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December 1, 2021

**BY EMAIL**

Scott Marler, Director  
Iowa Department of Transportation  
scott.marler@iowadot.us

**Re: Spatially Anisotropic Visible-Radiation Devices**

Dear Scott Marler,

We wish to alert the Iowa Department of Transportation to the dangers and liability issues related to the use of LED radiation devices such as LED headlights on commercial trucks.

The use of headlights is regulated by NHTSA federal standard FMVSS-108. Headlights can be divided into OEM and aftermarket categories. We have received a letter from NHTSA stating that NHTSA has never approved LED headlights for use in the aftermarket. Therefore, all LED aftermarket headlights are illegal.

Figure 1 shows a truck with an Iowa license plate and LED headlights. The reason that we know that the headlights are LED without using any special equipment is because the photo shows the individual LED elements.



Figure 1 - LED Headlights on Truck

For OEM LED headlights, NHTSA has not yet released a formal letter, but we can conclude that OEM LED headlights are also illegal because NHTSA has not approved the type of non-uniform radiation that is emitted by LED headlights, and LED headlights exceed the maximum limit for luminous intensity, when measured with proper equipment.

Figure 2 is a diagram that shows that *light* is spatially isotropic radiation in the human visible portion of the electromagnetic spectrum and that the radiation emitted by LEDs, while visible, is not *light* as defined in standard regulations which imply spatially isotropic radiation.

