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FCC Certification Test Report
For the
KEE Action Sports
Blue Eclipse Paint Ball Gun

FCC ID: W7BKEE58705

IC ID: 8265A-58705

WLL JOB# 11120
September 25, 2009

Prepared for:

KEE Action Sports
570 Mantua Avenue
Sewell, NJ 08080

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879



Testing Certificate 2675.01

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Prepared by:

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Abstract

This report has been prepared on behalf of KEE Action Sports to support the attached Application for Equipment Authorization. The test report and application are submitted for an Intentional Radiator under Part 15.249 (7/2008) of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy RSS-210 of Industry Canada. This Certification Test Report documents the test configuration and test results for a KEE Action Sports Blue Eclipse Paint Ball Gun.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

The KEE Action Sports Blue Eclipse Paint Ball Gun complies with the limits for an Intentional Radiator device under FCC Part 15.249 and RSS-210 of Industry Canada.

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1 Introduction

1.1 Compliance Statement

The KEE Action Sports Blue Eclipse Paint Ball Gun complies with the limits for an Intentional Radiator device under FCC Part 15.249 (7/2008) and Industry Canada RSS-210 with a Limited Modular Approval. The reason for the LMA is to show that the unit, which is to be sold as an after market addition for paintball markers, will comply with the requirements when installed by the end user. The transmitter board was exposed from the marker and not depending on the host for any of the shielding.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed in accordance with FCC Public Notice DA 00-705 and the 2003 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	KEE Action Sports 570 Mantua Avenue Sewell, NJ 08080
Purchase Order Number:	P-0006324
Quotation Number:	65099

1.4 Test Dates

Testing was performed on the following date(s):	9/4/2009 to 9/21/2009
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1.5 Test and Support Personnel

Washington Laboratories, LTD	John Reidell
Client Representative	Louis Spicer

1.6 Abbreviations

A	A mpere
ac	a lternating current
AM	A mplitude Modulation
Amps	A mperes
b/s	b its per second
BW	B andWidth
CE	C onducted E mission
cm	c entimeter
CW	C ontinuous W ave
dB	d eci B el
dc	d irect current
EMI	E lectromagnetic I nterference
EUT	E quipment U nder T est
FM	F requency M odulation
G	g iga - prefix for 10^9 multiplier
Hz	H ertz
IF	I ntermediate F requency
k	k ilo - prefix for 10^3 multiplier
LISN	L ine I mpedance S tabilization N etwork
M	M ega - prefix for 10^6 multiplier
m	m eter
μ	m icro - prefix for 10^{-6} multiplier
NB	N arrow b and
QP	Q uasi- P eak
RE	R adiated E missions
RF	R adio F requency
rms	r oot- m ean- s quare
SN	S erial N umber
S/A	S pectrum A nalyzer
V	V olt

2 Equipment Under Test

2.1 EUT Identification & Description

The KEE Action Sports Blue Eclipse Paint Ball Gun that has an integrated RF Transmitter, which is used to transmit a signal to an automatic loader that is attached to the marker

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	KEE Action Sports
FCC ID:	W7BKEE58705
IC ID:	8265A-58705
Model:	Blue Eclipse Paint Ball Gun
FCC Rule Parts:	§15.249
Industry Canada	RSS 210 Issue 7
Frequency Range:	2402MHz
Maximum Output Power:	13900.7 μ V/m @ 3 meters
Modulation:	GFSK
Occupied Bandwidth:	1.187MHz
Keying:	Manual
Type of Information:	Data
Number of Channels:	1
Power Output Level	Fixed
Antenna Connector	None
Antenna Type	Internal
Interface Cables:	None
Power Source & Voltage:	9V Battery
TX Spurious	164 μ V/m @ 3 meters
RX Spurious	N/A

2.2 Test Configuration

The KEE Action Sports Blue Eclipse Paint Ball Gun, Equipment Under Test (EUT), was configured with the radio outside the marker in a standalone configuration and operated from a 9Vdc power supply

2.3 Testing Algorithm

The KEE Action Sports Blue Eclipse Paint Ball Gun was operated in rapid fire mode to continuously transmit on its designated frequency of 2402MHz

Worst case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been

accepted by the FCC and approved by the American Association for Laboratory Accreditation (A2LA) under Certificate 2675.01 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-93)

