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

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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.

☒	New Submission	☒	Production Unit
☐	Class II Permissive Change	☐	Pre-Production Unit
D S S	Equipment Code	☐	Family Listing

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

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:

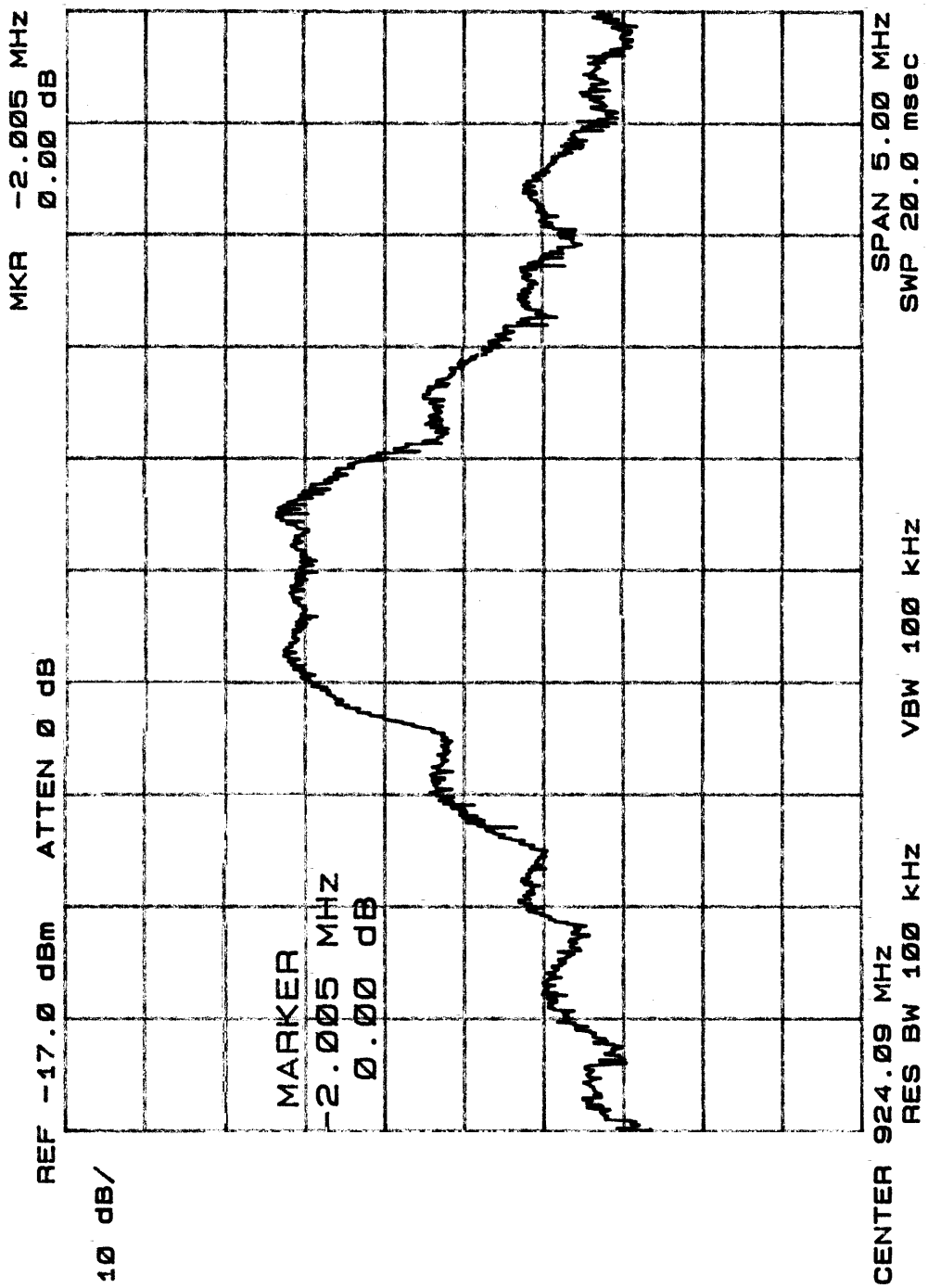
Test Conditions:

