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Motorcycle Headlamp Distribution Comparison

William T. Neale, Nathan Mckelvey, David Pentecost, and Daniel Koch Kineticorp LLC

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Abstract

The forward lighting systems on a motorcycle differ from the forward lighting systems on passenger cars, trucks, and tractor trailer. Many motorcycles, for instance, have only a single headlamp. For motorcycles that have more than one headlamp, the total width between the headlamps is still significantly less than the width of an automobile, an important component in the detection of a vehicle at night, as well as a factor in the efficacy of the beam pattern to help a driver see ahead. Single headlamp configurations are centered on the vehicle, and provide little assistance in marking the outside boundaries like a passenger car or truck headlamps can. Further, because of the dynamics of a motorcycle, the performance of the headlamp will differ around turns or corners, since the motorcycle must lean in order to negotiate a turn. As a result, the beam pattern, and hence visibility, provided by the headlamps on a motorcycle are unique for motorized vehicles. This paper measures the headlamp beam patterns of nine motorcycle headlamps. The type of motorcycles tested covers a variety of motorcycle styles and a variety of headlamp designs. Iso-illuminance diagrams are created from full scale tests and compared to each other. An additional discussion of the effect the roadway shoulder has on headlamp performance is also included.

Introduction

A 1982 study by Olson and Abrams on headlamp performance of motorcycle headlighting systems, found that the Motorcycle Safety Foundation Instructors surveyed in the study "regarded motorcycle headlighting as inadequate" [1]. Specifically, those surveyed indicated "a need for more illumination in the foreground area and to the sides of the lane"; basically, the entire area that a headlamp might typically illuminate. As Olson and Abrams point out "Many motorcycle headlamps do not have the output of an automotive headlamp, and most motorcycles have but one headlamp." An additional problem with the performance of motorcycle headlamps, is due to poor aiming. As Sturgis [1975] examined, improvements in the standardization of the aiming of headlamps is greatly needed [2]. With only one headlamp, and variability in the aiming, the illumination from motorcycle headlamps is a particular problem. The size and shape of the motorcycle has a large influence on the design of the headlamp systems. Because of the limited width of the vehicle, generating a beam pattern on the roadway from two headlamps is not as effective on a motorcycle as it can be on an automobile. The number of headlamp assemblies on the motorcycle may be limited to one, and the lamp housing may be smaller in size, limiting some of the technology available to a standard automobile, where the lamp assembly can protrude farther back into the hood area. Not only can these limitations reduce the amount of illumination on the road that would assist the motorcycle operator at night, it can make it more difficult for other drivers to recognize a motorcycle and judge its approaching speed. Gould et al., 2012 found that "The extent to which observers struggle to accurately judge motorcycle speed based on a solo headlight in nighttime conditions is rather alarming" [3]. The importance of a motorcycle's headlamp illumination both for the operators' visibility of objects in the road and the visibility of the motorcycle to other motorists is articulated in the research. The paper presented here measures the performance of nine motorcycle headlamps that represent a wide variety of motorcycle styles and headlamp design types. In addition, the performance of the headlamp on the roadway and the shoulder was evaluated. The motorcycles tested represent standard, sport and cruiser models, and the headlamps tested include Fresnel-sealed beam, reflector optics, and projector optics. Figure 1 shows a sample of some of the headlamps tested.

FIGURE 1 - Photos of three different headlamps from three different motorcycles

Procedure and Setup

The general procedure for mapping the headlamp pattern is consistent with published methods [4]. The testing was performed in an open area, where the only light source would be that of the tested headlamps. The roadway is flat and made of asphalt with a measured reflectivity of 8%. The setup included a grid consisting of 25 foot intervals extending out from the front of the motorcycle. With 11′ intervals to the right and left of center at each interval which correspond to the fog lines of the roadway. At these locations, vertical lux measurements were taken at ground level and at 3 foot above ground. Figure 2 shows a diagram of the general layout of the motorcycle position and the locations where measurements were taken.

In testing the headlamps, two different setups were performed. One setup tested the motorcycle headlamps as is, mounted correctly in the motorcycle. The participants who donated their bikes for testing articulated that they kept their bikes in good working order, and were aware of the importance of aiming the headlamp to maximize visibility. The condition of each headlamp was confirmed through on-site evaluation to verify that the aiming was appropriate for the vehicle. One of the owner's manuals, the Vulcan 900, states "adjusted too low, neither low nor high beam will illuminate the road far enough ahead. If adjusted too high, the high beam will fail to illuminate the road close ahead, and the low beam will blind oncoming drivers". Visual inspection of each headlamps' performance, at night and at the testing site, met this criteria. Any adjustments to the headlamps did not result in better performance as evaluated visually in the field. In addition, each headlamp showed that the condition and wear and tear of the lamp was also good. Figure 3 shows the general setup of the motorcycles tested "as is".

The second setup used a motorcycle headlamp and rig mount instead of the whole bike. The headlamp rig is powered by two standard car batteries wired in parallel so that a steady and consistent power can be supplied to the headlights. These batteries were monitored by a battery charger so that their charge did not get to low. This setup was tested with a multimeter at 13.8-14.2 volts, which is an identical power supply to that of the motorcycles' systems. The service manual for each motorcycle specified the electrical system as a "12 volt" system, and the charging voltages between 14-15.5 volts. Each motorcycle that was tested was checked with a multimeter and showed voltages between 13.4-14.5 volts during the tests. The headlights used in the headlight rig where elevated to the same height as if there were mounted on their respective motorcycle's. This was confirmed by in field measurements of the headlamp on the rig. The lights were then adjusted to be near level and to be oriented in the same way as they exist on the actual vehicle. This was confirmed through comparison to photographs and measurements from the stock vehicle. For all the setups, the headlamp was warmed up for several minutes prior to taking measurements. Figure 4 shows the second setup, of a rig mounted headlamp assembly.

To validate the process of using a headlamp assembly rig absent the motorcycle to which it belongs, a test was performed where a headlamp was mapped both in the rig setup and on its motorcycle. The headlamp test in these two configurations was from the 2010 Honda Fury (VT1300CXA). Light measurements were taken between the rig setup and the headlamp installed in the motorcycle at 25 foot intervals, and left and right of the headlamp beam pattern. Voltage was also measured and found to be between 13.8 V and 14.1 V between the setups. The average difference between lux measurements of the rig setup and the headlamp in the motorcycle was about 3%, with the highest error being about 8% at one discrete position. This test showed that between the rig setup and motorcycle setup, the headlamp performance was a close correlation. Figure 5 shows the setup comparison between the rig mounted headlamp and the motorcycle with stock mounted headlamp.