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± 2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Test Name: Radiated Emissions		Test Date: 09/04/2009	
Asset #	Manufacturer/Model	Description	Cal. Due
644	Sunol Science JB1	BiConalog Antenna	12/29/2009
71	HP, 85685A	Preselector, RF	06/28/2010
73	HP, 8568B	Analyzer, Spectrum	06/28/2010
69	HP, 85650A	Adapter, QP	06/28/2010
4	ARA, DRG-118/A	Antenna, DRG, 1-18GHz	02/06/2011
618	HP 8563A	Analyzer, Spectrum	04/10/2010
522	HP, 8449B	Pre-Amplifier, 1-26.5GHz	07/21/2010

4 Test Results

4.1 Duty Cycle Correction

Measurements may be adjusted where pulsed RF is utilized to find the average level associated with a quantity. This calculation is applied to limits for pulsed licensed and unlicensed devices.

- For Unlicensed Intentional Radiators under 47CFR Part 15, all duty cycle measurements compared to a 100 millisecond period
- i.e. duty cycle = on time/100, milliseconds

Duty Cycle Correction was not required for this device

4.2 Occupied Bandwidth: (FCC Part §2.1049 and RSS-210 A1.1.3)

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

At full modulation, the occupied bandwidth was measured as shown:

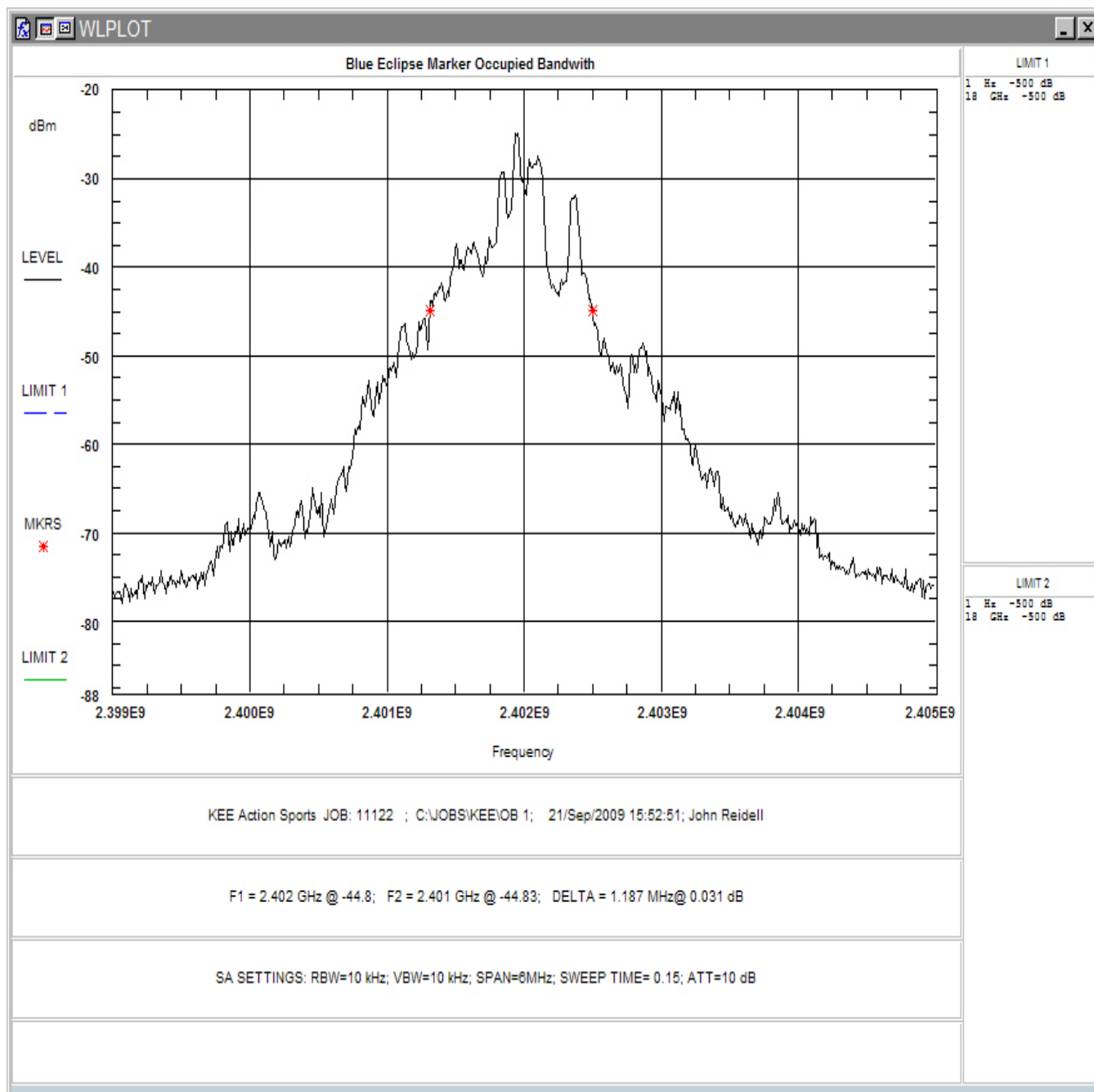


Figure 4-1. Occupied Bandwidth

Table 3 provides a summary of the Occupied Bandwidth Results.

Table 3. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Channel: 2402MHz	1.187MHz	N/A	Pass

4.3 Radiated Emissions: (FCC Part §2.1053, RSS210 A2.9)

The EUT must comply with the radiated emission limits of 15.249(a) & RSS210 A2.9. The limits are as shown in the following table.

Table 4. Radiated Emissions Limits

Fundamental Frequency	Field Strength of Fundamental ($\mu\text{V/m}$)	Field Strength of Harmonics ($\mu\text{V/m}$)
902 – 928 MHz	50,000	500
2400 – 2483.5 MHz	50,000	500
5725 – 5875 MHz	50,000	500
24.00 – 24.25 GHz	250,000	2500

4.3.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2003. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	<30 Hz (Avg.) 1MHz (Peak)