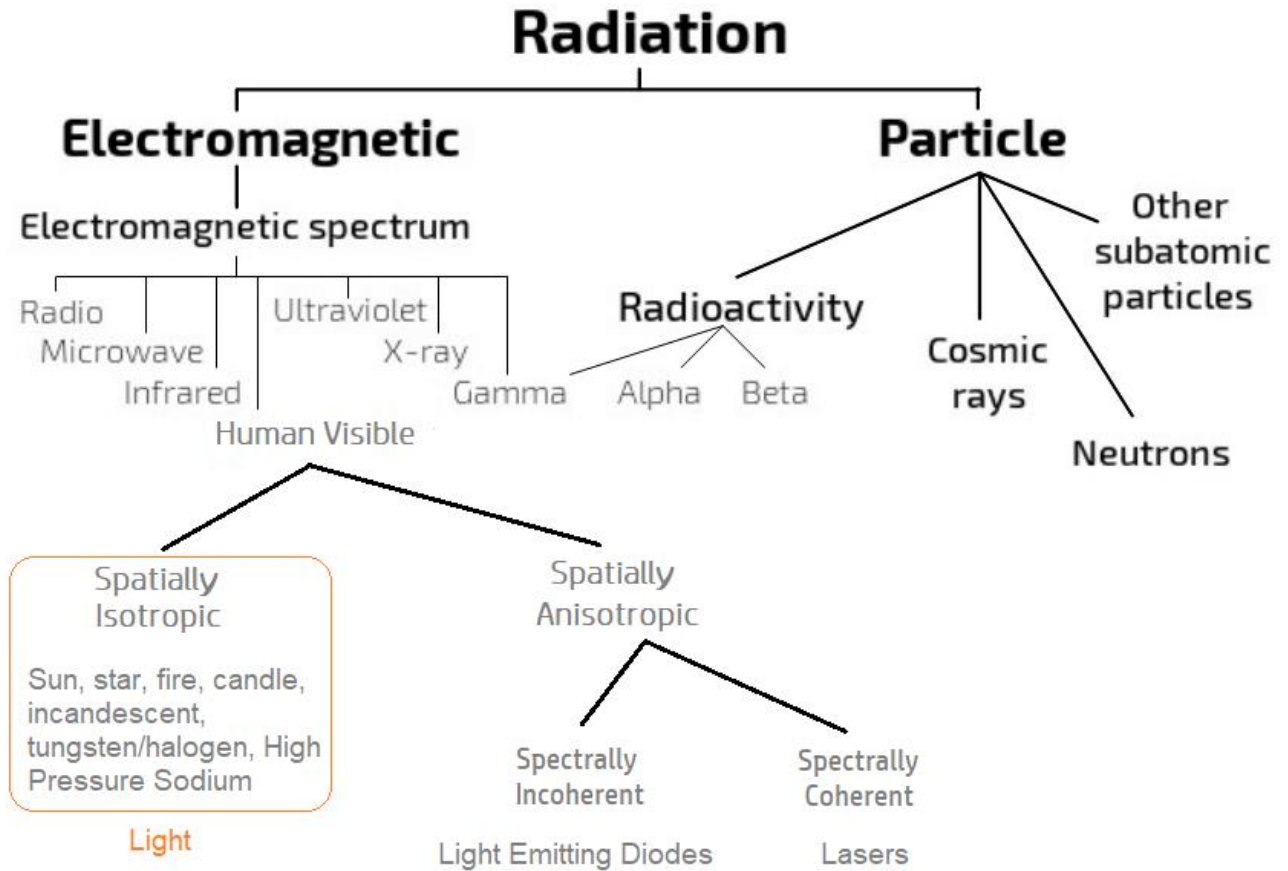


Figure 2 - Radiation

Figure 3 is a photo from an article that quoted the Texas Department of Insurance.<sup>1</sup> The photo shows typical headlights on the left side of the photo, and the dangerous blinding glare from LED headlights on the right side of the photo. As quoted in the article, TDI states, “During the brief time your eyes are making these adjustments, your vision is impaired.” Notice the yellow color of the truck headlights, versus the white/blue color of the LED headlights.

<sup>1</sup> <https://www.safetyandhealthmagazine.com/articles/21964-driving-in-the-dark-avoid-night-blindness>



Figure 3 - LED Headlights

To our knowledge, there are no ocular exposure standards for LEDs. In his 2009 presentation, Senior Engineer Michael Shulman of Underwriters Laboratories wrote, "Currently, neither the U.S. nor Canada have mandatory standards or regulations for ocular exposure to LEDs emitting incoherent visible light."<sup>2</sup> In the research article, titled Light Emitting Diode Induced Retinal Damage<sup>3</sup> the authors state, "*Excessive LED light exposure presents a potential hazard to retinal function.*" In other research, those in Risk Group 3 (those with epilepsy, autism, migraines, photophobia, etc.) are often purposely ignored during the research, invalidating results that might have shown that LEDs are safe.

The federal Americans with Disabilities Act prohibits discrimination. Since LED radiation interferes with major life functions such as seeing, thinking, and concentrating for people with disabilities, such as those with epilepsy, autism, PTSD, migraines, bipolar disorder and others, LED radiation is discriminatory. The US Access Board has not yet developed guidelines for spatially anisotropic radiation from LEDs. Since LED radiation prevents safe access to public services such as roads, sidewalks and government facilities, LED radiation is discriminatory.

As an example of how dangerous LED radiation is, consider this warning shown in Figure 4 from the company Gear Light. LED chip makers exceeded 100,000,000 nits of peak luminance as of 2018.<sup>4</sup>

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<sup>2</sup> [http://www.softlights.org/wp-content/uploads/2021/10/MichaelShulman\\_LEDFireElectricalSafety.pdf](http://www.softlights.org/wp-content/uploads/2021/10/MichaelShulman_LEDFireElectricalSafety.pdf)

<sup>3</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5313540/>

<sup>4</sup> [focusworld.com/test-measurement/research/article/16555223/nonlaser-light-sources-highluminance-leds-target-emerging-automotive-lighting-applications](http://focusworld.com/test-measurement/research/article/16555223/nonlaser-light-sources-highluminance-leds-target-emerging-automotive-lighting-applications)

**WARNING:** To avoid eye injury, do not stare directly into the light beam or shine the beam directly into anyone's eyes. This product is not designed, intended, or recommended for children or hazardous environments.



Figure 4 - LED Flashlight

Iowa DOT is not currently enforcing the laws prohibiting LED headlights. The purpose of this letter is to inform Iowa DOT of the liability issues of failing to enforce, and to alert Iowa DOT to the dangers that all drivers and pedestrians are exposed to from the high-glare, high luminance LED radiation. We have received notice from the Federal Motor Carrier Safety Administration that Iowa DOT does not need any authorization from FMCSA to begin enforcement.

Our first request is that Iowa DOT implement the inspection of LED truck headlights at Iowa DOT inspection stations. A visual inspection is all that is necessary to determine if the truck headlight is LED or not. A second method could also be used where a light meter is used to check color temperature. While the results of a light meter designed for spatially isotropic radiation will not produce accurate results, the displayed color temperature will be an indicator of LED radiation. Anything registering 4000 Kelvin or higher will most likely be LED.

Our second request is that Iowa DOT implement a citizen reporting system. As shown in Figure 1, a citizen can take a photo of the headlights and license plate of a vehicle and submit the photo to Iowa DOT for enforcement.

Sincerely,

*Mark Baker*

Mark Baker  
President

Soft Lights Foundation

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