

December 19, 2022

BY EMAIL

David Harkey, President
Insurance Institute for Highway Safety
dharkey@iihs.org

Re: LED Vehicle Headlights

Dear David Harkey,

The Soft Lights Foundation wrote to you on January 23, 2022, about the failure of IIHS to keep the insurance industry informed about the risks of LED vehicle headlights. To date, we have seen no indication that IIHS has alerted its member groups that LED vehicle headlights are unsafe and do not comply with federal safety standards. Therefore, we are writing to IIHS again.

LEDs emit visible radiation from a flat surface, creating a directed beam of spatially non-uniform energy that has very little dispersion over distance. This type of light is entirely unacceptable for use as a vehicle headlight, where the light should disperse safely over distance following an inverse square law and provide uniform illumination of the roadway. NHTSA standard FMVSS-108 has many built-in assumptions about requirements of a vehicle headlight, and one of those built-in assumptions is that the light disperses following an inverse square law. LED headlights emit a dense beam of light of approximately 70,000,000+ nits, which does not disperse following an inverse square law, and thus does not comply with FMVSS-108.

Despite these facts, NHTSA rejected our petition to hold the automakers accountable for their non-compliant LED headlights. NHTSA wrote, *“NHTSA disagrees. FMVSS No. 108 is not limited to “spherical/point light sources.” Specifically, regardless of the light sources used in headlamps, headlamps all have an area from which they emit light and they all emit different intensities of light in different directions. A key to understanding this topic is that the integral beam photometry requirements are for the lamp, not the light source.”* – This response, stating that the spatial properties of the light source are irrelevant, is invalid. A laser beam or directed-energy LED beam are not light sources that are safe and are not supported by FMVSS-108. The only reason for NHTSA to make this statement is provide cover for the auto industry’s use of LED headlights.

IIHS, on the other hand, has a different role to play than NHTSA. The IIHS member organizations are insurance companies who do not want to be paying out billions of dollars in insurance claims. The IIHS member organizations need vehicle headlights to be safe, but LED headlights are unsafe, creating dangerous blinding glare and likely long-term eye damage. The IIHS has a duty to inform its member companies that LED vehicle headlights do not comply with the Motor Vehicle Safety Act of 1966 and do

not comply with NHTSA FMVSS-108 because LED visible radiation does not disperse following an inverse square law.

In our understanding, IIHS continues to use invalid metrics and measurement devices for LED vehicle headlights. LEDs emit light from a flat surface. The metric for measuring light from a flat surface is luminance, not luminous intensity. The LED display industry understands this and advertises the peak luminance of their LED televisions in nits. For example, an LED TV may be advertised with a brightness of 300 nits.

Figure 1 is a table published by Hella, an LED headlight vendor. It is fundamental to note that the table uses luminance, not luminous intensity. As of 2013, Hella’s LED headlights had reached peak luminance of 70,000,000 candela/m², as shown in the table.

3 LED HEADLIGHTS ADVANTAGES: COMPARISON

LEDs are superior in several aspects. They might be more expensive to purchase than normal light bulbs or halogen bulbs, but their use pays for itself in a short time. The automotive industry in particular uses the positive features of the LED and employs it increasingly in new vehicles due to the following advantages:

Light Source	Luminous flux [lm]	Efficiency [lm/W]	Colour temperature [K]	Luminance [Mcd/m ²]
Conventional bulb W5W	~ 50	~ 8	~ 2700	~ 5
Halogen bulb H7	~ 1100	~ 25	~ 3200	~ 30
Gas discharge D2S	~ 3200	~ 90	~ 4000	~ 90
LED 2.5 Watts	~ 120 (2010) ~ 175 (2013)	~ 50 (2010) ~ 70 (2013)	~ 6500	~ 45 (2010) ~ 70 (2013)

Figure 1 - Headlight Luminance¹

Since **LED radiation does not disperse over distance**, then all 70,000,000 candelas will fall onto a 1 square meter surface at the 100-foot measurement distance. $70,000,000 \text{ candela/m}^2 \times 1 \text{ m}^2 = 70,000,000 \text{ candela}$, exceeding the limit of 20,000 candela specified in FMVSS-108 Table XIX. IIHS is failing to measure the peak luminance of LED headlights and incorrectly concluding that LED headlights meet FMVSS-108 Table XIX standards because IIHS is using the wrong measurement tools for flat surface directed energy beams.