FIGURE 2 - Graphic showing standardized layout for headlamp mapping

FIGURE 3 - Motorcycle testing setup

Measuring the Headlamp Performance

A total of nine headlamps were mapped, four of these headlamps were included on the bikes, and five were mounted on rigs. Figures 6 and 7 are photographs of all the bikes and headlamps that were documented during this research.

FIGURE 4 - Headlamp rig testing setup

FIGURE 5 - Rig mounted and motorcycle mounted headlamp comparison

FIGURE 6 - Motorcycles used in the testing

FIGURE 7 - Headlamps used in the testing

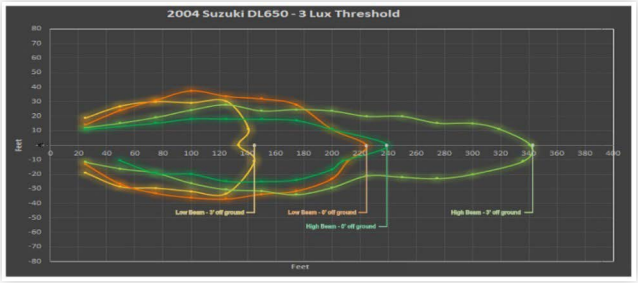
Table 1 has also been included to list each bike, make and model, and a brief description of the style of headlamp.

To measure the illumination from the headlamps, a Konica Minolta T-10 illuminance meter was used at each location. This device was calibrated on June 29, 2017 and certified with NIST traceability. Along the grid defined in Figure 2, measurements were taken at ground level and at 3 foot above the ground. Measurements were taken left and right of center until the measurements reached approximately 1-3 lux, representing meaningful light level thresholds for detection of non self- illuminated or retroreflective objects in the roadway.[5,6]. The illuminance measurements were plotted to a scaled iso-illuminance diagram. Figure 8 shows a sample of the

TABLE 1 - List of motorcycles and headlamps tested

Year	Make	Model	Category	Headlamp	Test Setup
2007	Kawasaki	VN900-D	Cruiser	Reflector	Motorcycle
2010	Honda	Fury	Cruiser	Fresnel	Motorcycle
2006	Triumph	Bonneville	Standard	Fresnel	Motorcycle
2004	Suzuki	DL650	Dual Sport	Reflector	Motorcycle
2005	Harley Davidson	FXSTSI	Cruiser	Reflector	Rig
2004	Harley Davidson	FXSTDI	Cruiser	Fresnel	Rig
1993	Harley Davidson	FXR	Cruiser	Fresnel	Rig
2005	Suzuki	GSXR-600	Sport	Projector	Rig
1992	Yamaha	Vmax	Sport	Fresnel	Motorcycle
2004	Honda	CBR 1000RR	Sport	Reflector	Motorcycle

FIGURE 8 - Iso-illuminance diagram of the 2004 Suzuki DL650



iso-illuminance diagram made from the mapping of the 2004 Suzuki DL650 motorcycle headlamp. In this figure, low beam and high beam measurements were made, at the road surface and at the 3 lux light level. A complete record of the measurements for all the headlamps for each test configuration are include in Appendix A.

Results

For discussion purposes, the headlamp measurements were separated into two groups. One group contained those headlamps which had the shortest distance when measured to a 3 lux level on the ground. The second group contained the half that had the farthest distance when measured to a 3 lux level on the ground. The terms assigned to those groups are the shortest performing and farthest performing headlamps. Figure 9 shows all the farthest performing low beam headlamp measurements, taken at the road surface, representing a 3 lux light level. Figure 10 shows all the shortest performing low beam headlamps, also measured at the same 3 lux level, at the road surface.

The individual motorcycle headlamp patterns are designated in color, and to simplify the data among the whole group. A profile was created that represents an average headlamp performance for the entire group. This average profile is shown in white.

FIGURE 9 - All Iso-illuminance patterns for the farthest performing headlamps. Low beam, 3 lux at the road surface

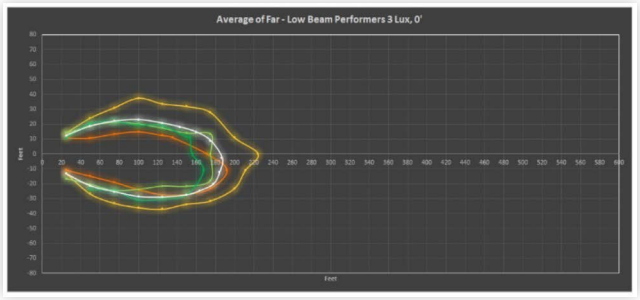
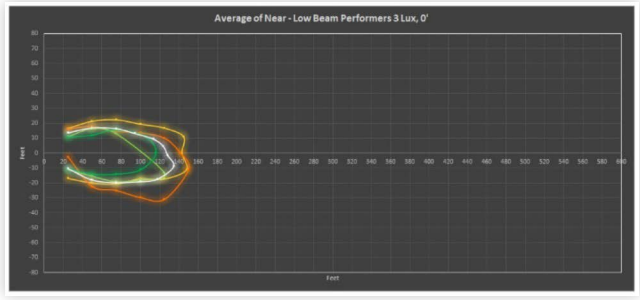


FIGURE 10 - All Iso-illuminance patterns for the shortest performing headlamps. Low beam, 3 lux at the road surface



The shortest performing group and the farthest performing group averages were compared to evaluate several concepts. First, averages were compared to evaluate how large of a range there is between motorcycle headlamp performance. In addition, showing the averages provides a general range for the 3 lux and 1 lux level of light for the motorcycles. This data may be helpful when comparing the difference between motorcycles to other automotive vehicles like cars and trucks. Figures 11 and 12 show the average beam patterns, from the farthest performing headlamps, for low beam and high beam, at the road surface, at the 3 lux and 1 lux light level. Figures 13 and 14 show the same data but for the shortest performing group.