Indoor	Temperature:	24 °C
	Humidity:	20 %
Outdoor	Temperature:	3 °C
	Humidity:	18 %

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


MKR -2.005 MHz
0.00 dB
SPAN 5.00 MHz
SWP 20.0 msec
REF -17.0 dBm
ATTEN 0 dB
VBW 100 kHz
MARKER
-2.005 MHz
0.00 dB
10 dB/
CENTER 924.09 MHz
RES BW 100 kHz

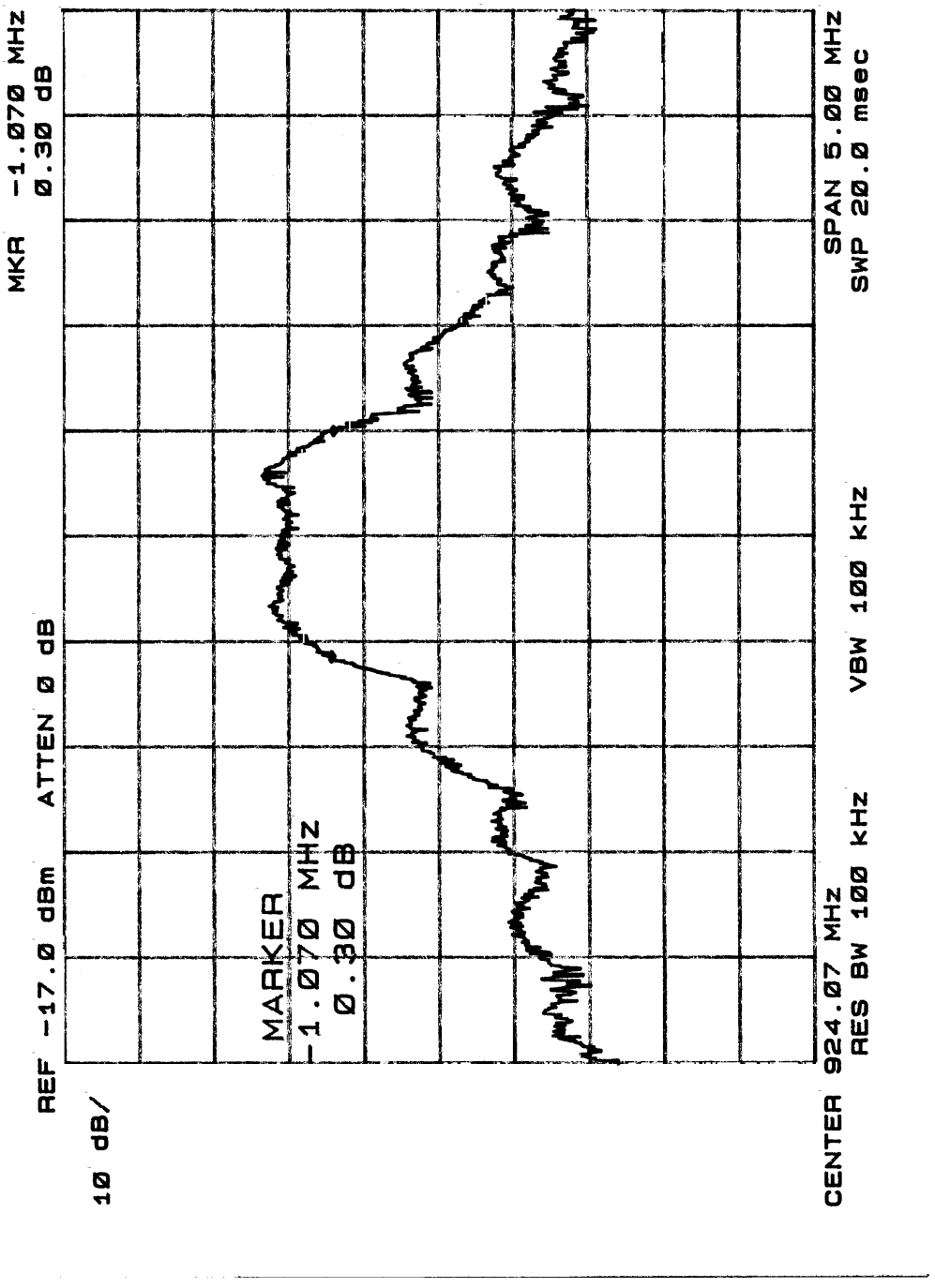
Section 3. Occupied Bandwidth

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.

Occupied Bandwidth: 6dB



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:

$$\frac{P = E^2 R^2}{30G} = \frac{0.065^2 x9}{30(1)} = 0.00126\text{W}$$

