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Electronic Head Lamp Glare Management System for Automobile Applications

Dr.Harish Harsurkar[1],Prof.Husain Shaikh[2], Rajkumar Malusare[3], Mahesh Mahangade[4]

[1]HOD Mechanical Engineering Vidya Prasarini Sabha's College of Engineering and Technology ,Lonavala

[2]Asst.Professor Mechanical Engineering Vidya Prasarini Sabha's College of Engineering and Technology ,Lonavala

[3]Student Mechanical Engineering Vidya Prasarini Sabha's College of Engineering and Technology ,Lonavala

[4]Student Mechanical Engineering Vidya Prasarini Sabha's College of Engineering and Technology ,Lonavala

Abstract-

Headlamp glare is an issue that has grown in terms of public awareness over the past decade.High beam of headlight of an on-coming car has blinding effect and decreases visibility during night driving dangerously. The drivers of most vehicles use high, bright beam while driving at night. This causes a discomfort to the person traveling from the opposite direction. He experiences a sudden glare for a short period of time. This is caused due to the high intense headlight beam from the other vehicle coming towards him from the opposite direction. We are expected to dim the headlight to avoid this glare. This glare causes a temporary blindness to a person resulting in road accidents during the night. This model concept eliminates the requirement of manual switch by the driver which is not done at all time. This concept very useful in the automobile field applications, which provides safety of driver during night driving. The construction, working, advantages & future scope of the system is discussed detail in this paper.

Keywords: Headlight, automatic, dimmer, control, high beam, low beam, Kelvin (K).

1. INTRODUCTION

1.1 System Introduction

Driving an automobile is primarily a visual task. By one estimate, as much as 90% of the information that drivers gather is received visually (Alexander,
G. and Lunenfeld, H. 1990), and whatever the actual percentage may be, the importance of the visual system to driving can not be doubted (Sivak, 1996). However, in order for the visual system to detect, attend to, and recognize information, there must be adequate lighting. Drivers require enough lighting at night to see a variety of objects on the highway, including traffic control devices, lane lines, vehicles, pedestrians, animals, and other potentially hazardous objects. However, too much light or improper lighting can result in glare, which can be a major problem both in terms of the abilityto see and visual comfort.

The requirement of headlight is very common during night travel. The same headlight which assists the driver for better vision during night travel is also responsible for many accidents thatare being caused. The driver has the control of the headlight which can be switched from high beam (bright) to low beam (dim). The headlight has to be adjusted according to the light requirement by the driver. During pitch black conditions where thereare no other sources of light, high beam is used to.On all other cases, low beam is preferred. But in a two-way traffic, there are vehicles plying on both sides of the road. So when the bright light from the headlight of a vehicle coming from the opposite direction falls on a person, it glares him for a certain amount of time. This causes disorientationto that driver. This discomfort will result in involuntary closing of the driver's eyes momentarily. This fraction of distraction is the prime cause of many road accidents. The prototype that is has been designed, reduces this problem by actually dimming down the bright headlight of our vehicle to low beam automatically when it senses a vehicle at close proximity approaching from the other direction. The entire working of the dimmer isa simple electronic circuitry arrangement which senses and switches the headlight according to the conditions required. Headlamp glare is an issue that has grown in terms of public awareness over thepast decade. Developments in light source technologies and optical design have resulted in headlamp systems with higher efficiency (and thus the ability to produce higher luminance). High beam of headlight of an on-coming car has blinding effect and decreases visibility dangerously. Glare occurs when visual field brightness is greater thanthe luminance to which the eyes are adapted. It canbe caused by direct and indirect light sources. Discomfort glare causes discomfort, annoyance,fatigue, and pain. Disability glare produces a reduction in the visibility distance of low contrast objects. The elderly, people with light-colored eyes, and those suffering from cataracts are especially sensitive to disability glare. Glare at night can be mitigated by design changes in roadways, automobiles, and vehicle lighting systems. Countermeasures work in four ways, by:

1) Reducing the intensity of the glare source;
2) Reducing the illumination reaching the driver's eyes;
3) Increasing the glare angle; and
Indirectly minimizing the effects of glare.