Emissions were measured to the 10th harmonic of the transmit frequency. Worst case emission levels are reported.

The following is a sample calculation used in the data tables for calculating the final field strength of spurious emissions and comparing these levels to the specified limits.

Sample Calculation:

Spectrum Analyzer Voltage (SA Level):	V dBμV
Antenna Factor (Ant Corr):	AFdB/m
Cable Loss Correction (Cable Corr):	CCdB
Duty Cycle Correction (Average)	DCCdB
Amplifier Gain:	GdB
Electric Field (Corr Level):	$EdB_{\mu V/m} = VdB_{\mu V} + AFdB/m + CCdB + DCCdB - GdB$

Table 5: Radiated Emission Test Data

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
66.75	V	90.00	1.00	7.30	8.2	6.0	100.0	-24.5	Ambient
85.80	V	270.00	1.28	8.80	9.8	8.5	100.0	-21.4	Ambient
133.48	V	180.00	1.80	7.40	15.0	13.1	150.0	-21.2	Ambient
247.88	V	0.00	1.65	6.30	13.6	9.9	200.0	-26.1	Ambient
519.28	V	180.00	1.60	6.00	21.0	22.5	200.0	-19.0	Ambient
541.74	V	180.00	1.60	6.60	21.8	26.3	200.0	-17.6	Ambient
2401.89	V	135.00	2.50	79.00	-4.7	5164.6	50000.0	-19.7	Fundamental Peak
4804.07	V	45.00	2.60	40.00	-1.6	83.0	500.0	-15.6	
7206.79	V	0.00	2.50	33.9	3.3	72.3	500.0	-16.8	Ambient
9609.85	V	0.00	2.50	33.4	4.0	74.2	500.0	-16.6	Ambient
12011.04	V	0.00	2.50	32.6	5.9	83.7	500.0	-15.5	Ambient
66.75	H	180.00	2.50	6.90	8.2	5.7	100.0	-24.9	Ambient
85.80	H	270.00	2.20	8.60	9.8	8.3	100.0	-21.6	Ambient
133.48	H	0.00	3.25	5.40	15.0	10.4	150.0	-23.2	Ambient
247.88	H	180.00	1.00	0.80	13.6	5.3	200.0	-31.6	Ambient
519.28	H	45.00	2.11	4.90	21.0	19.8	200.0	-20.1	Ambient
541.74	H	270.00	1.36	6.50	21.8	26.0	200.0	-17.7	Ambient
2401.89	H	120.00	1.21	87.60	-4.7	13900.7	50000.0	-11.1	Fundamental Peak
4804.07	H	90.00	1.19	45.90	-1.6	163.7	500.0	-9.7	
7206.79	H	0.00	2.50	33	3.3	65.1	500.0	-17.7	Ambient
9609.85	H	0.00	2.50	33.1	4.0	71.7	500.0	-16.9	Ambient
12011.04	H	0.00	2.50	32.4	5.9	81.8	500.0	-15.7	Ambient