$$= 1.26\text{ mW}$$

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 dBµV/m @ 3m at 1848.0 MHz. This is 10.5 dB below the specification limit.

Measurement Data: See attached graphs.

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.

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.

Radiated Photographs (Worst Case Configuration)

Front View

Section 6. Transmitter Power Density

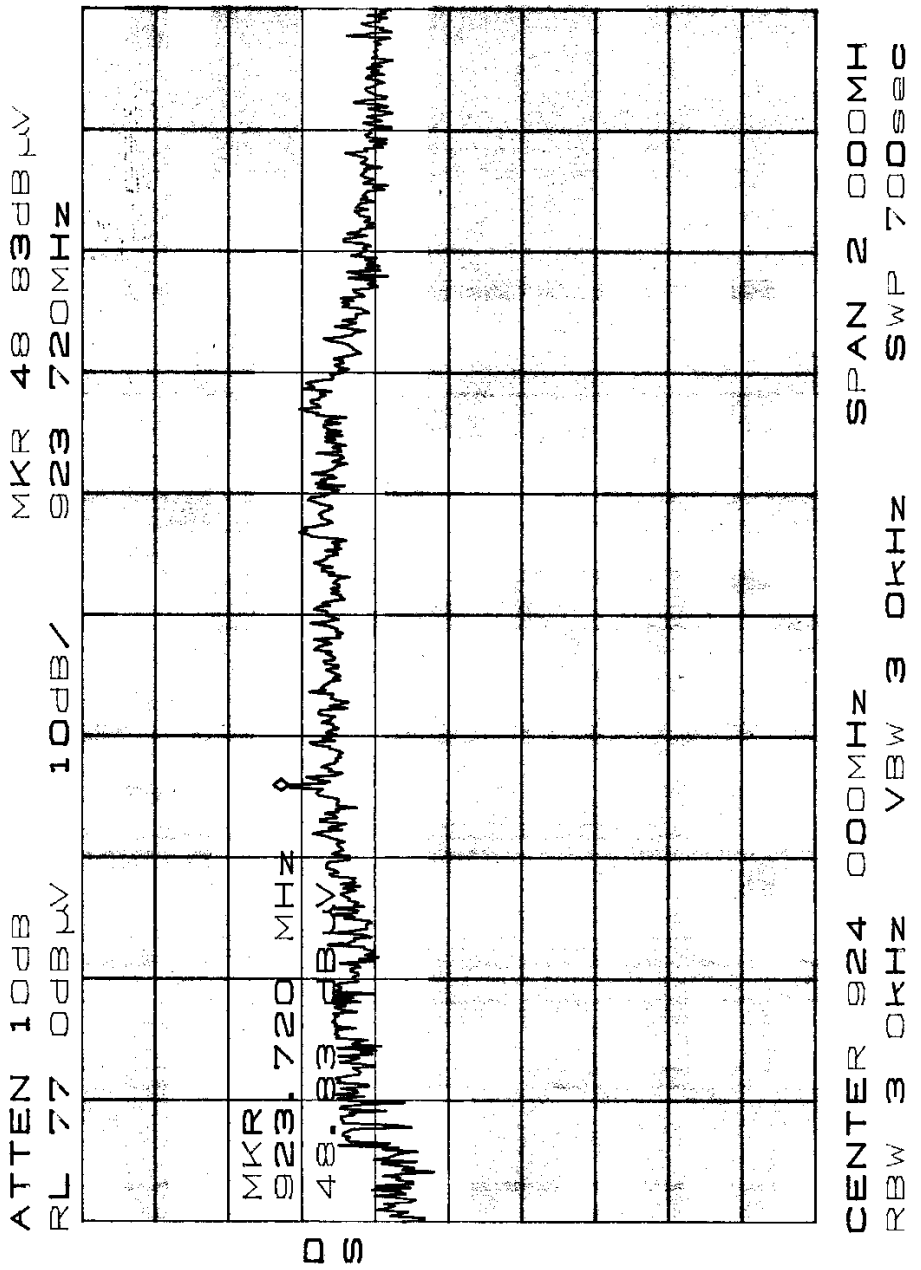
NAME OF TEST: Transmitter Power Density	PARA. NO.: 15.247(d)
TESTED BY: Glen Westwell	DATE: February 28, 2000

