

Nemko Test Report: 1L0697RUS2

Applicant: Bitswave, Inc.
10700 Corporate Dr.
Stafford, TX 77477

**Equipment Under Test:
(E.U.T.)** Playstation Plug-In

FCC ID: P5G-368-397-YY-PI

In Accordance With: **FCC Part 15, Subpart C, 15.249**
For 900 MHz Transmitters

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

A handwritten signature in blue ink, appearing to read "Tom Tidwell".

Authorized By: Tom Tidwell, EMC/Wireless Manager

Date: 10/31/02

Total Number of Pages: 20

EQUIPMENT: Playstation Plug-In
FCC ID: P5G-368-397-YY-PI

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EQUIPMENT: Playstation Plug-In
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Section 1. Summary Of Test Results

Manufacturer: BitsTechInc
Model No.: HH-01B(playstation plug in)
Serial No.: BWHH01B1201(playstation plug in)

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 15.249. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated Emissions were made on an open area test site.



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: 100351-0

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FCC PART 15, SUBPART C
FOR 900 MHz TRANSMITTERS
PROJECT NO.: 1L0697RUS2

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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Conducted Emissions	15.207	Complies
Radiated Emissions	15.249	Complies

Footnotes For N/A's:

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Section 2. General Equipment Specification

Frequency Range:	Single	
Operating Frequency(ies) of Sample:	910.7-917.7 MHz	
Tunable Bands:	N/A	
Number of Channels:	Eight	
Channel Spacing:	1 MHz	
Crystal Frequencies:	12 MHz	
User Frequency Adjustment:	Dip Switches	
Integral Antenna	Yes ☒	No ☐