As shown in these figures, there is a significant range between the performance of the headlamps, for both the low beam and high beam samples. Between the farthest performers and the shortest performers, on low beam at ground level, the farthest performing headlamps measured approximately 52 feet greater reach at the 3 lux level than the shortest

FIGURE 11 - Average Iso-illuminance pattern for farthest performing headlamps. Low beam, 3 lux and 1 lux, at the road surface

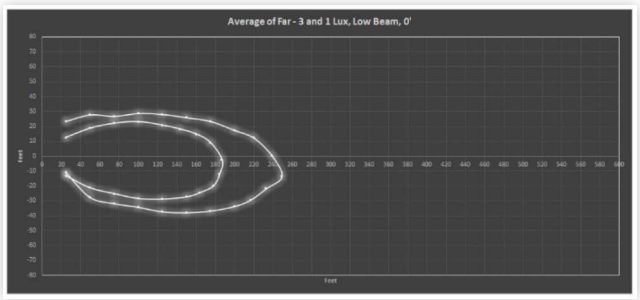


FIGURE 12 - Average Iso-illuminance pattern for farthest performing headlamps. High beam, 3 lux and 1 lux, at the road surface

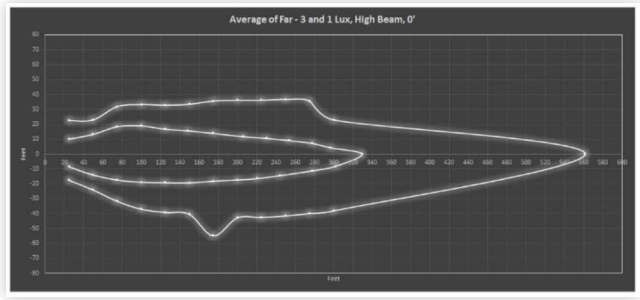


FIGURE 13 - Average Iso-illuminance pattern for shortest performing headlamps. Low beam, 3 lux and 1 lux, at the road surface

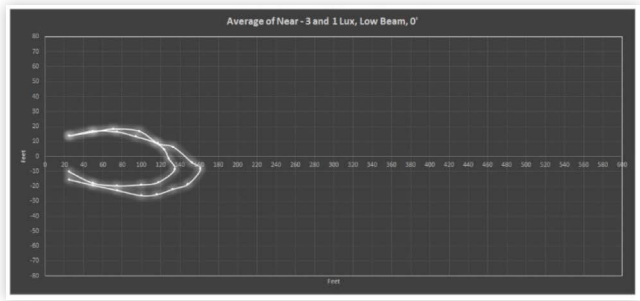
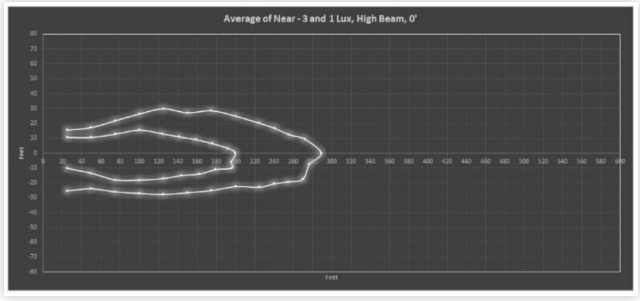


FIGURE 14 - Average Iso-illuminance pattern for shortest performing headlamps. High beam, 3 lux and 1 lux, at the road surface



performing group. For high beam, this same comparison is approximately 130 feet.

To examine how wide of a difference there is between two specific motorcycle headlamps, not just the averages, the following comparison was made, and represented in Figures 15 and 16. In these graphs, the shortest performing headlamp was compared to the farthest performing headlamp for low beam and high beam.

The difference in distance between the farthest and shortest performing headlamps, measuring down the middle, is significant. For low beam, this difference measures 109 feet, and for high beam 228 feet. The low beam headlamp patterns shown in Figure 15 are the 2004 Suzuki DL650 (farthest performer shown in orange) and the 2004 HD FXSTDI

FIGURE 15 - Low beam comparison of farthest performing and shortest performing headlamps. Iso-illuminance pattern is 3 lux at the road surface.

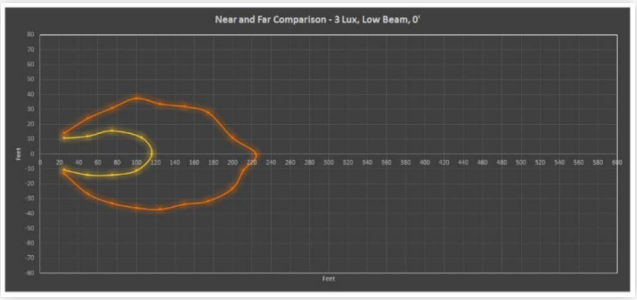
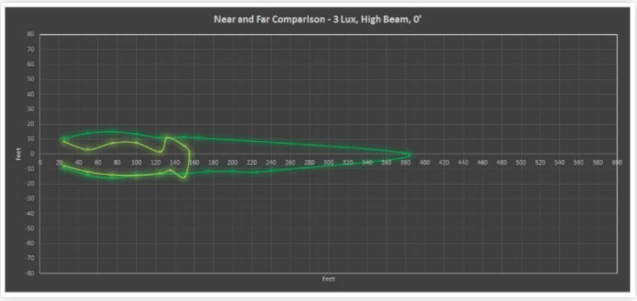


FIGURE 16 - High beam comparison of farthest performing and shortest performing headlamps. Iso-illuminance pattern is 3 lux at the road surface.



(shortest performer shown in yellow). For the high beam comparison in Figure 16, the high beam headlamp patterns shown are the 2010 Honda Fury (farthest performer shown in dark green) and the 2004 Honda CBR1000RR (shortest performer shown in light green).

An additional analysis was done to compare the general differences between the low beam and high beam performances of the motorcycle. For this analysis, the maximum distance was measured, for low and high beam of each motorcycle. The distance from the headlamp corresponds to the farthest distance a 3 lux reading was obtained at ground level. Table 2 shows the general distance difference between the low beam and high beam of each motorcycle.

TABLE 2 - Comparison of 3 lux maximum distance at road surface between low and high beams

	3 Lux at 0′		
Year Make Model	Low Beam [ft]	High Beam [ft]	Distance Increased
1993 Harley Davidson FXR	116	340	193%
2004 Harley Davidson FXSTDI	116	292	152%
2004 Honda CBR1000RR	146	156	7%
2004 Suzuki DL650	225	239	6%
2005 Harley Davidson FXSTSI	90	304	238%
2005 Suzuki GSXR600	190	216	14%
2006 Triumph Bonneville	192	148	-23%
2007 Kawasaki VN900D	160	225	41%
2010 Honda Fury	148	384	159%

For many of the headlamps, as expected, the high beam pattern increases the level of light a significant distance beyond the low beam. In our testing, though, we found that for some headlamps, the high beam did not provide much additional illumination, and for one of the headlamps tested, the light level on the ground on high beam was oddly less than the low beam. Upon examination, it was determined that the angle of the beam pattern was considerably high, thus shining light straight rather than down towards the ground, where the measurements were being taken.

Effect of the Shoulder

Roadways may contain shoulders that are made of different material than the roadway itself, including gravel, dirt or grass. Since the reflectivity of the material on the shoulder can be different than the paved asphalt of the roadway, a comparison was done to examine how the actual headlamp performance might change due to the difference in surface material of the shoulder. To evaluate what effect, if any, the shoulder had on the performance of the headlamp, a 2010 Honda Fury was measured at two varying locations. The first location was a roadway that was entirely paved with asphalt and had no shoulder within the testing area. The roadway is wide enough to accommodate the full beam pattern so that no illuminance measurements were taken outside of the paved area. The second location included a two-lane asphalt paved roadway. The headlamp beam pattern was shone over asphalt as well as a dirt shoulder. Figures 17 and 18 show the two different testing sites.