1.1.1 Headlight

Headlights should project sufficient light far in advance of the vehicle so that steering and braking can be taken in time, while not causing excessive glare to oncoming drivers. While driving,it is necessary to illuminate the rod ahead of the automobile so as to reveal objects ahead from a safe distance but improper lighting arrangements of the vehicles on road cause difficulty in driving at night. Bad driving habits and infrequent use of beam shifting/signals further enhances this problem andoften remains the main reason for road accidents at night. With the auto boom, which had brought alarge number of vehicles on to Indian rods? Theaccident rate has also risen alarmingly. "In about three lakh road accidents that occur every year, more than 70,000 persons are killed and 2.5 lakh injured. It is therefore, of paramount importance to drivers and other rod users of fine-tune their road sense" Driving an automobile is primarily a visual task. By one estimate, as much as 90% of the information that drivers gather is received visually (Alexander, G. and Lunenfeld, H. 1990), and whatever the actual percentage may be, the importance of the visual system to driving can notbe doubted (Sivak,1996). However, in order for the visual system to detect, attend to, and recognize information, there must be adequate lighting. Drivers require enough lighting at night to see a variety of objects on the highway, including traffic control devices.

1.1.2 Methods of lighting

There are only two practical methods of lighting the highway system at night: fixed overhead lighting and vehicle head lighting. While the fraction of roads with fixed overhead lighting increases significantly each year, this form of lighting is expensive and can not be relied upon as the only means of providing for night visibility. Head lighting, form its inception, has involved a compromise between providing sufficient lighting for drivers to see (with adequate preview time), and avoiding excessive light that might produce glare. These two goals have been translated into standards in the from of minimum requirements to providevisibility and maximum limitations to control glare. Progressive improvements in head lighting and new technologies have increased night visibility and reduced the impact of glare, but any changes should be carefully considered before implementation. Changes in headlamp designs that affect light intensity, beam pattern and aiming have significantly improved night vision on the highway. Along with improvements in headlight systems, glare resistant interior surfaces, glare reducing mirrors, and changes to the highway environment have either directly reduced glare or indirectly reduced the effect of glare on drivers.

1.2. Basic terms

The remainder of the introduction provides definitions of some basic terms used in the study of lighting and vision. The key terms to be definedare:

- Brightness
- Point light source
- Luminous intensity
- Luminance
- Illuminance
- Reflectance
- Glare

1.2.1 Brightness

Brightness is the attribute of visual sensation according to which an area appears to emit more or less light. Brightness is a relative term which describes the appearance of to an observer. An object of any brightness will appear brighter is the ambient light levels are lower. Brightness can range from very bright (brilliant) to very dim (dark). In popular usage, the term “brightness” implies higher light intensities, whereas “dimness” implies lower intensities

1.2.2 Point light source

Point light source is a light source that subtends an extremely small angle at the observer’s eye so that its attributes are not affected by its size, only by its luminous intensity. An example of a point light source is a star.

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1.2.4 Luminance

Luminance is the amount of luminous flux reflected or transmitted by a surface into a solid angle per unit of area perpendicular to givendirection. More simply, it is a physical measure ofthe amount of light reflected or emitted from a surface and roughly corresponds to the subjective impression of “brightness”. Luminance does not vary with distance. It may be computed by dividing the luminous intensity by the source area, or by multiplying iluminance and reflectance. The mostcommon units of measurement for luminance are candelas per square meter (cd/m2), foot- lamberts (fL), and mill lamberts (mL)

1.2.5 **Illuminance**

The illuminance or light level is the amount of light energy reaching a given point on a defined surface area, namely the luminous flux (i.e. lumens) per square meter. Illuminance is invisible! It is light passing through space and not seen unless you look at the source (e.g. a light bulb) or a surface it reflects off. In other words we can only see "luminance”

1.2.6 **Reflectance**

Reflectance is a measure of the reflected incident light (illuninance) that is actually reflected away from a surface. For many surfaces reflectance will depend on the angle of viewing and the angle from which it is illuminated, as well as the properties of the surface (including diffuseness or retro reflectivity of the surface).