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Theory of Operation

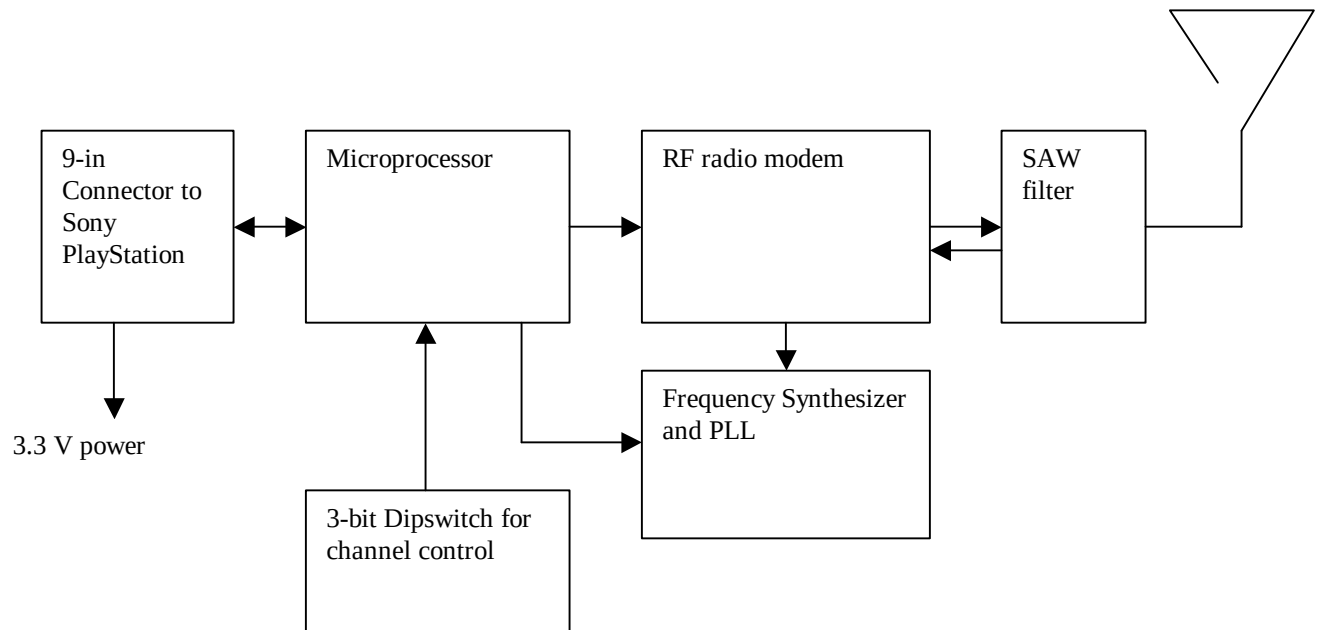
Station Side Radio

The radio system is mainly composed of three parts: radio modem, frequency synthesizer and baseband microprocessor. The radio is interfaced with Sony PlayStation via a 9-pin connector. Sony PlayStation sends a command to the radio every 16 milliseconds. The radio takes the data from PlayStation, packetize the data by adding preambles, frame information, and error checking bytes. The packetized frame is transmitted to the wireless joystick. When joystick replies, this radio receives the data, un-packetize it, and sends to Sony PlayStation. The radio modem is a FSK modem running at 78 kbps with Manchester encoding to avoid frequency drifting. Frequency is controlled by a frequency synthesizer which adjusts a voltage-controlled RF oscillator dynamically for accurate frequency management. Channel is set by selecting a 3-position dipswitch. A total of 8 channels can be selected conversing the frequency range of 910.7 – 917.7 MHz. The antenna is an embedded PCB antenna antenna matching is done by using lumped inductors and capacitors. The radio is a half-duplex system and is powered by a 3.3V power source provided by Sony PlayStation. The total average power consumption of the radio system is about 20 mA at 3.3V.

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Wireless Joypad Block Diagram

Station Side (PS-2 Plug-in)



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Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207
TESTED BY: Lance Walker	DATE: 12/20/2001

Minimum Standard:

Frequency (MHz)	Maximum Powerline Conducted RF Voltage	
	(mV)	(dBmV)
0.45 - 30.0	250	48

Test Results: Complies**Method of Measurement: (Procedure ANSI C63.4-1992)**

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak Detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak Detector.

EQUIPMENT: Playstation Plug-In
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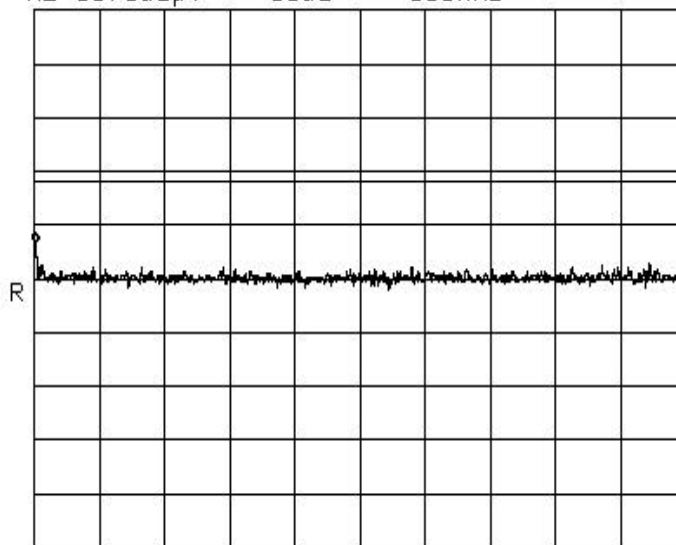
Dallas Headquarters:

802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot		Powerline Conducted	
Page <u>1</u> of 2			
Job No.: 1L0697R	Date: <u>12/20/2001</u>	Complete: <u>X</u>	
Specification: FCC15.249	Temperature(°C): <u>22</u>	Preliminary: _____	
Tested By: <u>Lance Walker</u>	Relative Humidity(%): <u>50</u>		
E.U.T.: <u>Wireless Game Controller Set</u>			
Configuration: <u>Normal</u>			
Sample Number: <u>S01, S02</u>			
Location: <u>Lab 2</u>	RBW: <u>Refer to plots</u>	Measurement	
Detector Type: <u>Peak</u>	VBW: <u>Refer to plots</u>	Distance: <u>N/A</u> m	
Test Equipment Used			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: <u>1267</u>		
Filter: _____	Cable #2: <u>1038</u>		
Receiver: <u>1464</u>	Cable #3: _____		
Attenuator #1: _____	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: <u>1555</u> <u>545</u> <u>674</u>			
Measurement Uncertainty: <u>+/-1.7 dB</u>			

*ATTEN 0dB MKR 36.67dBμV
RL 80.0dBμV 10dB/ 500kHz



START 450kHz STOP 30.00MHz
*RBW 10kHz *VBW 10kHz SWP 740ms

Notes: Neutral line

EQUIPMENT: Playstation Plug-In
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Data Plot		Powerline Conducted	
Page 2 of 2			
Job No.:	1L0697R	Date:	12/20/2001
Specification:	FCC15.249	Temperature(°C):	22
Tested By:	Lance Walker	Relative Humidity(%)	50
E.U.T.:	Wireless Game Controller Set		
Configuration:	Normal		

