MEASUREMENT/TECHNICAL REPORT

130 kHz TRANSMITTER FOR THE SIGMA SPORT USA

MODEL 0367 RCS Speedometer

FCC ID: M5L367RCS

RF Emission Measurements Performed For Determination of Compliance with FCC "Rules and Regulations" Part 15 Subpart C As Required for Certification for Intentional Radiators

Issue Date: June 12, 1998

This report concerns: Original grant

Equipment type: 130 kHz Intentional Radiator

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? No

Transition Rules Request per 15.37? No

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Frequency	Resolution Bandwidth	Video Bandwidth
9-150 kHz	1 kHz	1 kHz
150kHz-30 MHz	10 kHz	10 kHz
30 - 1000 MHz	100 kHz	100 kHz

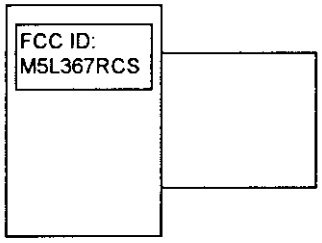
Radiated emission measurements were performed with linearly polarized broadband antennas frequency range from 30 MHz to 1000 MHz. The result obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. If radiated emission is detected approaching the specification limit, the measurement of the emission is repeated using a tuned dipole antenna with a Roberts Balun.

2.0 Product Labeling

The label is vinyl with permanent, pressure-sensitive adhesive. The compliance statement is listed in the user's manual. The background is black with white letters. The label is 0.5 x 0.219 inches The location is on the rear of the EUT as shown in figure 2.1.

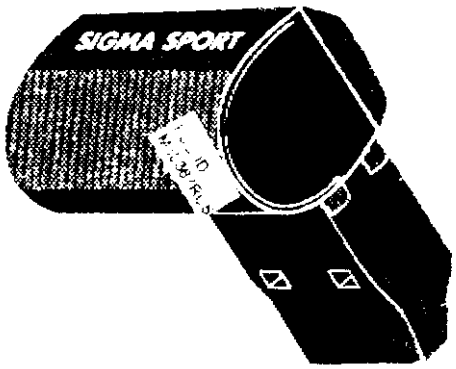
Figure 2.1 FCC ID Label & Location

Rear of EUT



Actual Label 

Drawing of EUT, actual size



3.0 System Test Configuration

3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted on a bicycle front fork. The receiver was mounted on the handle bars. The EUT was powered with a new battery. There are no wire connections possible for the EUT.

3.2 Special Accessories

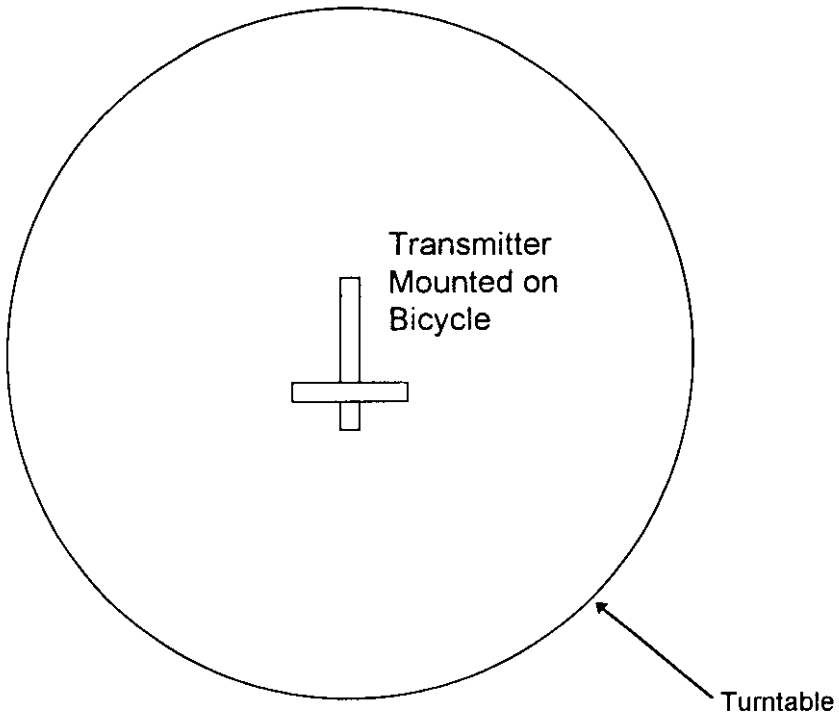
There was no special equipment used to achieve compliance.