1.2.7 **Glare**

2 Glare can be defined generally as a bright, steady, dazzling light or brilliant reflection that occurs when the luminous intensity or luminance within the visual field is greater than that to whichthe eyes are accustomed; glare can cause discomfort, annoyance, or loss in visual performance and visibility. Direct glare is caused by light sources in the field of view whereas reflected glare is caused by bright reflections from polished or glossy surfaces that are reflected toward an individual (for example, a chrome nameplate ona leading vehicle). The entire visual field contributes to the glare level, and event a completely uniform field, such as that in a photometric sphere, will produce some glare.

1.3. Concept of headlamp dipping

To see far enough ahead, the beam pattern of the headlight must have a high intensity directed just below the horizontal. To prevent glare to oncoming drivers. There needs to be a very low intensity n the direction just above the horizontal. "Headlight serves not only to light the road ahead but also to illuminate pedestrians, cyclists and rod signs mounted on the side of the road as well as overhead signs, indicating a need for a wide beam spread". All these requirements for safe and comfortable driving make the design of an optimum beam pattern a compromise, which should well balance. Optimum design has been based on two types of beam pattern:

- Low Beam (Meeting beam)
- High beam (driving beam)

The low beam is used where there is road lighting and on unlit roads when there are on- coming drivers. A high beam is much more intense and is projected further down the road and can be used only on rural roads and highways when thereis no oncoming traffic. Double filament bulb or bifocal bulbs are most extensively used and universally accepted to meet above requirement of driving and meeting beams. These bulbs have two filaments in which one filament is positioned in relation to the reflector to give the main forward beam, while the other filament gives the dipped beam the driver controls this system; either by a foot operated switch or by a switch mounted on the steering column. The present practice is to operate the dipswitch manually. The auto Dipping Device senses the opposite vehicles brith headlights and automatically makes our vehicles bright lights dip, but for a few seconds only; afterwards the device will make our lights to start flickering. This function will be repeated to all the vehicles coming in the opposite direction

Fig.1 Glare due to HID Head Lamp

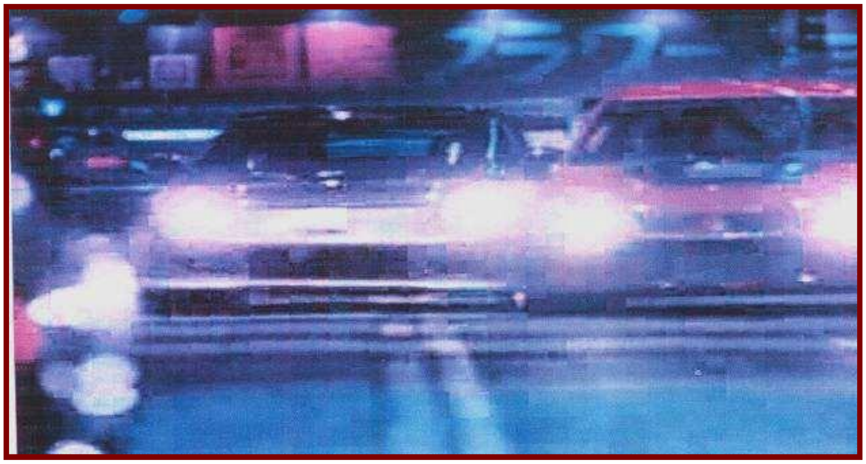

Fig.2. Glare due to HID Head Lamp

1.4. Problems associated with manual dipping

There are many reasons due to which manual dipping is not being done satisfactorily. One of the major reasons includes sheer physical strain involved in operation of the dipper switch hundreds of times every night. "The total for a single night will be 1000 if we consider 8 hours of traveling and one encounter every one-minute and could exceed this number if one travels on roads with dense traffic." The other reason includes a general tendency of paying more attention to steering control at the cost of dipping during a critical vehicle meeting situation especially in the case of heavy loaded vehicles.

