How does headlamp glare affect driving performance?

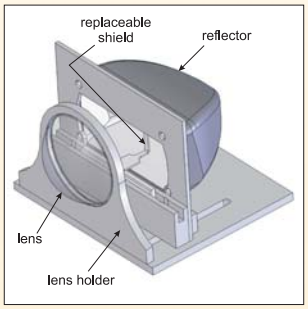
Working with the National Highway Traffic Safety Administration (NHTSA), the LRC completed a series of studies to ascertain the impacts of headlamp glare on visibility, driving performance and safety, and to evaluate an approach to intelligent forward lighting systems with the potential to adapt to the environment and to the presence of nearby drivers.

Does headlamp glare increase crash risk?

The LRC conducted a naturalistic driving study to assess whether drivers engage in certain behaviors in locations with increased historical crash risk. Drivers were found to increase head movements and vary their speed in riskier locations. Many drivers responded similarly when exposed to oncoming headlamp illumination, suggesting a link between headlamp glare and crash risk.

What factors influence glare?

Through computer simulation the LRC studied the effects of changes in lamp type (halogen versus high-intensity discharge [HID]), mounting height, optical type and vertical aim on visibility and glare. Aim was found to be the most influential factor. This was reinforced by real-world measurements of more than 100 vehicles at a roadway intersection in Watervliet, N.Y. Very high mounting heights (greater than 1 meter from the ground) also increase glare significantly to other drivers.



AFS prototype developed by LRC.

How many vehicles have misaimed headlamps?

Using a modified portable headlamp aim setting device, the LRC measured the aim status of headlamps on more than 100 vehicles including some brand new ones. About two-thirds of in-use vehicles had at least one headlamp aimed improperly; nearly one-third of new cars had one or more misaimed headlamps.

LRC researcher adjusts headlamp aim measurement equipment.

What could be done to mitigate glare?

Regular adjustment of headlamp aim would make visibility and glare conditions more consistent for the driving public. Restricting headlamp height to 1 meter would reduce discomfort glare to oncoming drivers. An LRC-developed advanced forward-lighting system (AFS) prototype that provides a “prime beam” similar to the output of a high beam, with the ability to reduce intensity in a small angular region toward nearby drivers’ eyes, has promise for maximizing visibility while minimizing glare.

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