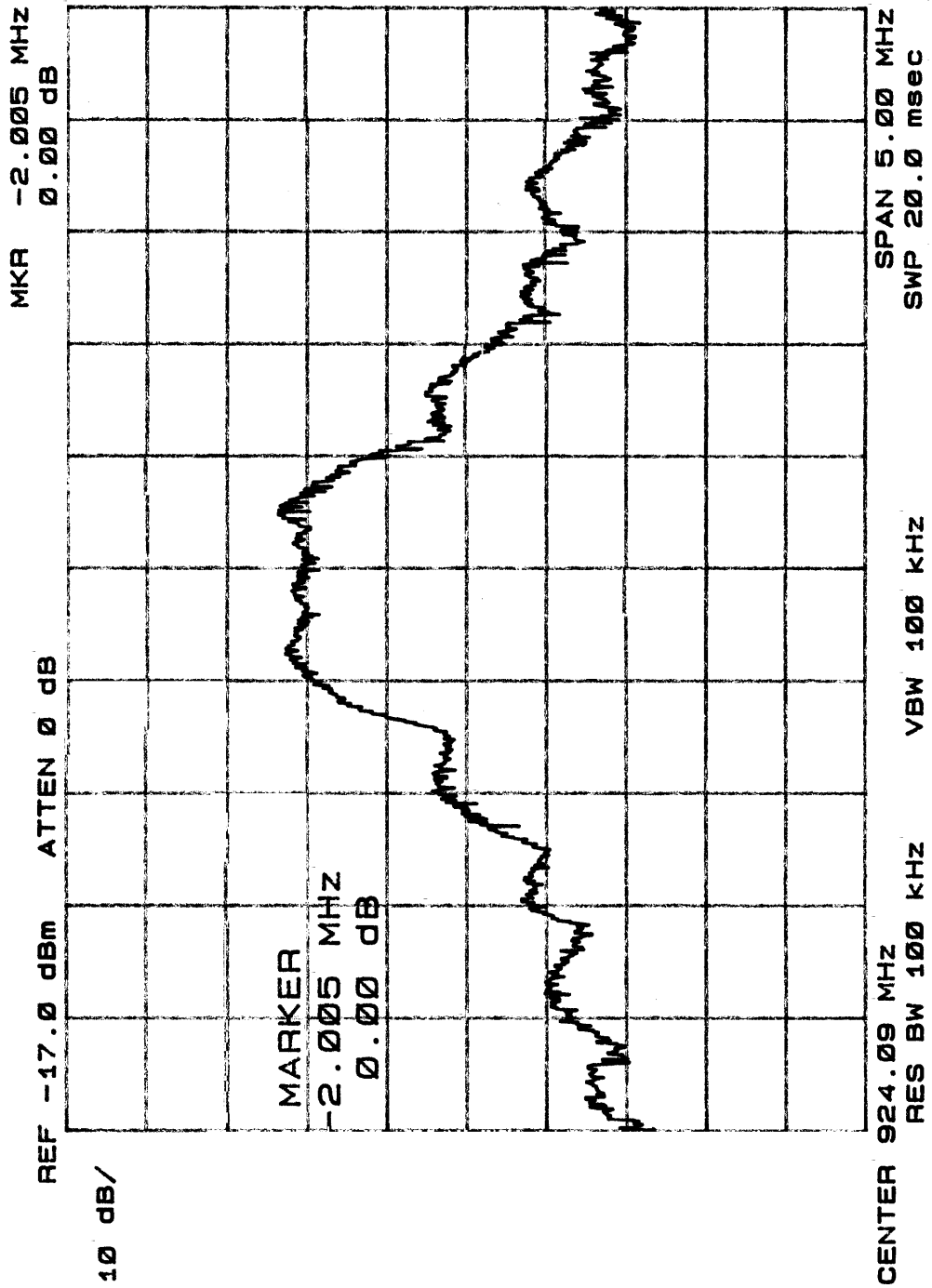
EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Section 2. General Equipment Specification

Transmitter

| | |
|--|---------------------------------|
| Power Input: | 4.5 Vdc Battery |
| Frequency Range: | 924 MHz Fixed |
| Tunable Bands: | 1 |
| 6 dB Bandwidth: | 1.07 MHz |
| Type of Modulation | Direct Sequence Spread Spectrum |
| Emissions Designator: | 2M00L1D |
| Power Output Adjustment Capability: | None |