*ATTEN 0dB MKR 35.67dBμV
RL 80.0dBμV 10dB/ 500kHz

START 450kHz STOP 30.00MHz
*RBW 10kHz *VBW 10kHz SWP 740ms

Notes:	Hot line

EQUIPMENT: Playstation Plug-In
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Conducted Photographs (Worst Case Configuration)



EQUIPMENT: Playstation Plug-In
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Section 4. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.249
TESTED BY: Lance Walker	DATE: 12/19/2001

Minimum Standard: Para no. 15.249

(a) The field strengths shall not exceed the following:

Fundamental (MHz)	Field Strength (mV/m)	Field Strength (dBmV)	Harmonic (µV/m)	Harmonic (dBmV)
902-928	50	94	500	54

(b) Field strength limits are specified at a distance of 3 metres.

(c) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limits of 15.209 whichever is the less attenuation.

(d) ...for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Test Results: Complies

Measurement Data: See attached table.

Maximizing Emission Levels: The equipment was operated in continuous transmit mode. Handheld equipment is tested on three orthogonal axis in order to determine worst-case orientation. The EUT is located on a turntable and the turntable is rotated 360 degrees. The antenna height is also adjusted to maximize emission levels.

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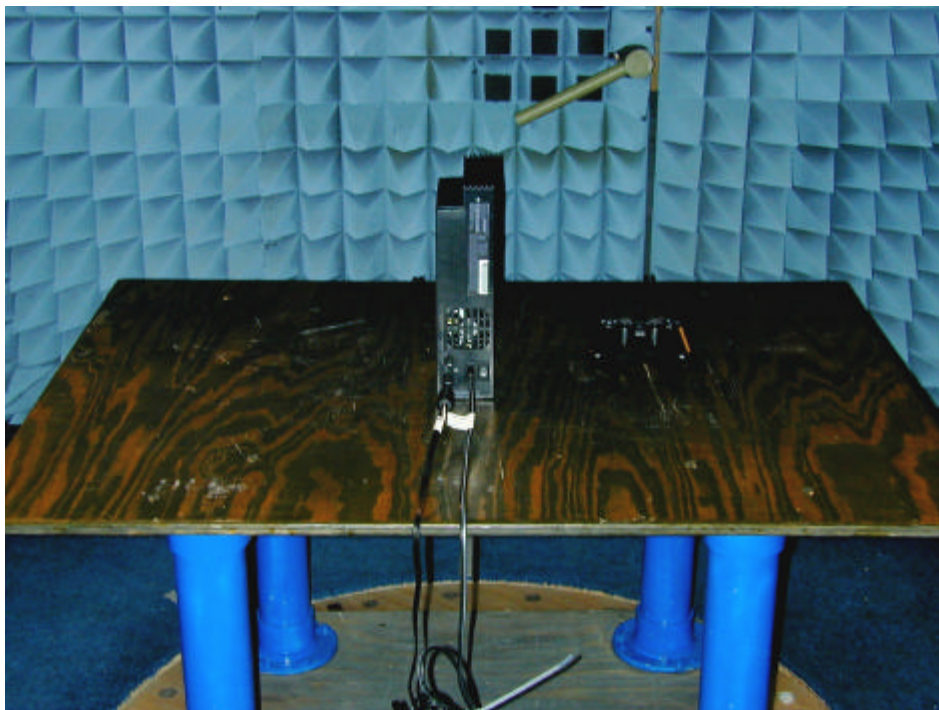
Radiated Emissions								
Page <u>1</u> of <u>2</u>								
Job No.: 1L0697R		Date: 12/19/01						
Specification: FCC 15.247 Sub C		Temperature(°C): <u>22</u>						
Tested By: <u>ance Walker</u>		Relative Humidity(%) <u>50</u>						
E.U.T.: <u>Plug-in transceiver</u>								
Configuration: <u>Normal Tx</u>								
Sample Number: <u></u>								
Location: <u>AC 3</u>		RBW: <u>1 MHz</u>						
Detector Type: <u>Peak</u>		see note					VBW: <u>1 MHz</u>	
Test Equipment Used								
Antenna: <u>1304</u>		Directional Coupler: <u>#N/A</u>						
Pre-Amp: <u>1016</u>		Cable #1: <u>1484</u>						
Filter: <u>#N/A</u>		Cable #2: <u>1485</u>						
Receiver: <u>1464</u>		Cable #3: <u>1626</u>						
Attenuator #1: <u>#N/A</u>		Cable #4: <u>#N/A</u>						
Attenuator #2: <u>#N/A</u>		Mixer: <u>#N/A</u>						
Additional equipment used: <u></u>								
Measurement Uncertainty: <u>+/- .7 dB</u>								
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
0.911	65.3	23.8	2	0	91.1	94	-2.9	
1.821	71.4	25.1	2.8	33.3	66.0	74	-8.0	Pk 2nd Hor, low Ch
1.821	71.4	25.1	2.8	33.3	47.6	54	-6.4	Avg 2nd Hor, low Ch
2.732	57.6	29.0	3.6	33.5	56.7	74	-17.3	Pk 3rd Hor, low Ch
2.732	57.6	29.0	3.6	33.5	38.3	54	-15.7	Avg 3rd ""
3.643	43.5	30.8	3.5	33.6	44.2	54	-9.8	4th Hor low Ch NF
4.554	42.8	32.0	4.1	33.8	45.1	54	-8.9	5th Hor low Ch NF
5.464	41	34.1	4.7	33.5	46.3	54	-7.7	6th Hor low Ch NF
0.918	64.5	23.8	2	0	90.3	94	-3.7	high fundamental
1.835	68.3	25.1	2.8	33.3	62.9	74	-11.1	Pk 2nd Hor, High Ch
1.835	46.3	25.1	2.8	33.3	40.9	54	-13.1	Avg 2nd Hor, High Ch
2.753	53.1	29.0	3.6	33.5	52.2	54	-1.8	3rd hor high ch
3.671	43.2	30.8	3.5	33.6	43.9	54	-10.1	4th hor high ch NF
4.589	43.5	32.0	4.1	33.8	45.8	54	-8.2	5th hor high ch NF
5.506	42.8	34.1	4.7	33.5	48.1	54	-5.9	6th hor high ch NF
0.916	63.3	23.8	2	0	89.1	94	-4.9	mid fundamental
1.831	70.5	25.1	2.8	33.3	65.1	74	-8.9	Pk 2nd Hor, Mid Ch
1.831	70.5	25.1	2.8	33.3	46.7	54	-7.3	Avg 2nd Hor, Mid Ch
2.747	53	29.0	3.6	33.5	52.1	54	-1.9	3rd hor mid ch
3.663	44.5	30.8	3.5	33.6	45.2	54	-8.8	4th hor mid ch NF
4.579	42.2	32.0	4.1	33.8	44.5	54	-9.5	5th hor mid ch NF
5.494	42.7	34.1	4.7	33.5	48.0	54	-6.0	6th hor mid ch NF
Notes: Unless otherwise noted measurements made with peak meter and avg limits. Peak readings are corrected by 18.4dB to derive Avg.								