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.

Transmitter Power Density: PSD = -61.8 + 48.8 = -13 dBm



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.

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:

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

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

G_p = 11.68 dB + 1.42 dB ÷ 2 dB = 15.1 dB

Section 8. Test Equipment List

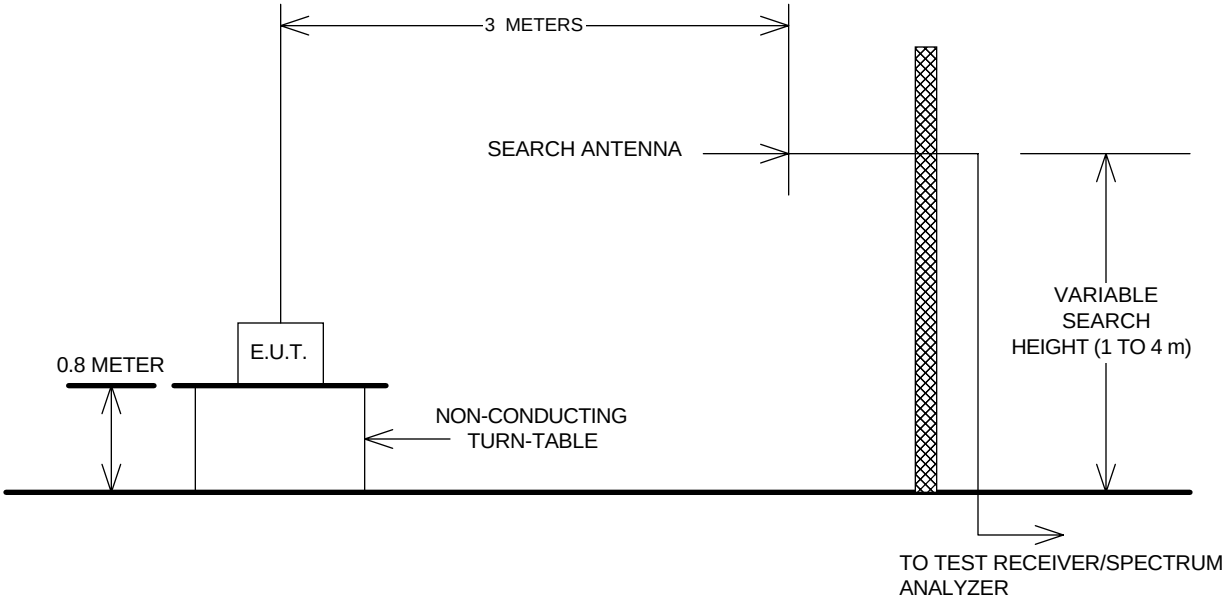
CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	June 16/99	June 16/00
	Plotter	Hewlett Packard	7470A	2308A30807	NCR	NCR
2 Year	RF Millivoltmeter	Rohde & Schwarz	URV5	FA000420	Oct. 6/99	Oct. 6/01
1 Year	Receiver	Rohde & Schwarz	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