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929



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Section 3. Occupied Bandwidth

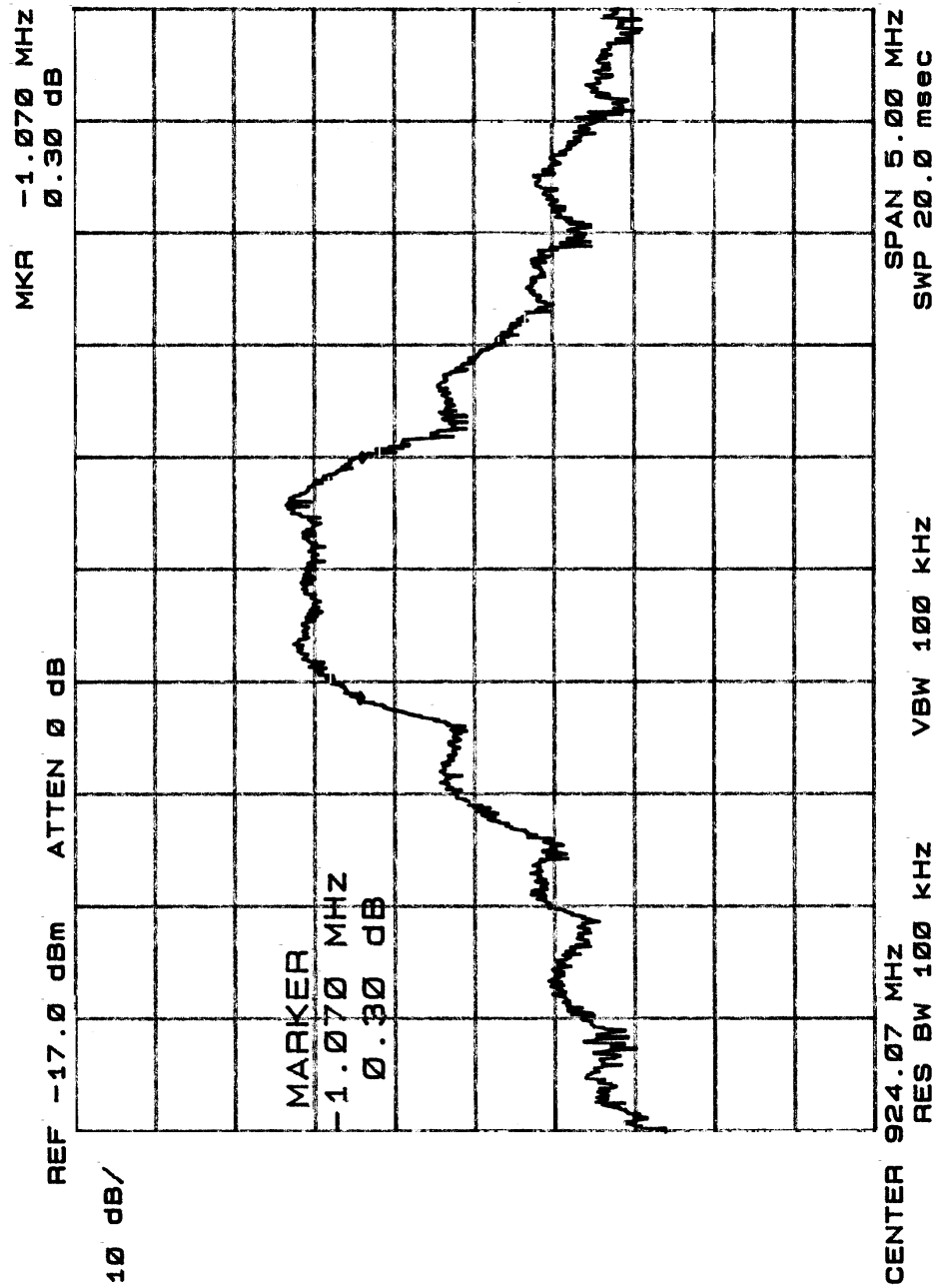
| | |
|----------------------------------|-------------------------|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 15.247(a)(2) |
| TESTED BY: Glen Westwell | DATE: March 2, 2000 |

Test Results: Complies. The 6 dB bandwidth is 1.07 MHz.
See attached graph.

Measurement Data: See attached graph.