EQUIPMENT: Playstation Plug-In
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Radiated Spurious Emissions								
Page <u>2</u> of <u>2</u>		Continuation Page						
Job No.:		Date: 11/22/02						
Specification: CFR 47, Part 15		Temperature(°F): <u>72</u>						
Tested By: #N/A		Relative Humidity(%) <u>50</u>						
E.U.T.:		Plug-in transceiver						
Configuration:		Normal Tx						
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
0.911	64.5	23.8	2	0	90.3	94	-3.7	low fundamental
1.821	68.7	25.1	2.8	33.3	63.3	74	-10.7	Pk 2nd Ver, low Ch
1.821	68.7	25.1	2.8	33.3	44.9	54	-9.1	Avg 2nd Ver, low Ch
2.732	56.2	29.0	3.6	33.5	55.3	74	-18.7	Pk 3rd Ver, low Ch
2.732	56.2	29.0	3.6	33.5	36.9	54	-17.1	Avg 3rd Ver
3.643	43.5	30.8	3.5	33.6	44.2	54	-9.8	4th Ver low Ch NF
4.554	42.8	32.0	4.1	33.8	45.1	54	-8.9	5th Ver low Ch NF
5.464	41	34.1	4.7	33.5	46.3	54	-7.7	6th Ver low Ch NF
0.918	64.3	23.8	2	0	90.1	94	-3.9	high fundamental
1.835	68.5	25.1	2.8	33.3	63.1	74	-10.9	Pk 2nd Ver, High Ch
1.835	68.5	25.1	2.8	33.3	44.7	54	-9.3	Avg 2nd Ver, High Ch
2.753	49.7	29.0	3.6	33.5	48.8	54	-5.2	3rd ver high ch
3.671	43.2	30.8	3.5	33.6	43.9	54	-10.1	4th ver high ch NF
4.589	43.5	32.0	4.1	33.8	45.8	54	-8.2	5th ver high ch NF
5.506	42.8	34.1	4.7	33.5	48.1	54	-5.9	6th ver high ch NF
0.916	62.3	23.8	2	0	88.1	94	-5.9	mid fundamental
1.831	62.6	25.1	2.8	33.3	57.2	74	-16.8	Pk 2nd Ver, Mid Ch
1.831	62.6	25.1	2.8	33.3	38.8	54	-15.2	Avg 2nd Ver, Mid Ch
2.747	47.3	29.0	3.6	33.5	46.4	54	-7.6	3rd ver mid ch
3.663	44.5	30.8	3.5	33.6	45.2	54	-8.8	4th ver mid ch NF
4.579	42.2	32.0	4.1	33.8	44.5	54	-9.5	5th ver mid ch NF
5.494	42.7	34.1	4.7	33.5	48.0	54	-6.0	6th ver mid ch NF
Notes:	Unless otherwise noted measurements made with peak meter and avg limits. Peak readings are corrected by 18.4dB to derive Avg.							