FIGURE 17 - Testing site with different material shoulder

FIGURE 18 - Testing site with same material shoulder

FIGURE 19 - Iso-illuminance of testing the effect of shoulder material

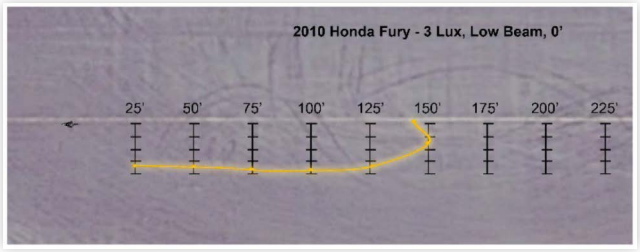


FIGURE 20 - Effect of the shoulder on headlamp performance

For a baseline measurement, the first testing location composed of flat asphalt pavement was chosen to measure a consistent headlamp pattern, with no contribution from a material change of a shoulder. The flat asphalt pavement had 8% reflectivity. A single yellow lane line with an average reflectivity of 50% served as a station line for points of measurement. Headlamp lux measurements were taken at 25′ intervals away from the motorcycle and 5′ lateral intervals away from the centerline of the motorcycle towards the right shoulder of the roadway. An image showing the iso-illuminance results of the test are illustrated in Figure 19.

The site containing a shoulder was also tested. This site, as seen in the photographs, also has a similar yellow lane line that would serve as a station line from which measurements were taken. In addition to asphalt and yellow lane lines, the roadway contained a shoulder with gravel, grass and dirt. The reflectivity measurements of the asphalt roadway and yellow lane line were the same as the baseline testing site 8% and 50% respectively. Additionally, the reflectivity of the white line measured 50%, the gravel 20%, and grass/dirt mix was 15%. Table 3 shows the reflectivity of the various material properties of the shoulder.

Headlamp lux measurements were gathered on the site with the shoulder in the same manner and at the same points in front of and laterally along the headlamp pattern as the baseline site. After gathering the measurements, the numbers were compared. In the area where the roadway surface was the same between both tests, the measurements remained consistent. However, in the area where the shoulder material differs, the measurements also differed. Not surprisingly, shoulder areas with higher reflective material than that of the asphalt correlate to higher illuminance values of the headlamp. Figure 20 shows a top down view of the setup at the site containing the shoulder. This image shows the percentage increase in the measured lux value for each of the specific locations measured. As seen in this image, the area of the shoulder where the reflectivity is approximately 2 to 3 times as reflective as the roadway surface, there is also an increase in the lux value measured.

TABLE 3 - Materials on the roadway and shoulder and respective reflectivity

Lateral Distance	Roadway Material	Reflectivity
0 ft (center)	Yellow Lane Line	50%
5 ft (right)	Asphalt	8%
10 ft (right)	White Fog Line	50%
15 ft (right)	Gravel	20%
20 ft (right)	Grass	15%

Conclusions

When measuring the light values of the headlamp between the roadway and the shoulder, it was determined that the reflectance of the shoulder surface material has an impact on the measurements. However, the reflectance of the surface material is not the only factor. The surface texture, its smoothness for example, can also affect the overall light measurements. As for the overall headlamp testing, the data collected during this testing shows that motorcycle headlamps can have

TABLE 4 - Listed of tested headlamps by performance - low beam

Year Make Model	Headlamp Type	Bulb Type	Low Beam 3 Lux at 0′ [ft]
2004 Suzuki DL650	Reflector	Left - H4 12V 60/55W E13	225
		Right - H4 12V 60/55W E13	
2006 Triumph Bonneville	Fresnel	H4 12V 60/55W E13	192
2005 Suzuki GSXR600	Projector	Upper - H4 12V 60/55W	190
		Lower - E520 H7 12V 55W DOT 12972LL E1	
2007 Kawasaki VN900D	Reflector	H4 12342 LL 12V 60/55W E1 2C3 U	160
2010 Honda Fury	Fresnel	H4 ED 12V 50/55W U E1 2C3	148
2004 Honda CBR1000RR	Reflector	Left - J903 H7 12V 55W DOT 12972LL E1	146
1993 Harley Davidson FXR	Fresnel	H4 12V 60/55W E13 2B9	116
2004 Harley Davidson FXSTDI	Fresnel	HB2 DOT 9035 BiLux 12V 60/55W H4 U 37R E1 0080	116
2005 Harley Davidson FXSTSI	Reflector	HB2 DOT 9003 L BiLux 12V 60/55W H4 U 37R E1	90

TABLE 5 - Listed of tested headlamps by performance - high beam

Year Make Model	Headlamp Type	Bulb Type	High Beam 3 Lux at 0′ [ft]
2010 Honda Fury	Fresnel	H4 ED 12V 50/55W U E1 2C3	384
1993 Harley Davidson FXR	Fresnel	H4 12V 60/55W E13 2B9	340
2005 HD FXSTSI	Reflector	HB2 DOT 9003 L BiLux 12V 60/55W H4 U 37R E1	304
2004 Harley Davidson FXSTDI	Fresnel	HB2 DOT 9035 BiLux 12V 60/55W H4 U 37R E1 0080	292
2004 Suzuki DL650	Reflector	Left - H4 12V 60/55W E13	239
		Right - H4 12V 60/55W E13	
2009 Kawasaki VN900D	Reflector	H4 12342 LL 12V 60/55W E1 2C3 U	225
2005 Suzuki GSXR600	Projector	Upper - H4 12V 60/55W	216
		Lower - E520 H7 12V 55W DOT 12972LL E1	
2004 Honda CBR1000RR	Reflector	Left - J903 H7 12V 55W DOT 12972LL E1	156
		Right - J903 H7 12V 55W DOT 12972LL E1	
2006 Triumph Bonneville	Fresnel	H4 12V 60/55W E13	148

a large difference in the beam pattern and performance between motorcycles. In addition, the performance between low beam and high beam is irregular and inconsistent. Further analysis could be performed to determine if the type and style of headlamp is a factor, and how the overall results of the headlamp patterns compare to the performance of passenger cars and commercial trucks [7]. Tables 4 and 5 show the final list of headlamps tested, ordered from the farthest performing to the shortest performing, on low beam and high beam, measuring 3 lux at the road surface.