ANNEX A

BLOCK DIAGRAMS

Test Site For Radiated Emissions

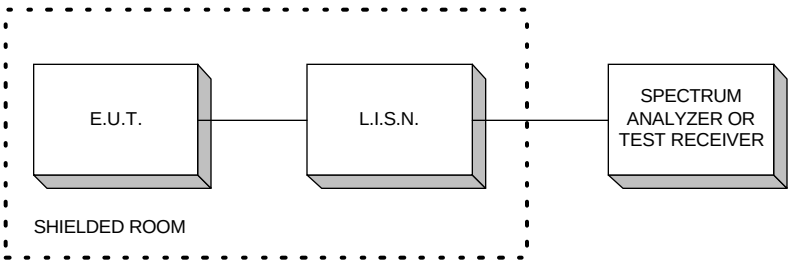


Below 1 GHz
Peak detector.
RBW = 100 kHz

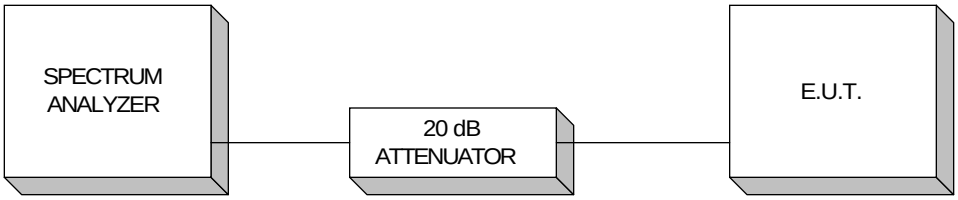
Above 1 GHz For Peak Emission Levels
Peak detector
RBW = 1 MHz
VBW = >RBW

Above 1 GHz For Average Emission Levels
Peak detector
RBW = 1 MHz
VBW = 10 Hz

Conducted Emissions

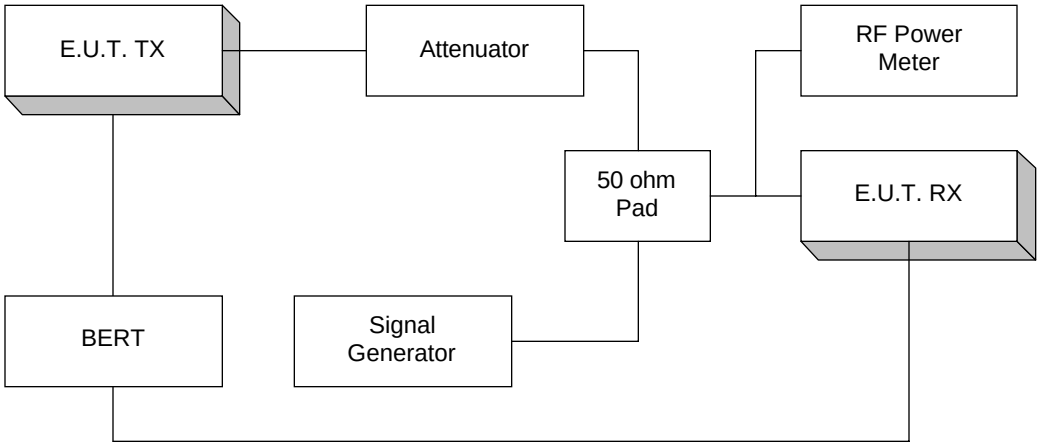


Transmitter Power Density & Peak Power At Antenna Terminals



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.