Shown below are the warning labels for several LED products, alerting the operator that LEDs can cause momentary blindness, eye damage, and vision loss, even at a distance. Notice the parenthetical “not even from a distance” in the Ryobi warning. This is because the light emitted by a flat surface emitter does not follow an inverse square law for dispersion.

¹ Hella - <https://www.hella.com/techworld/us/Technical/Automotive-lighting/LED-headlights-833/>

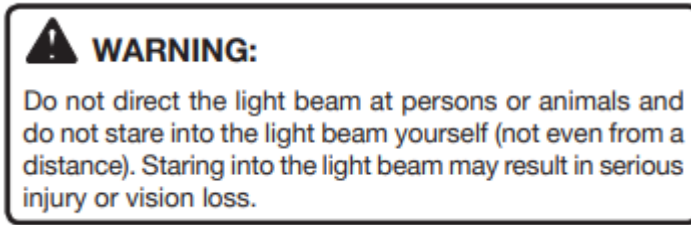


Figure 2 - Ryobi LED Warning

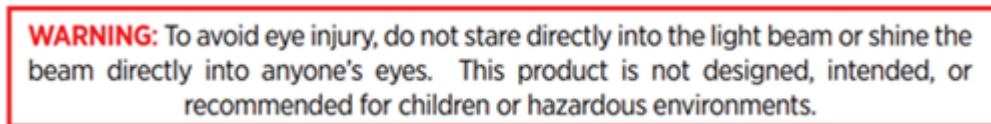


Figure 3 - GearLight LED Warning



Figure 4 - Whelen Engineering LED Warning²

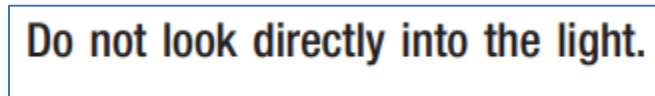


Figure 5 - Feit Electric LED Warning³

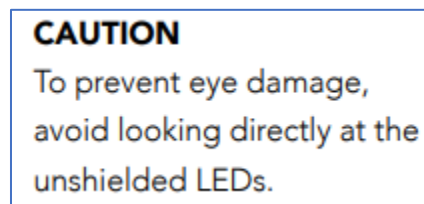


Figure 6 - Hydrobuilder LED Warning⁴

² <https://www.whelen.com/wp-content/uploads/2020/08/14555.pdf>

³ https://www.feit.com/wp-content/uploads/2019/09/LEDR56FP_927_MANUAL.pdf

⁴ <https://hydrobuilder.com/media/pdf/instructions/ROI-E720-user-manual.pdf>

- Avoid direct eye exposure to the light source while it is on.

Figure 7 - Acuity Brands LED⁵

According to these warning labels, LED light should not be shined directly into the eyes, and yet this scenario is exactly the situation with LED headlights on vehicles. LED headlights are not safe for our eyes. There is long term and cumulative damage occurring from exposure to the high blue content, extremely dense visible radiation emitted by LED headlights.

These videos show the blinding glare of LED headlights.

1. <https://youtu.be/sQHpkG7UhA>
2. https://www.reddit.com/r/IdiotsInCars/comments/zbtt4k/i_couldnt_see_anything_except_bright_headlights/
3. https://external-preview.redd.it/MLCYAdoPptm_uSaKv2ZkGDzjnbM4-zfXukD95R5eKN4.gif?format=mp4&s=ff06a307bae58774ef0ecc5e23bcce9e95cdf702
4. <https://www.reddit.com/r/fuckyourheadlights/>

Figure 8 is an example of LED headlight glare.