Physiological and psychological state of a driver also affects the dipping practices. Working hours, economic issues and social factors influences the mindset of the driver. "Another major cause in 'ego problem', which makes each one wait till the other person initiates dipping, which may not happen"

1.5. Dipping practices in India

There has been a study carried out by "Road Research institute, New Delhi", which reveals the poor state of dipping affairs on the Indian roads. The observations and recommendations of the study group on road safety are as follows:

1.5.1 Night driving

"A frequent cause of accidents at night is the glare caused by oncoming vehicles which momentarily blinds the driver's vision. It takes three to eight seconds for a person with good eyesight to recover from the glare and during this time the vehicle will have covered a long distance in utter darkness and it will be sheer luck if it escapes an accident. A glare recovery test should be carried out to gauge the applicant's ability in this direction, followed by tests pertaining the color and night blindness" To avoid this, it is imperative that as the vehicles approach from opposite direction, the main beams should be switched OFF and the dipped beams used instead, so that the two vehicles can pass each other safely. Contrary to the above requirement, many of our heavy vehicle drivers are given to the practice of blinding oncoming vehicles drivers by using both the main and dipped beams of their headlights simultaneously, to gain on advantage over the oncoming driver".

1.5.2. Driving at night with main beam of headlight on

"This is one of the common failings of our drivers in night driving, specially on dark or badly lit roads in our cities and towns. Driving courtesy imposes a special responsibility on the driver, that the oncoming driver is not handicapped by the dazzle of headlights a high intensity directed just below the horizontal. To prevent glare to on-coming drivers, there needs to be a very low intensity in the direction just above the horizontal and to the right. The small difference in angular direction between the high intensity of the low-beam pattern down the road and the low intensity in the glare direction works only for well- aimed headlights on straight, flat roads. All these requirements for safe and comfortable driving make the design of an optimum beam pattern a finely-balanced compromise, which has not yet been achieved with any great success."