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Contact Information

William Neale, M. Arch.
Kineticorp, LLC
(303) 733-1888
wneale@kineticorp.com
www.kineticorp.com

Appendix A

1993 Harley High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-21.58	-15.75	-13.08	4.38	46.80	4.58	17.42	20.25	32.42
50	-26.42	-15.92	-12.92	6.09	46.70	5.20	13.83	17.25	24.00
75	-35.58	-25.42	-19.08	8.92	33.90	7.80	24.75	30.67	38.25
100	-44.25	-28.00	-23.08	9.82	26.80	7.28	24.67	28.33	39.75
125	-45.33	-29.08	-24.58	10.06	20.40	7.20	22.08	25.67	35.50
150	-45.92	-34.33	-25.58	10.12	15.68	4.76	21.83	27.17	35.17
175	-73.17	-33.33	-26.75	8.93	12.40	5.68	22.08	29.33	39.25
200	-49.92	-33.33	-27.25	7.54	8.84	4.95	20.67	28.67	39.67
225	-48.42	-33.00	-26.67	6.67	7.06	4.26	19.67	28.50	44.42
250	-47.50	-32.83	-26.08	5.70	5.23	3.70	17.17	25.42	44.00
275	-47.17	-31.50	-22.92	4.80	4.66	3.09	15.67	23.42	43.50
300	-46.67	-30.08	-21.83	4.09	3.94	1.99			25.67
3 lux max				380.00	340.00	278.00			
2 lux max				490.00	482.00	300.00			
1 lux max				530.00	575.00	425.00			

1993 Harley High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-29.08	-18.50	-13.00	4.42	597.00	5.27	18.00	19.08	24.83
50	-24.00	-19.58	-17.00	20.95	140.20	16.63	23.17	27.00	35.25
75	-31.50	-26.58	-23.00	16.23	65.00	17.02	25.33	27.17	35.00
100	-31.00	-27.00	-23.00	15.87	35.10	12.27	25.25	28.00	35.00
125	-38.08	-35.33	-23.50	13.61	22.59	9.31	24.67	28.25	35.08
150	-47.00	-36.00	-27.75	11.55	15.59	7.34	25.25	31.67	37.17
175	-47.75	-35.67	-28.50	9.47	11.66	5.81	25.92	33.08	41.58
200	-54.33	-34.50	-28.50	7.90	9.05	4.60	20.00	31.42	45.50
225	-54.33	-33.58	-27.42	6.56	7.18	4.04	19.08	30.42	45.83
250	-54.42	-33.08	-25.92	5.51	5.34	3.34	15.17	28.17	46.33
275	-49.92	-32.50	-25.50	4.65	4.49	3.03		24.08	46.25
300	-47.58	-32.42	-25.50	3.93	3.71	2.56			
3 lux max				345.00	320.00	275.00			
2 lux max				380.00	402.00	330.00			
1 lux max				502.00	517.00	430.00			

1993 Harley Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-13.83	-10.73	-10.22	1.47	23.12	1.30	10.14	10.14299	12.17
50	-15.92	-14.08	-12.00	5.58	5.23	0.99	5.79	10.65	
75				1.91	2.28	0.97			
100				0.79	1.25	0.86			
125					0.83				
150									
175									
200									
225									
250									
275									
300									
3 lux max				67.57	67.82				
2 lux max				0.00	82.33				
1 lux max				75.00	114.92	57.92			

1993 Harley Low Beam Ground Level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-14.67	-11.00	-11.00	1.97	86.00	3.03	11.00	11.83	13.42
50	-17.75	-16.33	-15.25	9.49	22.39	5.87	16.42	17.42	20.17
75	-24.17	-21.17	-19.00	7.81	9.12	4.10	13.08	21.58	25.58
100	-29.08	-22.67	-17.75	5.48	4.40	2.65		13.17	28.33
125	-31.75	-19.33	-13.50	3.42	2.18	1.59			14.50
150	-28.75	-12.00		2.10	1.14	1.02			
175	-26.00			1.48	0.88	0.72			
200				1.04					
225									
250									
275									
300									
3 lux max									
2 lux max									
1 lux max									

2004 HD FXSTDI High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-6.75	0.30	7.29	1.12	7.65		
50			-15.00	5.84	38.60	8.83	13.00		
75			-15.42	6.98	43.90	8.46	17.17		
100			-17.33	6.70	27.34	7.01	20.00		
125			-18.92	5.80	18.13	6.10	19.25		
150			-20.92	4.53	14.26	5.47	18.33		
175				3.82	9.95	4.48	14.42		
200			-14.42	3.17	7.38	3.74	11.42		
225				2.70	5.54	3.04			
250				2.35	4.39	2.47			
275					3.41				
300					2.80				
3 lux max				209.04	291.80	226.75			
2 lux max									
1 lux max									

2004 HD FXSTDI High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-11.50	4.43	320.00	1.91	10.96		
50			-16.92	10.30	67.40	8.83	15.50		
75			-16.92	13.34	24.75	9.93	18.25		
100			-18.33	7.83	14.60	8.67	21.58		
125			-18.92	5.75	9.09	5.66	20.25		
150			-21.92	4.91	7.04	4.16	19.33		
175			-17.00	3.75	5.06	3.06			
200				2.99	3.91	2.44			
225				2.39	3.12	2.06			
250				1.97	2.54	1.72			
275					2.02				
300									
3 lux max				199.67	230.17	177.42			
2 lux max									
1 lux max									

2004 HD FXSTDI Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25				4.67	6.07	1.31	7.09		
50				0.60	1.25	0.60			
75				0.64	0.59	0.34			
100									
125									
150									
175									
200									
225									
250									
275									
300									
3 lux max					40.92				
2 lux max									
1 lux max									

2004 HD FXSTDI Low Beam Ground Level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-10.57	1.64	36.50	0.74	10.61		
50			-14.00	7.91	51.10	5.61	12.00		
75			-14.00	5.86	23.37	6.13	15.58		
100				3.04	6.50	3.61	11.42		
125				0.96	1.11	0.80			
150									
175									
200									
225									
250									
275									
300									
3 lux max				100.00	116.20	105.43			
2 lux max									
1 lux max									

CBR 1000-RR High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-14.20	-8.20	-7.50	1.23	49.70		7.60	8.00	9.80
50	-14.40	-14.00	-10.00	2.10	17.26	6.48	2.60	3.00	4.40
75	-17.00	-12.40	-11.00	3.00	8.08	3.92	5.20	7.80	10.60
100	-17.80	-13.50	-9.50		4.75		10.40	6.40	16.70
125	-19.20	-11.50	-3.00	2.60	3.10		3.70	10.60	30.20
150	-19.20	-5.30		1.77	2.14	1.55		5.80	23.00
175	-17.30			1.33	1.60	1.25			6.30
200	-13.80			1.80	1.23				10.60
225									
250									
275									
300									
3 lux max					127.60				
2 lux max					156.50				
1 lux max					222.00				