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
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Occupied Bandwidth: 6dB



EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Section 4. Peak Power Output

| | |
|---------------------------------|-------------------------|
| NAME OF TEST: Peak Power Output | PARA. NO.: 15.247 (b) |
| TESTED BY: Glen Westwell | DATE: February 28, 2000 |

Test Results: Complies. The maximum peak power output of the transmitter is 1.26 mW.

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

$$\frac{P = E^2 R^2}{30G} = \frac{0.065^2 \times 9}{30(1)} = 0.00126W$$
$$= 1.26 \text{ mW}$$

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Section 5. Spurious Emissions (Radiated)

| | |
|---|-------------------------|
| NAME OF TEST: Spurious Emissions (Radiated) | PARA. NO.: 15.247(c) |
| TESTED BY: Glen Westwell | DATE: February 28, 2000 |

Test Results: Complies. The worst-case emission level is 65.8 dB μ V/m @ 3m at 1848.0 MHz. This is 10.5 dB below the specification limit.

Measurement Data: See attached graphs.

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Test Data - Radiated Emissions (PEAK)

| Test Distance (meters) : 3 | | Range: A Tower | | Receiver: ESVP/8656E | | RBW (kHz): 100 | | VBW (kHz): 300 | | Detector: Peak | |
|-------------------------------|-----------|-------------------|---------------------|-------------------------|----------------------------|--------------------------|-------------------------|------------------------|-------------------------------|-------------------|----------------|
| Freq. (MHz) | Ant. * | Pol. (V/H) | Ant. HGT. (m) | Table (deg.) | RCVD Signal (dBµV/m) | Ant. Factor (dB)** | Amp. Gain (dB)*** | Duty Cycle Corr. | Field Strength (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
| 924.0 | E/D4 | V | | | 59.3 | 35.3 | | | 94.6 | 131.0 | 36.4 |
| 924.0 | E/D4 | H | | | 61.0 | 35.3 | | | 96.3 | 131.0 | 34.7 |
| 1848.0 | Hrn2 | V | | | 65.5 | 32.8 | -47.0 | | 51.3 | 76.3 | 25.0 |
| 1848.0 | Hrn2 | H | | | 80.0 | 32.8 | -47.0 | | 65.8 | 76.3 | 10.5 |
| 2772.0 | Hrn2 | V | | | 59.5 | 36.6 | -47.8 | | 48.3 | 76.3 | 28.0 |
| 2772.0 | Hrn2 | H | | | 59.7 | 36.6 | -47.8 | | 48.5 | 76.3 | 27.8 |
| 3696.0 | Hrn2 | V | | | 60.3 | 41.0 | -47.0 | | 54.3 | 76.3 | 22.0 |
| 3696.0 | Hrn2 | H | | | 54.8 | 41.0 | -47.0 | | 48.8 | 76.3 | 27.5 |
| 4620.0 | Hrn2 | V | | | 46.2 | 42.5 | -45.8 | | 42.9 | 76.3 | 33.4 |
| 4620.0 | Hrn2 | H | | | 48.7 | 42.5 | -45.8 | | 45.4 | 76.3 | 30.9 |
| 5544.0 | Hrn2 | V | | | 42.3 | 45.3 | -45.1 | | 42.5 | 76.3 | 33.8 |
| 5544.0 | Hrn2 | H | | | 44.5 | 45.3 | -45.1 | | 44.7 | 76.3 | 31.6 |

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.

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Test Data - Radiated Emissions (AVERAGE)

| Test Distance (meters) : 3 | | Range: A Tower | | Receiver: ESVP/8656E | | RBW (kHz): 100 | | VBW (kHz): 300 | | Detector: Peak | |
|-------------------------------|-----------|-------------------|---------------------|-------------------------|----------------------------|--------------------------|-------------------------|------------------------|-------------------------------|-------------------|----------------|
| Freq. (MHz) | Ant. * | Pol. (V/H) | Ant. HGT. (m) | Table (deg.) | RCVD Signal (dBµV/m) | Ant. Factor (dB)** | Amp. Gain (dB)*** | Duty Cycle Corr. | Field Strength (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
| 2772.0 | Hrn2 | V | | | 49.2 | 36.6 | -47.8 | | 38.0 | 54.0 | 16.0 |
| 2772.0 | Hrn2 | H | | | 47.0 | 36.6 | -47.8 | | 35.8 | 54.0 | 18.2 |
| 3696.0 | Hrn2 | V | | | 45.2 | 41.0 | -47.0 | | 39.2 | 54.0 | 14.8 |
| 3696.0 | Hrn2 | H | | | 46.7 | 41.0 | -47.0 | | 40.7 | 54.0 | 13.3 |
| 4620.0 | Hrn2 | V | | | 39.2 | 42.5 | -45.8 | | 35.9 | 54.0 | 18.1 |
| 4620.0 | Hrn2 | H | | | 38.7 | 42.5 | -45.8 | | 35.4 | 54.0 | 18.6 |

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.