3.3 Equipment Modifications

No modifications to the EUT were made by Radiometrics Midwest Corporation to achieve compliance with the specification.

Figure 3.1 Configuration of Tested System

Radiated Emissions:
Front wheel was 10 cm above the ground so that the wheel could spin to simulate normaloperation.



Ground Plane

Notes:
- Not to Scale
- Antenna height varied 1-4 mtrs
- Antenna rotated for maximum
- Distance from antenna to tested system is 3 and 10 meters

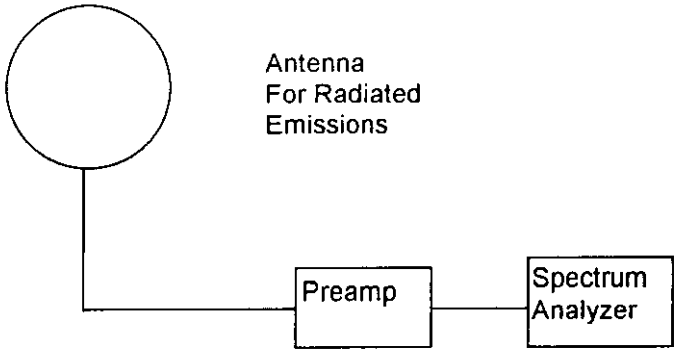


Table of Contents

1.0 General Information

1.1 Product Description

The 0367 (referred to as the EUT in this report) is a transmitter for a wireless speedometer system. The EUT operates at 130 kHz. It is designed to transmit from the fork of a bicycle to handle bar. The EUT is battery powered.

1.2 Related Submittals

Sigma Sport USA is not submitting any other products to the FCC.

1.3 Tested System Details

Model Number	FCC ID	Description	Cable Descriptions
0367RCS EUT Submitted for Grant	M5L367RCS	Speedometer Transmitter	No cables can be attached
BC1100	N/A	Speedometer Receiver	No cables can be attached

1.4 Test Methodology

The test procedures used are in accordance with the ANSI document C63.4-1992, (July 17, 1992) "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The EUT was on a flush mounted turntable during the tests.

For the tests below 30 MHz, radiated emissions measurements were performed in the open field at a test distance of 3 and 10 meters. The detected emission levels were maximized by rotating the bicycle (the EUT was attached to the forks), by raising the loop antennas 1 to 4 meters above the ground, and by rotating the loop antennas in both vertical and horizontal polarizations. Since the EUT is battery powered no conducted emissions are required.

1.5 Test Facility

The open area test site used to collect the radiated data is located on 8625 Helmar Road in Newark, Illinois. The open field test site has a metal ground screen. Details of the site characteristics are on file with the FCC. Preliminary radiated emission scans were performed in shielded enclosure "B" at Radiometrics' Romeoville, Illinois EMI test lab. These sites have been fully described in a report dated July 24, 1996, and accepted by the FCC in a letter dated October 1, 1996 (31040/SIT 1300F2).

1.6 Test Equipment

Radiated emission measurements are performed with shielded loop antennas. An Empire LG-105 and an Empire LP-105 antenna was used. The emission measurements were performed with spectrum analyzer with a peak detector.

5.0 EUT Circuit Diagrams

Figure 5.1 EUT Circuit Diagrams

As Per 47 CFR 0.457 and 47 CFR 0.459 (Request For Confidentially) Materials are in the Envelope Marked:

CONFIDENTIAL
SIGMA SPORT USA
FCC ID: M5L367RCS

6.0 Radiated Emission Data

The following table lists the highest emission frequencies, measured levels, correction factor (includes cable, antenna, and preamp corrections), the corrected reading, plus the limit. Explanation of the Correction Factors are given in paragraph 7.2.1.

Since the operating frequency is 130 kHz, the limit at 300 meters is 2400/130 uV/meter or 18.5 uV/meter or 25.3 dBuV/meter at the fundamental frequency.

The data below shows the field intensity of the maximized radiated emissions when extrapolated to a distance of 300 meters. The actual test distance was 3 and 10 meters.