CBR 1000-RR High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-26.40	-9.30	-7.80	1.35	146.10	1.00	8.40	9.40	11.00
50	-15.00	-13.50	-12.00	5.71	72.20	9.13	3.00	3.80	4.80
75	-19.20	-15.50	-14.00	5.81	16.87	7.34	7.40	9.20	10.60
100	-21.40	-17.00	-14.30	4.36	8.11	4.90	7.60	12.00	16.70
125	-22.80	-16.60	-13.10	3.45	4.80	3.30	1.50	9.50	22.00
150	-22.50	-15.40	-15.60	2.40	3.22	2.26	5.30	14.80	22.40
175	-22.50	-17.60		1.83	2.25	1.70		8.20	26.50
200	-20.80			1.50	1.59	1.46			22.40
225	-20.60			1.23	1.32	1.20			19.20
250					1.00				
275									
300									
3 lux max					155.67				
2 lux max					181.80				
1 lux max					250.00				

CBR 1000-RR Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-10.40	-10.00	-9.20	1.44	4.85	1.35	2.00	6.60	14.20
50	-19.00	-14.18		2.66	2.56			3.00	9.20
75	-24.00			1.50	1.44				7.50
100									
125									
150									
175									
200									
225									
250									
275									
300									
3 lux max					44.40				
2 lux max					61.60				
1 lux max					94.00				

CBR 1000-RR Low Beam Ground Level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-2.50	-3.00	-2.50	11.96	67.70	10.86	16.10	18.00	27.00
50	-25.30	-24.30	-22.30	22..35	51.90	9.19	17.80	23.10	25.10
75	-31.60	-28.00	-25.00	16.10	19.80	6.44	14.50	17.40	22.40
100	-35.50	-31.80	-29.80	9.00	8.76	4.23	13.60	17.00	21.40
125	-40.60	-34.50	-31.00	4.98	4.58	2.88	10.00	14.00	20.00
150	-45.00	-33.60		3.02	2.71	1.84		8.00	18.60
175	-43.60			1.88	1.66	1.39			16.60
200	-37.50			1.25	1.13				9.00
225									
250									
275									
300									
3 lux max					146.12				
2 lux max					164.00				
1 lux max					231.60				

2004 Suzuki DL650 High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25				231	16.23	2.90	10.92		
50			-10.58	2.8	8.1	24.30			
75			-19.2	5.65	10.2	5.48	15.20		
100			-19.8	5.51	9.45	6.56	18.10		
125			-24.8	4.83	6.96	5.20	18.10		
150			-25	3.95	4.87	4.42	17.90		
175			-23.8	4.21	4.92	3.52	17.10		
200			-16.7	3.17	3.93	3.00			
225				2.62	3.42	2.52			
250				2.42	2.69				
275									
300									
3 lux max				207.73	239.38	200.00			
2 lux max									
1 lux max									

2004 Suzuki DL650 High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-11.6	3.64	668	4.17	12		
50			-16.2	24.09	131.1	19.7	15.1		
75			-19.11	24.18	61.1	17.25	19		
100			-26.1	17.22	37.8	16.5	24.1		
125			-30.5	13.41	23.41	11.82	27.8		
150			-31.5	10.55	14.06	9.17	23.5		
175			-34	9.38	11.68	7.55	24.5		
200			-29.2	6.79	8.52	6.09	23.5		
225			-21.11	5.22	6.74	4.69	19.8		
250			-22	4.55	5.12	4.12	19.8		
275			-23	4.38	4.54	3.91	15.11		
300			-20	3.55	4.04	3.32	15		
3 lux max				336	341	319			
2 lux max									
1 lux max									

2004 Suzuki DL650 Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-19	27.7	170.5	20.89	18.5		
50			-28.7	31.5	33.2	21.01	26.8		
75			-29.6	16.02	11.62	14.78	29.9		
100			-31.9	9.44	6.21	8.85	29.1		
125			-33.4	4.88	3.1	3.85	30.2		
150				2.52	2.81	2.5			
175				1.72	1.07	2.06			
200									
225									
250									
275									
300									
3 lux max				144.9153	133.6207	140.7407			
2 lux max									
1 lux max									

2004 Suzuki DL650 Low Beam Ground Level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-13	8	76.3	9.21	14		
50			-26.8	29.7	49.1	23.03	24.1		
75			-33.1	19.93	28.14	18.8	31		
100			-36.11	13.31	19.92	14.33	37.5		
125			-37.11	9.42	11.53	8	33.7		
150			-33.7	5.9	7.29	6.15	31.9		
175			-31.6	4.7	5.7	4.54	27.9		
200			-23.11	3.42	4.77	3			
225				2.49	2.97	2.34			
250									
275									
300									
3 lux max				211.2903	224.5833	192.5676			
2 lux max									
1 lux max									

2005 HD FXSTSL High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-15.92	-13.08	-12.08	4.66	292.00	2.97	11.00	11.83	14.58
50	-23.25	-19.58	-16.50	11.48	88.80	6.64	15.17	18.83	23.00
75	-28.17	-22.33	-19.50	13.89	45.70	8.31	17.08	19.33	27.50
100	-30.33	-24.67	-22.50	9.72	27.12	7.23	19.42	22.50	27.58
125	-32.42	-26.42	-22.67	7.99	17.92	5.79	19.67	23.92	30.50
150	-35.17	-28.50	-23.50	6.64	12.65	4.25	16.67	24.25	32.42
175	-36.92	-28.08	-21.17	5.84	9.43	3.52	16.33	22.67	32.42
200	-38.50	-27.58	-16.83	4.87	7.35	2.93		19.50	33.42
225	-38.17	-22.67	-16.67	4.34	5.83	2.50		15.42	30.92
250	-37.25	-20.50	-13.83	3.75	4.75	2.17		13.58	30.75
275	-36.17	-19.33	-12.67	3.12	3.96	2.04			28.42
300	-31.58	-16.50		2.85	3.26	1.76			23.67
3 lux max				286.11	318.42	197.03			
2 lux max					389.25				
1 lux max					547.67				

2005 HD FXSTSL High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-13.67			1.59	4.23	1.20	11.00	11.00	12.50
50	-21.83	-16.83	-14.17	6.55	13.90	3.51	12.08	15.42	21.58
75	-27.83	-22.17	-19.08	7.24	15.64	5.30	16.58	19.08	25.33
100	-29.83	-24.08	-21.08	6.68	13.14	4.30	17.58	21.67	26.67
125	-33.08	-27.33	-20.33	6.70	11.04	3.44	14.50	22.33	29.92
150	-34.92	-26.00	-17.83	5.81	942.00	2.87		20.08	31.50
175	-36.67	-24.00	-16.67	5.27	7.84	2.81		17.00	31.75
200	-35.67	-21.58	-16.33	4.71	6.56	2.75		13.67	32.33
225	-36.75	-21.33	-16.00	4.14	5.35	2.54		13.33	27.67
250	-35.58	-19.83	-13.50	3.65	4.52	2.27		12.83	29.08
275	-32.75	-17.75		3.08	3.86	2.21			27.58
300	-29.67	-15.83		2.84	3.17	1.90			19.92
3 lux max				283.33	303.58	144.30			
2 lux max					381.00				
1 lux max					547.92				