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Radiated Photographs (Worst Case Configuration)

Front View



EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Section 6. Transmitter Power Density

| | |
|---|-------------------------|
| NAME OF TEST: Transmitter Power Density | PARA. NO.: 15.247(d) |
| TESTED BY: Glen Westwell | DATE: February 28, 2000 |

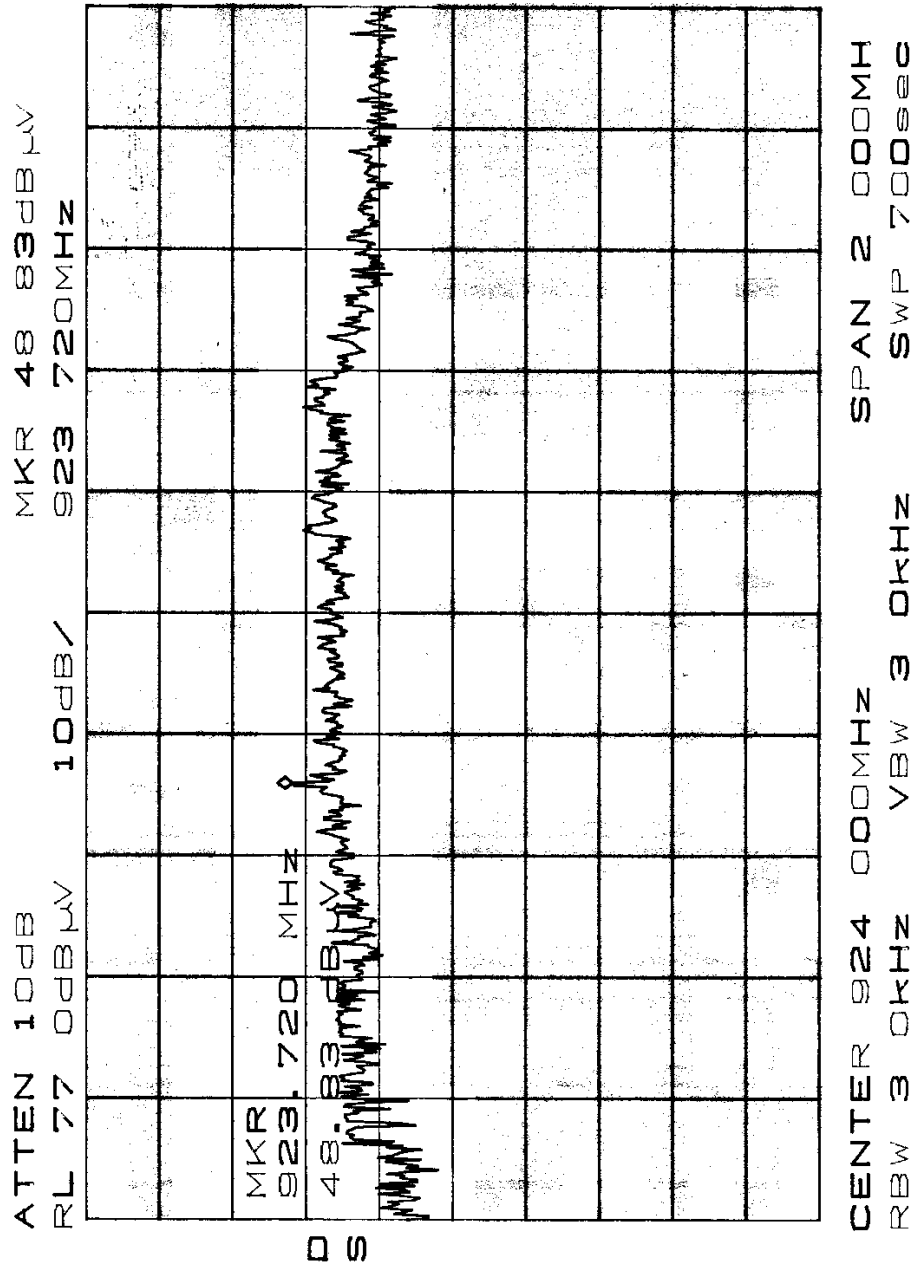
Test Results: Complies.