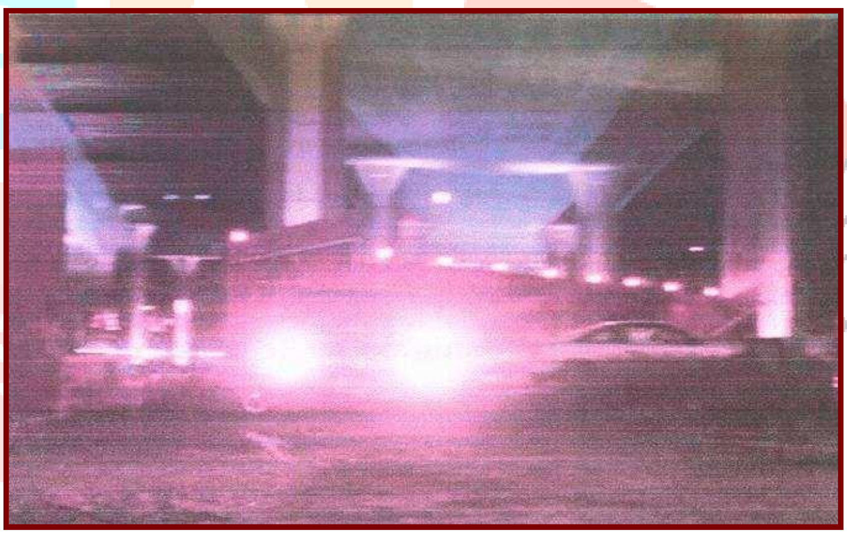

Fig.2 Headlamp at high beam intensity

2. EXPERIMENTAL SETUP

2.1. The Device

The headlamp glare management device is a safety accessory, which automatically shifts the headlights position according to the existing lighted atmosphere. The essential objective of the device is to promote nighttime road safety by minimizing glare. The device is intelligent enough to understand lit and dark roads and operates the headlamps accordingly. Headlamp glare management system can be fitted in any type of vehicle. This device has been successfully tested on actual road conditions. The system automatically avoids glaring form the opposite vehicles thus provides clearer and safer drive at night.

2.2. Double mode on/off function

First mode-allows the driver to operate dim/dip action mechanically and manually as usual. Second mode-enable the system to operate fully automatic and hence the driver can almost forget about thedim/dip action thus ensuring safe and pleasant travel. Auto Dipper keeps the head light in "High" beam if there is no vehicle from opposite direction. While crossing, first momentary dip is given by the vehicle fitted with the auto dipper automatically to "Low" beam and continues in the "Low" beam till the two vehicles cross each other.

2.3. Range tuner

The driver can select the tuner according to his convenience to activate the dim/dip action in terms of distance between the approaching vehicles. Presently the range of the device is 5 m to 50 m. however depending upon the conditions the range can be further increased upto about 500 m and can also be made variable

2.4. Description of the device

The size of the device is about 1 inch cube and can be fitted in any type of vehicle within half an hour only. Device can be installed any where near steering as per convenience so that "ON-OFF" switch on auto dipper box can be used easily. Sensor Eye is mounted near wiser position near the top edge of windscreen (inside the car) such that it receives the light of the approaching vehicle in proper position. Sensor eye can also the fitted inheadlamps itself. Sensor position can be adjusted slightly by bending the sensor support. The device gets activated only when headlights are in "on" position. The performance of the device is directly proportional to the intensity of light which falls on the sensor. If intensity that falls is high the response will be fast. For truck & buses, sensor eye can be placed on lower side of wind shield inside close to the right hand of driver and for car and jeep etc. the device can be operated with the exiting 12 volts battery of the vehicle.

Fig.3 Experimental setup for electronic headlamp glare management device.

2.5. Main component of device

Following are the main component of device:

1. Headlamps
2. Sensor (ORP 12)
3. Switch
4. Battery (12V)
5. Relay
6. rectifier circuit
7. I.C. (integrated circuit)
8. Capacitors & resistor
9. Diodes
10. Wires & clips

Two circuits are use to proper working of thedevice that is:

2.5.1. Headlamps

A headlamp is a lamp attached to the front of a vehicle to light the road ahead. Headlight is a synonym for headlamp. Headlamp performance has steadily improved throughout the automobile age,

2.5.2. Sensor

Sensor is a device which is us to sense the different type of action like light, temperature, air, motion etc. the sensor sense the condition by own natural property like voltage resistance etc. for example is we have to sense light then we use a resistance. After sensing it sends the information or signal inthe form of voltage or temperature. In this experiential device we used LDR (light dependent resistor) sensor description of this sensor given below:

2.5.2.1 Working of LDR sensor

An LDR is a component that has a resistance that changes with the light intensity that falls upon it. They have a resistance that falls with an increase in the light intensity falling upon the device.
Applications of LDR Sensor: There are manyapplications for Light Dependent Resistors. Theseinclude.