2005 HD FXSTSL Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-13.67	-12.33	-12.00	4.06	20.29	0.78	9.74	10.30	10.87
50	-22.58	-18.83	-16.92	9.24	29.90	3.86	11.83	12.92	16.75
75	-27.67	-21.50	-19.00	8.98	19.47	5.77	15.50	17.18	20.17
100	-28.17	-23.33	-19.17	5.90	15.37	4.99	15.92	19.50	23.33
125	-29.25	-23.00	-16.75	3.92	10.45	3.55	12.92	18.17	25.42
150	-30.00	-18.33		2.88	6.97	2.49		13.30	22.83
175	-28.08	-11.92		2.43	4.33	1.63			18.83
200	-18.17			1.90	2.85	1.12			11.83
225	-15.25			1.56	1.87	0.84			
250	-12.83			1.22	1.38				
275				0.92	1.00				
300									
3 lux max				147.12	197.47	137.97			
2 lux max				195.28	221.68	164.24			
1 lux max				268.33	275.00	210.71			

2005 HD FXSTSL Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-16.25	-12.92	-12.00	3.88	144.20	1.51	10.89	10.89	14.00
50	-20.75	-14.83	-13.58	6.06	17.71	1.29			12.33
75	-21.17	-17.92	-14.42	3.58	4.65	0.85			
100	-23.30			1.71	1.94	0.67			
125				0.92	0.97	0.47			
150									
175									
200									
225									
250									
275									
300									
3 lux max				82.75	90.22				
2 lux max				96.12	99.45				
1 lux max				122.47	124.23	66.48			

2005 Suzuki GSXR-600 High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-24.60	-17.00	-16.00	11.35	104.00	6.50	14.80	17.00	20.00
50	-33.00	-25.00	-23.00	16.90	62.30	12.20	19.20	22.40	29.60
75	-33.00	-29.00	-25.00	14.53	29.90	10.90	21.40	25.40	33.00
100	-33.00	-28.00	-24.00	11.27	17.49	7.16	21.80	27.20	36.00
125	-33.00	-27.00	-20.60	8.89	10.04	5.09	19.40	25.50	37.80
150	-31.00	-22.60	-18.00	6.50	6.91	3.98	14.40	20.20	32.00
175	-28.00	-19.00	-17.00	4.62	4.54	3.00	11.00	16.40	30.60
200	-24.40	-19.60	-15.80	3.49	3.50	2.45	20.00	13.40	27.40
225	-25.40	-20.40		2.35	2.74	2.00	15.40		21.00
250	-25.00			1.80	2.00	1.76			19.00
275	-26.40			1.20	1.60	1.35			15.00
300	-27.00				1.31	1.25			14.00
3 lux max				210.75	216.45	175.00			
2 lux max				240.91	250.00	275.00			
1 lux max				308.33	328.00				

2005 Suzuki GSXR-600 High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-19.60	-15.20	-11.00	3.00	34.47	1.66	9.00	10.00	16.00
50	-20.40	-15.50	-13.00	3.63	26.57	3.00	11.00	14.00	17.80
75	-24.00	-23.80	-21.00	2.57	14.71	1.78	8.40	10.00	19.50
100	-20.20	-12.50	-13.00	3.00	9.16	1.52	8.60	8.60	16.40
125	-18.00	-15.00	-13.00	4.37	6.14	1.37	7.40	8.00	14.00
150	-18.80	-15.60	-12.00	3.98	4.35	1.30	7.40	8.00	13.50
175	-20.40	-16.00		3.13	3.16	1.27	7.00	8.20	13.00
200	-21.60	-16.00		2.50	2.45	1.28	11.00	8.00	13.00
225	-23.00	-13.00		1.70	1.98	1.28	11.00	6.60	13.20
250	-23.80	-15.40		1.22	1.67	1.22	11.00	6.00	13.80
275	-24.80				1.33	1.11			13.00
300	-23.40								16.00
3 lux max				180.16	203.60	50.00			
2 lux max				215.63	222.50	70.49			
1 lux max				250.00	333.00	275.00			

2005 Suzuki GSXR-600 Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-16.80	-7.50	-6.50	1.25	8.38	1.00	6.40	6.60	
50	-15.30	-10.00	-8.00	1.60	3.00	1.36		7.30	14.00
75	-15.00		-7.00	2.00	1.56	1.10			12.00
100	-16.00			2.00					
125	-18.50			1.20					
150									
175									
200									
225									
250									
275									
300									
3 lux max					50.00	50.00			
2 lux max				100.00	67.36				
1 lux max				125.00					

2005 Suzuki GSXR-600 Low Beam Ground Level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25	-19.80	-17.60	-16.60	9.44	99.40	5.45	14.00	15.00	19.60
50	-30.00	-24.00	-20.40	16.07	53.80	10.76	19.00	22.40	30.20
75	-32.00	-27.40	-24.50	14.61	27.45	10.00	21.40	25.00	31.00
100	-33.00	-29.00	-23.80	13.56	15.97	7.11	20.20	26.00	35.80
125	-34.00	-26.00	-21.60	9.21	9.83	5.00	17.40	22.80	36.00
150	-31.00	-24.50	-21.80	5.92	6.15	3.57	14.00	20.00	33.00
175	-30.00	-24.00	-17.80	3.73	3.38	2.49	13.50	16.40	30.00
200	-30.00	-19.40		2.50	2.23	1.75			25.60
225	-31.00			1.71	1.42	1.21			19.60
250	-25.00			1.13					
275	-18.00								
300									
3 lux max					183.26				
2 lux max					204.50				
1 lux max					247.00				

2006 Triumph Bonneville High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-10.37	2.50	11.23	2.39	10.24		
50			-10.90	2.95	8.61	2.06	9.42		
75			-11.50	3.27	6.33	2.24	8.96		
100			-11.50	3.22	5.10	2.78			
125			-11.20	3.32	3.89	2.38			
150				2.40	2.94	2.21			
175				2.60	2.35	2.10			
200									
225									
250									
275									
300									
3 lux max				133.70	148.42				
2 lux max									
1 lux max									