Measurement Data: See attached graphs.

Power spectral density was measured on the outdoor range at a distance of 3m using the power substitution method where the E.U.T. is replaced with a calibrated signal generator and dipole antenna.

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Transmitter Power Density: $PSD = -61.8 + 48.8 = -13 \text{ dBm}$



EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
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Section 7. Processing Gain

| | |
|-------------------------------|-------------------------|
| NAME OF TEST: Processing Gain | PARA. NO.: 15.247(e) |
| VERIFIED BY: Glen Westwell | DATE: February 29, 2000 |

Test Results: Complies. The processing gain of the system is 15.1 dB.

Measurement Data: See attached data.

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Processing Gain Data

The processing gain was determined by measuring the jamming margin of the E.U.T. and using the formula Jamming Margin = $G_p = (S/N)_{out} - L_{sys}$

The value $(S/N)_{out}$ was calculated by using the fomula:

$$P_e = (1/2) \text{EXP} (-E/2N_0)$$

Where,

P_e is the minimum Bit Error Rate required for proper operation.

E/N_0 is $(S/N)_{out}$

System Losses are specified by the manufacturer to be 2 dB.

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

$$G_p = 11.68 \text{ dB} + 1.42 \text{ dB} \div 2 \text{ dB} = 15.1 \text{ dB}$$

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Section 8. Test Equipment List

| CAL CYCLE | EQUIPMENT | MANUFACTURER | MODEL | SERIAL | LAST CAL. | NEXT CAL. |
|------------------|--------------------|---------------------|--------------|---------------|------------------|------------------|
| 1 Year | Spectrum Analyzer | Hewlett Packard | 8565E | FA000981 | June 16/99 | June 16/00 |
| | Plotter | Hewlett Packard | 7470A | 2308A30807 | NCR | NCR |
| 2 Year | RF Millivoltmeter | Rohde & Schwarz | URV5 | FA000420 | Oct. 6/99 | Oct. 6/01 |
| 1 Year | Receiver | Rohde & Schwarz | ESVP | 892661/014 | Mar. 29/99 | Mar. 29/00 |
| 1 Year | Horn Antenna | EMCO #2 | 3115 | 4336 | Nov. 11/99 | Nov. 11/00 |
| 1 Year | Dipole Antenna Set | EMCO #2 | 3121C | FA001349 | Apr. 5/99 | Apr. 5/00 |
| 1 Year | Signal Generator | Hewlett Packard | 8660C | 2044A03304 | Oct. 30/99 | Oct. 30/00 |

NA: Not Applicable
NCR: No Cal Required
COU: CAL On Use

KTL Ottawa

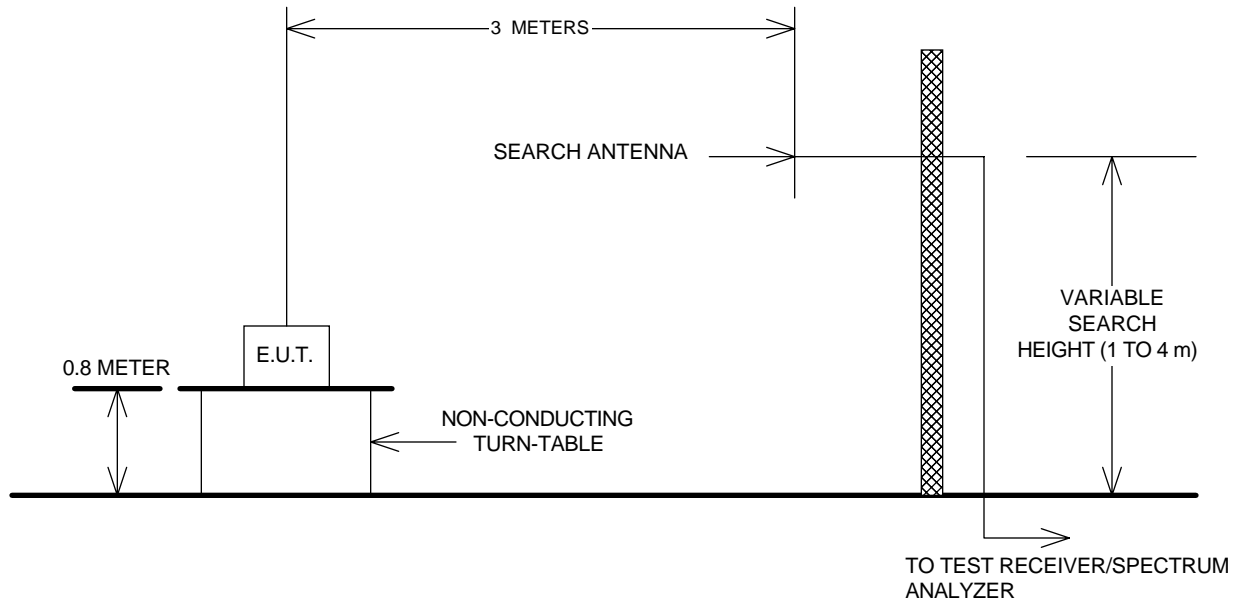
FCC PART 15, SUBPART C
DIRECT SEQUENCE TRANSMITTERS
PROJECT NO.: 9R02282
ANNEX A