- Lighting switch: The most obviousapplication for an LDR is to automatically spurred by the great disparity between daytime and nighttime traffic fatalities: the US National Highway Traffic Safety Administration states that nearly half of all traffic-related fatalities occur in the dark, despite only 25% of traffic traveling during darkness
- turn on a light at certain light level. An example of this could be a street light.Camera shutter control: LDRs can be used to control the shutter speed on a camera. The LDR would be used the measure the light intensity and the set the camera shutter speed to the appropriate level The resistance of an LDR may typically have the following resistances. Daylight = 5000 ohms, Dark= 2000000 Ohms

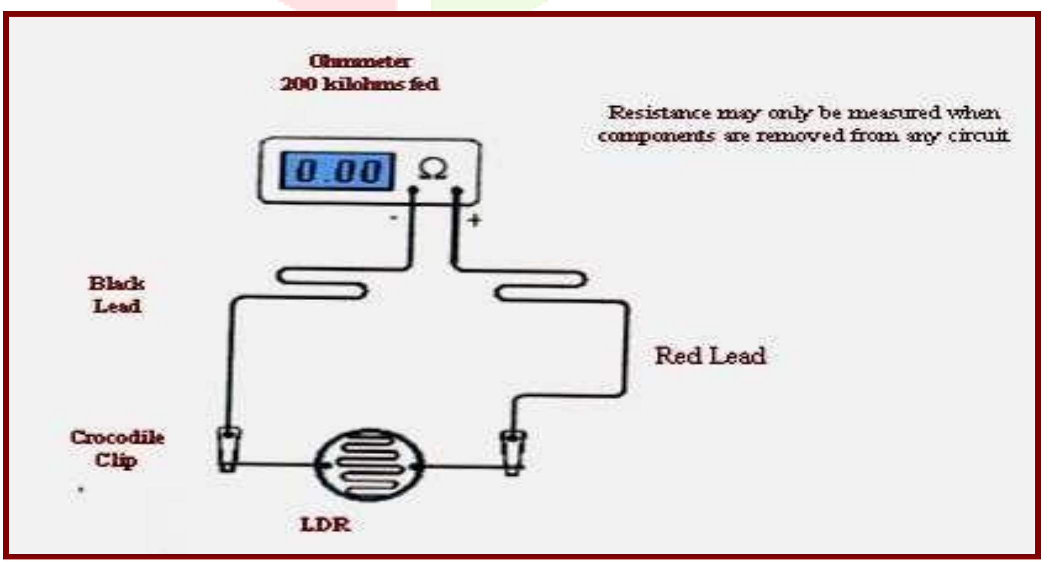

Fig.4 LDR Sensor

2.6. Block Diagram Of The Device

The block diagram of the headlamp glaremanagement device is shown below. The device is composed of a sensor, and electronic control unit, switch and a battery of 12V. The sensor of the device sensor the light of the oncoming vehicle and the electronic unit dips the headlamp of the devicefitted vehicle

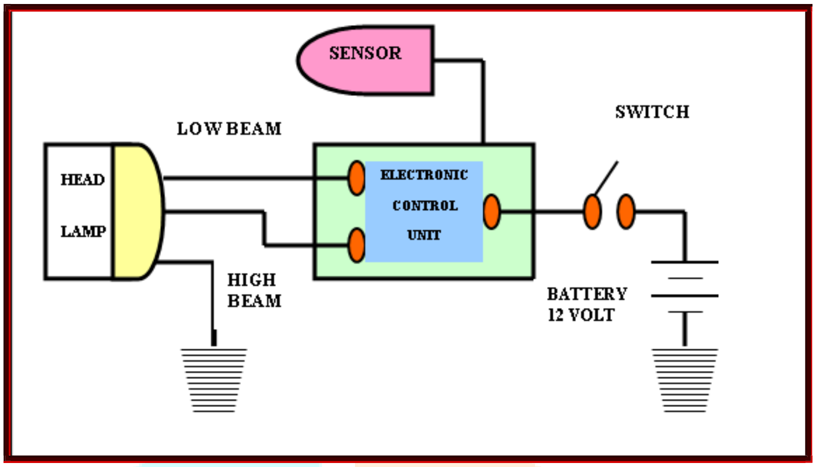

Fig. 5 Schematic Diagram of Electronic head lamp glare management System

3. RESULTS

Sensing the opposite vehicles bright head lights automatically our vehicles bright lights DIP- but for few seconds only. Immediately after the crossing of the opposite vehicles the lights will come to bright position automatically, this function will berepeated to all the vehicles coming in the opposite direction. Dipping will result in smooth and happy driving pleasure for drivers and negligible risk of accidents

Those vehicles fitted with device are almost out of the risk of accidents, because by giving signal our vehicles for clear road negations.