2006 Triumph Bonneville High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-16.1	5.66	185.3	5.59	15.2		
50			-15	10.02	51.7	32.7	13		
75			-16.8	9.73	23.72	5.08	13.75		
100			-17.7	9.31	14.33	5.59	14.5		
125			-18.9	7.66	8.45	4.52	14		
150			-17.8	5.07	5.82	4.44	13.5		
175			-16.9	4.58	4.07	3.65			
200			-12	3.13	3.37	2.43			
225				2.26	2.35	2.12			
250									
275									
300									
3 lux max				203.7356	209.0686	188.3197			
2 lux max									
1 lux max									

2006 Triumph Bonneville Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-10.91	2.18	106.50	1.82	10.88		
50			-16.00	20.52	25.48	2.35	10.69		
75			-21.20	14.08	11.87	4.06	12.50		
100			-25.60	7.72	6.71	3.55	13.50		
125			-27.60	5.06	4.12	2.60			
150			-27.00	3.64	2.82	1.97			
175				2.67	2.16	1.50			
200					1.60				
225									
250									
275									
300									
3 lux max				166.49	148.33	114.47			
2 lux max									
1 lux max									

2006 Triumph Bonneville Low Beam Ground Level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-10.82	1.91	69.30	1.29	10.72		
50			-15.00	16.34	47.30	2.29	10.83		
75			-19.11	17.66	21.43	5.09	13.50		
100			-24.00	11.61	11.41	4.79	15.00		
125			-27.60	7.55	6.30	3.38	12.50		
150			-27.30	5.25	4.22	2.51			
175			-23.30	3.56	2.79	1.85			
200				2.75					
225									
250									
275									
300									
3 lux max				192.28	171.33	135.92			
2 lux max									
1 lux max									

2007 Kawasaki VN900-D High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-12.50	2.40	551.00	2.30	10.90		
50			-16.08	21.30	101.30	4.06			
75			-20.75	19.45	37.80	6.80	14.00		
100			-25.00	13.76	20.41	7.21	15.67		
125			-28.67	14.75	13.12	5.55	17.83		
150			-30.08	13.92	7.67	4.95	15.92		
175			-21.42	8.28	5.55	3.83	14.50		
200			-20.00	6.56	5.54	4.20	18.42		
225			-22.42	6.85	3.93	2.57	11.00		
250			-22.42	5.20	3.17				
275				3.55					
300				1.90					
3 lux max				283.33	250.00	218.40			
2 lux max									
1 lux max									

2007 Kawasaki VN900-D High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-10.06	2.40	9.40	1.95	9.45		
50			-10.57	2.85	6.69	1.35	7.60		
75			-17.17	4.38	6.80	2.38	9.46		
100			-19.67	4.26	5.84	3.29			
125			-20.42	4.24	4.94	2.95			
150			-15.25	4.31	4.13	2.54			
175			-14.00	3.19	2.63	2.04			
200			-11.00	2.88	4.43	2.40			
225			-14.00	2.95	2.23	1.53			
250			-11.00	2.50	1.94	2.00			
275									
300									
3 lux max				190.32	216.25	121.32			
2 lux max									
1 lux max									

2007 Kawasaki VN900-D Low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25				9.93	127.80	3.20			
50			-21.58	16.80	32.10	4.74	14.00		
75			-27.42	11.23	9.76	4.95	16.00		
100			-25.33	7.65	7.35	4.26	15.00		
125			-23.58	5.83	4.03	3.26			
150			-18.58	4.33	3.48	2.61			
175				2.90	2.15	1.63			
200				2.32	1.92	1.30			
225									
250									
275									
300									
3 lux max				173.25	159.02	135.00			
2 lux max									
1 lux max									

2007 Kawasaki VN900-D Low Beam Ground Level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25				4.03	49.80	1.77	10.78		
50			-23.58	20.62	27.50	12.93	20.50		
75			-24.58	11.72	12.50	9.12	21.83		
100			-30.75	7.43	7.93	6.24	19.42		
125			-30.00	4.90	4.75	4.09	19.00		
150			-27.42	3.75	3.30	3.12	11.50		
175				2.71	2.05	2.33			
200				2.15	2.32	1.80			
225									
250									
275									
300									
3 lux max				168.03	156.00	153.80			
2 lux max									
1 lux max									

2010 Honda Fury High Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-9.165	2.71	13.81	2.78	10.71261		
50			-14	5.26	29.6	5.66	14		
75			-16	4.05	23.18	4.78	15		
100			-14	3.56	18.44	3.65	13.5		
125			-13	3.89	15.07	3.1			
150			-13	3.64	12.96	3.2	11.5		
175			-11.5	3.47	9.3	2.86			
200			-11.5	3.07	7.9	2.76			
225			-12	3.42	6.48	2.8			
250				2.75	6.81	2.9			
275					5.8				
300					4.65				
3 lux max				240.6716	384	164.7059			
2 lux max									
1 lux max									

2010 Honda Fury High Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-13	3.75	666	4.2	14		
50			-16.7	7.67	194.2	8.17	15.8		
75			-16.5	7.29	85.1	7.48	17.3		
100			-17.2	8.91	48	9.29	17.2		
125			-18.1	8.32	32.5	6.88	16.8		
150			-16.5	7.28	22.82	6.33	16.6		
175			-17.8	6.5	16.51	4.8	15.7		
200			-15	4.76	12.38	4.56	14.5		
225			-15	4.48	9.86	4.07	15.7		
250			-15	3.96	8.12	4.3	15.7		
275			-13.5	3.79	6.85	3.9	14		
300			-13	3.51	5.61	3.32	13		
3 lux max				330	410	327			
2 lux max									
1 lux max									

2010 Honda Fury low Beam Ground level									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-15	5.34	93.6	4.94	14.7		
50				3.07	13.19	3.68	12		
75			-14	5.9	4.41	6.76	14.5		
100				2.26	2.1	4.23	16.6		
125				1.6	1.31	2.59			
150				0.82	0.78	1.67			
175									
200									
225									
250									
275									
300									
3 lux max				94.91758	90.25974	118.1894			
2 lux max									
1 lux max									

2010 Honda Fury low Beam 3 Foot Measurement									
Distance	Distance lateral (ft)			Lux Measurement			Distance lateral (ft)		
longitudinal (ft)	1 lux	2 lux	3 lux	11ft(right)	Center	11ft(left)	3 lux	2 lux	1 lux
25			-16.8	12.85	48.1	12.44	16.5		
50			-19.8	9.87	31.6	11.02	21.3		
75			-20.5	7.89	16.38	7.4	22.3		
100			-17.1	6.75	8.29	6.8	19.4		
125			-17.2	4.6	4.53	4.24	16.8		
150				2.88	2.45	2.7			
175									
200									
225									
250									
275									
300									
3 lux max				148.2558	143.3894	145.1299			
2 lux max									
1 lux max									

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