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

ANNEX A
BLOCK DIAGRAMS

EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

Test Site For Radiated Emissions



Below 1 GHz

Peak detector.
RBW = 100 kHz

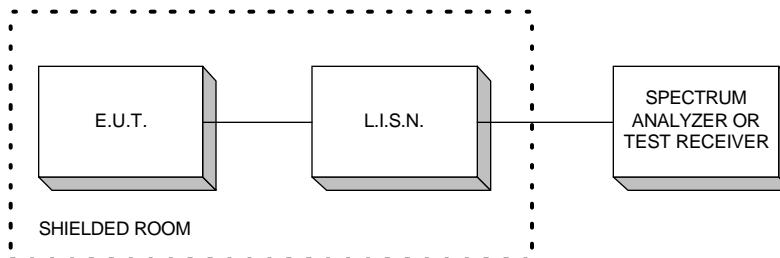
Above 1 GHz For Peak Emission Levels

Peak detector
RBW = 1 MHz
VBW = >RBW

Above 1 GHz For Average Emission Levels

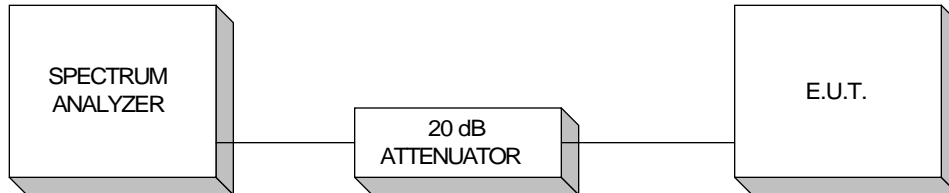
Peak detector
RBW = 1 MHz
VBW = 10 Hz

Conducted Emissions



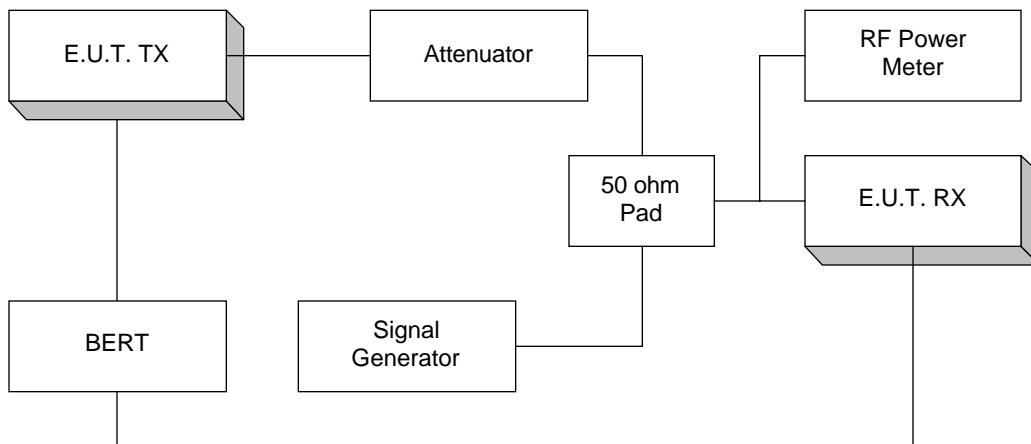
EQUIPMENT: Wireless 929 Spread Spectrum Transmitter
FCC ID: F5300SS929

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.