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Radiated Photographs (Worst Case Configuration)





Plot 1- Duty Cycle of Plug-in

$$\text{Duty Cycle factor (dB)} = 20 \log (6 \times 2\text{msec.}/100\text{msec.}) = -18.4 \text{ dB}$$

EQUIPMENT: Playstation Plug-In
FCC ID: P5G-368-397-YY-PI

Section 5. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01
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
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01
1038	CABLE, .5m	KTL RG223	N/A	05/29/01
1267	CABLE, 14.8m	KTL RG223	N/A	05/10/01
545	LISN	Schwarz Beck 8120	8120350	07/09/01
1555	Filter high pass 5KHz	Solar Electronics 7930-5.0	933125	05/29/01
674	LIMITER	HP 11947A	3107A02200	11/04/00

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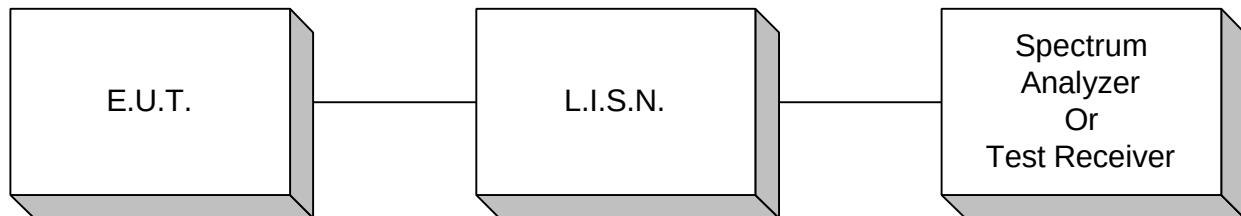
EQUIPMENT: Playstation Plug-In
FCC ID: P5G-368-397-YY-PI

ANNEX A

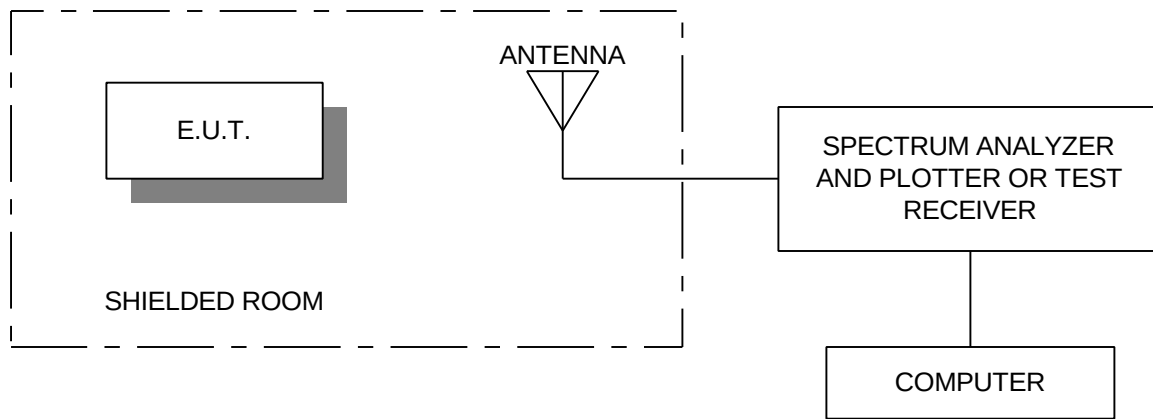
TEST DIAGRAMS

EQUIPMENT: Playstation Plug-In
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Conducted Emissions



Radiated Prescan



EQUIPMENT: Playstation Plug-In
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Test Site For Radiated Emissions