6.1 Magnetic Field Radiated Emissions Measurements (0.009 to 30 MHz)

Manufacturer : Sigma Sport USA
Model : 0367RCS
Specification : FCC 15.209
Test Date : 6/3/98
Antennas used : Shielded Loop Antennas
Test Distance : 3 Meters
Decay Exponent : 2
Correction Factors = cable loss - preamp gain - distance corr. factor
36 dB Preamplifier

Freq. kHz	Meter Reading dBuV	Antenna Factor dB	Correction Factors dB	Field Strength of Signal dBuV/m	Limit Field Strength dBuV/m	Margin Under Limit dB
130.07	60.8	46.2	-116.0	-9.0	25.3	34.3
260.14	20.0*	57.1	-115.9	-38.8	19.3	58.1
390.21	20.0*	58.1	-115.9	-37.8	15.8	53.6
Test Distance : 10 Meters						
130.07	45.4	46.2	-95.0	-3.4	25.3	28.7
260.14	20.0*	57.1	-95.0	-17.9	19.3	37.2

* Ambient level
No emissions were detected from the EUT above 140 kHz
The measurements were made using a peak detector function. The bandwidths used are listed in section 1.5 of this report.

Judgment: Passed by at least 28.7 dB.

Test Personnel: _____ Date 6/12/98

Jeffrey E. Tomes
Senior EMC Technician

6.2 Electric Field Measurements 30 to 1000 MHz

Model : 0367RCS
Specification : FCC Part 15.209
Test Date : 6/3/98
Test Distance : 3 Meters

Abbreviations: BC = Biconical; LP = Log-Periodic; DP = Dipole; V = Vertical; H = Horizontal
Note: Correction Factors = Cable Loss - Preamp Gain - Distance Correction Factor.

Freq. MHz	Analyzer Reading dBuV	Antenna Factor dB	Antenna Polarity/ Type	Correction Factors dB	Field Strength of Signal dBuV/m	Limit Field Strength dBuV/m	Margin Under Limit dB
50.0	20.0*	12.8	V/BC	-18.2	14.6	40.0	25.4
150.0	20.0*	14.3	V/BC	-16.3	18.0	43.5	25.5
250.0	20.0*	12.2	V/LP	-15.5	16.7	46.0	29.3
50.0	20.0*	12.8	H/BC	-18.2	14.6	40.0	25.4
150.0	20.0*	14.3	H/BC	-16.3	18.0	43.5	25.5
250.0	20.0*	12.2	H/LP	-15.5	16.7	46.0	29.3

* Ambient level; No emissions were detected from the EUT from 30 to 1000 MHz

The measurements were made using a peak detector function. The bandwidths used are listed in section 1.5 of this report.

Judgment: Passed by 25.4 dB.

Test Personnel: _____ Date 6/12/98

Jeffrey E. Tomes
Senior EMC Technician

6.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG + DC
Where: FS = Field Strength; RA = Receiver Amplitude; AF = Antenna Factor
CF = Cable Attenuation Factor; AG = Amplifier Gain; DC = Decay correction factor

Assume a receiver reading of 49.5 dBuV is obtained. The Antenna Factor of 8.1 and a Cable Factor of 1.7 is added. The Amplifier Gain of 23.3 dB is subtracted, giving a field strength of 36 dBuV/m. The 36 dBuV/m can be mathematically converted to its corresponding level in uV/m. The decay factor is -59.1 dB (only used for measurements below 30MHz).

FS = 42.5 + 8.1 + 1.7 - 23.3 = 36.0 dBuV/m
Level in uV/m = Common Antilogarithm [(36 dBuV/m)/20] = 63.1 uV/m

6.3.1 Decay Factor Calculations

The distance correction factor is calculated as follows:

Distance factor (dB) = -2*20*Log(300/TD)

TD is the actual test distance in meters. 300 meters is the specification distance. The actual Distance correction factor at 10 meters is -59.1 dB.

Since the Decay exponent was not measured the exponent used was 2.0

7.0 PHOTOS OF TESTED EUT

The following photos are attached:

Figures 7.1 & 7.2 EUT Front & Rear View

Figures 7.3 & 7.4 Case Open & Inside Cases

Figures 7.5 & 7.6 RF PCB Component & Foil Side