Figure 8 - LED Headlights

⁵ https://img.acuitybrands.com/public-assets/catalog/753016/epanl-instruction-sheet.pdf?abl_version=12%2f06%2f2021+12:23:30&DOC_Type=Installation_Instruction_Sheets

The following are a sampling of the comments from the change.org petition⁶ that has nearly 35,000 signatures demanding that NHTSA ban blinding LED headlights.



Viviana Martinez

44 minutes ago

I can't see when there's a car with bright headlights behind me. There's no way to get away from the light and it's super dangerous to guess at where you're going when you're driving.



Liana Fan

1 day ago

It is terrifying to drive at night with these blinding lights. It is such a danger



Lori Connell

1 day ago

I almost cannot drive at night now- it's so disorienting. I can't concentrate on driving safely when oncoming lights hit me in the eye- I'm blinded. And the ones coming up from the rear give a triple blinding effect in rearview and side mounts all at once. It completely alters depth perception.



Makaila Carpenter

2 days ago

I have an astigmatism and these LED headlights make driving dangerous and nearly impossible.



linda kelly

3 days ago

Lights blind other drivers and cause deaths and accidents



Tina Dougherty

3 days ago

I totally agree with this petition. I don't like driving at night for this reason! It is so dangerous for these lights to be used as headlights.

⁶ <https://www.change.org/p/u-s-dot-ban-blinding-headlights-and-save-lives>



Ruth MacGabhann

3 days ago

These lights are blinding and make driving in the dark very difficult!



Vanessa Herrera

4 days ago

I have to pull over every time someone with led headlights comes towards me. If I look at their lights. I'm blinded for several minutes



wilmot Price

6 days ago

I have been blinded by these kinds of lights many times.



Louise Dell

1 week ago

I have been blinded far too many times by these lights and have had many near misses! In the dark they dazzle you, and then you can't see properly for minutes after



Christen Croft

3 weeks ago

I wholeheartedly agree. It's dangerous! When they are coming toward me in a narrow dark road at night, some headlights are so blinding and I have to hope for the best until the other vehicle passes. When they are directly behind me, I have to fold my rearview mirror up (which is dangerous in and of itself, but still less so than not doing it) so that I can see on front of me and that only helps so much, since the glare from them are still blinding me from my sideview mirror. I don't understand why this has been allowed to become such an issue, in the first place. I hope this will save some lives.



ryan hansmann

3 weeks ago

I am a professional driver and the harsh white light makes working dangerous and hard to see while driving at night.



Kenneth Moya

4 weeks ago

We're in Southern California where there's streetlights every 15 feet. You don't need these here, and we NEED to be able to see in front of us instead of using both hands to block the rear and side view mirrors when you're behind us.



Jenny Isadore

4 weeks ago

LED head lights are blinding and very dangerous. Especially at night in the rain when you can't see the lines on the road or anything in front of you because you're blinded by LED head lights.

IIHS has not addressed these complaints from the public. IIHS has a duty to notify its member companies that LED headlights are dangerous so that the risk managers at the insurance companies can plan accordingly. It is negligent for IIHS to simply ignore these issues and not keep its member companies informed.

The Food and Drug Administration is the agency that is responsible for publishing comfort, health, and safety regulations for electromagnetic radiation from electronic products. The FDA has not yet vetted LEDs for comfort, health, or safety, and has not authorized the use of any LED products. The Soft Lights Foundation has petitioned the FDA to regulate LED products:

<https://www.regulations.gov/document/FDA-2022-P-1151-0001>

IIHS has a duty to abandon its current measurement techniques that are invalidly being used to measure LED headlights. IIHS has a duty to inform its member companies that the visible radiation from LED headlights does not disperse following an inverse square law and is thus unsafe and not compliant with federal safety regulations. IIHS has a duty to publicly state that LED headlights are creating unsafe, dangerous, and discriminatory conditions.

Sincerely,

Mark Baker
President

Soft Lights Foundation

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