In the present system the driver required to control the steering with his one hand and the other hand is required to operate the DIM/DIPPER switch to make the head to totally eliminated by providingthe vehicle with our device which will give the driver a very happy and pleasant experience of driving and total safety to the vehicles and to the traveling passengers.

4. CONCLUSIONS

Headlamp glare is an issue that has grown in terms of public awareness over the past decade. High beam of headlight of an on-coming car has blinding effect and decreases visibility dangerously. With the auto boom, the ability to see and visual comfort lighting can result in glare, which can be a major problem both in terms in accident rate has also risen alarmingly. However too much light or improper lighting can result in glare, which can be a major problem both in terms of the ability to see and visual comfort.

Glare occurs when visual field brightness is greater than the luminance to which the eyes are adapted. Glare is caused by both direct and indirect light sources. Discomfort glare produces loss in visual discomfort, annoyance, and fatigue. Disability glare produces loss in visual performance which is generally defined as a reduction in the visibility distance of low contrast objects. The elderly, people with light-colored eyes and those suffering from cataracts are especially sensitive to disability glare. Glare at night can be mitigated by prudent design of the roadway, the automobile, and vehicle lighting systems.

The extent to which glare is a problem for night driving is not easily quantified. In the absence of official statistics or scientific data, evidence of a glare problem is based almost entirely upon subjective reports, most of which are anecdotal without data from well-designed experiments, we can only qualitatively assess the deleterious effects of glare, and the economic and safety consequences are left unknown. While there is little doubt that the number of drivers complaining about glare is increasing, the age of the driving population is also increasing. Without good data there is no way of knowing whether the drivers having problems with glare are those with the most exposure to glare situations (such as high volume two-lane roads), or whether they are older drivers that have visual problems even in the absence of glare, if drivershave basic problems with night vision, solving their problems with glare may increase their risk by giving them a false sense of security and encouraging them to drive more at night.

In terms of glare, the discomfort glare, the SPD.Factors such as light source size, driver age, visual condition (within reasonable limits) and expectations seem to be mush smaller effects, and more open to influence by other factors of the environment.

REFERENCES

1. Alexander, G. J.; Lunenfeld, H. (1990): A user's guide to positive guidance, third ed." Report No.FHWA-SA-90-017, U.S.Department of Transportation, Federal Highway Administration, Washington, DC, pp. 1–39.
2. Bulloth, J.D.; Fu Z, Van Derloske J. (2002):Discomfort and disability glare from halogen and HID Headlamps system, Society of Automotive Engineers world congress, Detroit, MI: society of automotive engineers.
3. Gupta, K.M. : Automobile Engineering (Umesh Publications)
4. Muralikrishnan, R. (2014): automatic headlight dimmer a prototype for vehicles", International Journal of

Research in Engineering and Technology, 3, 02, pp.85-90.

5. Report “Glare from head lamps and other front mounted lamps department of transportation national highway traffic safety administration us”
6. Report “Light pollution information”, astronomical society of greater Hortfort.
7. Report “The concept of auto dipping”. Kakatiya Electronic Private Limited, INDIA.
8. Report “The quest for travel”. Delhi Traffic Police, INDIA.
9. RobertL Boylested & Loues Nashelsky :Electronic device & circuit system”, by (prentice-Hll of India private Limited).
10. Sivak, M.; Simmons, C. J.; & Flannagan, M. (1990): Effect of headlamp area on discomfort glare, Lighting Research Technology, 22, pp.49–52.