Soft Lights Foundation

9450 SW Gemini Drive
PMB 44671
Beaverton, OR 97008

January 12, 2022

BY EMAIL

Margaret Pittelkow, Vice President
American Automobile Association
mpittelkow@national.aaa.com

Re: Toxic, Hazardous, Discriminatory, and Illegal LED Headlights

Dear Margaret Pittelkow,

The National Highway Transportation Safety Administration has never approved spatially anisotropic visible radiation from a flat surface for use as a vehicle headlight, Daytime Running Light, taillight or flashing light. For aftermarket headlights, NHTSA has released a letter confirming that NHTSA has never approved any aftermarket LED headlights[1] Therefore, all LED light beams in use on vehicles are illegal and this creates a significant liability issue for the American Automobile Association.

Figure 1 is a photo taken in October, 2021 of a vehicle with LED headlights. This photo is representative of the glare and danger presented by LED headlights.

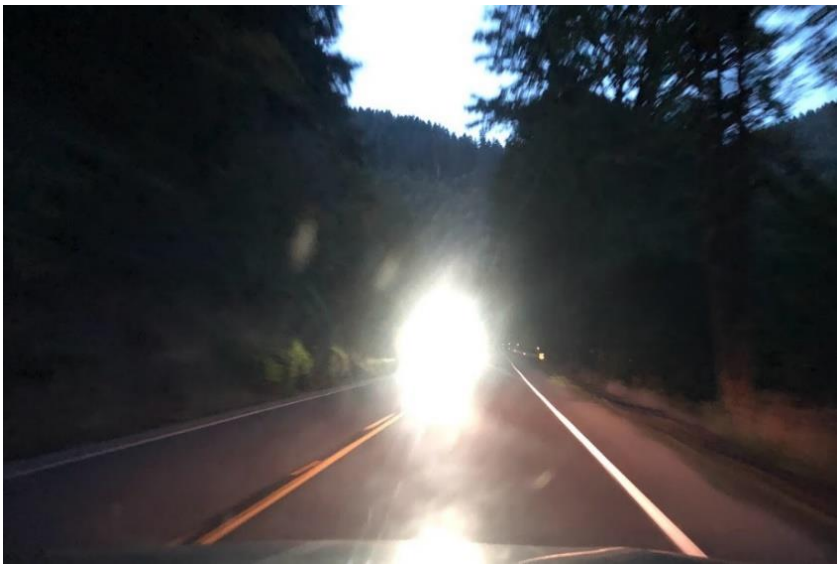

Figure 1 - LED Headlights

[1] http://www.softlights.org/wp-content/uploads/2021/12/Leroy-Angeles.pdf

Figure 2 shows an older model truck with aftermarket LED replacement headlights. We know that the headlights are LED because we can see the diodes in the photo.

Figure 2 - Illegal Aftermarket LED Headlights

Light Emitting Diodes produce light beams, rather than spatially uniform light. The result of the emission from the flat surface of an LED chip is an exceedingly intense beam from the middle of the chip that exceeds human tolerance levels and is toxic, hazardous, and discriminatory. This spatially non-uniform electromagnetic radiation from LEDs is unregulated and not approved by the government.

The left side of Figure 3 shows a spherical emitter that sends light in all directions in space. Because of the curvature of the emitter, the light rays do not overlap, and the radiation is spatially, spectrally, and temporally uniform. Every single point on the sphere is the same as any other point. On the other hand, the right side of Figure 3 shows a flat surface emitter such as an LED, which has a middle and edges. This flat surface creates a situation where the middle of the chip has different energy than the edges of the chip. LEDs send light only in the forward direction and the light rays are confined to an 'escape angle' which is determined by the physical characteristics of the chip. Thus, there are overlapping rays, with the most overlap being in the center of the chip, and the least overlap being on the edges. The result is that every point in space has different spatial, spectral, and temporal properties.

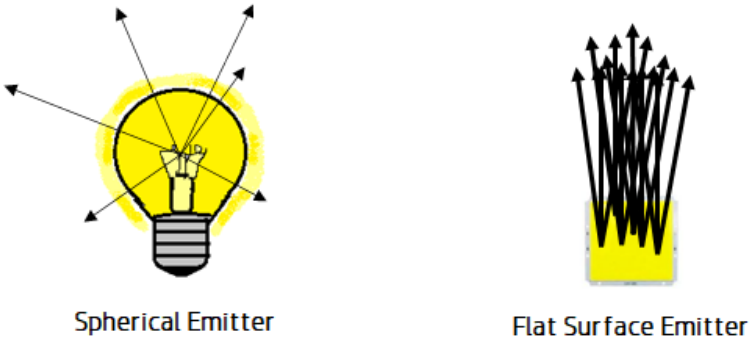

Figure 3 - Spherical vs. Flat Surface Emitter

Figure 4 shows the uniform spatial energy from candles, incandescent and High-Pressure Sodium versus the non-uniform spatial energy from an LED. The intense peak of energy will cause eye damage and will overload the nerve signals to the brain because the information is not uniform.

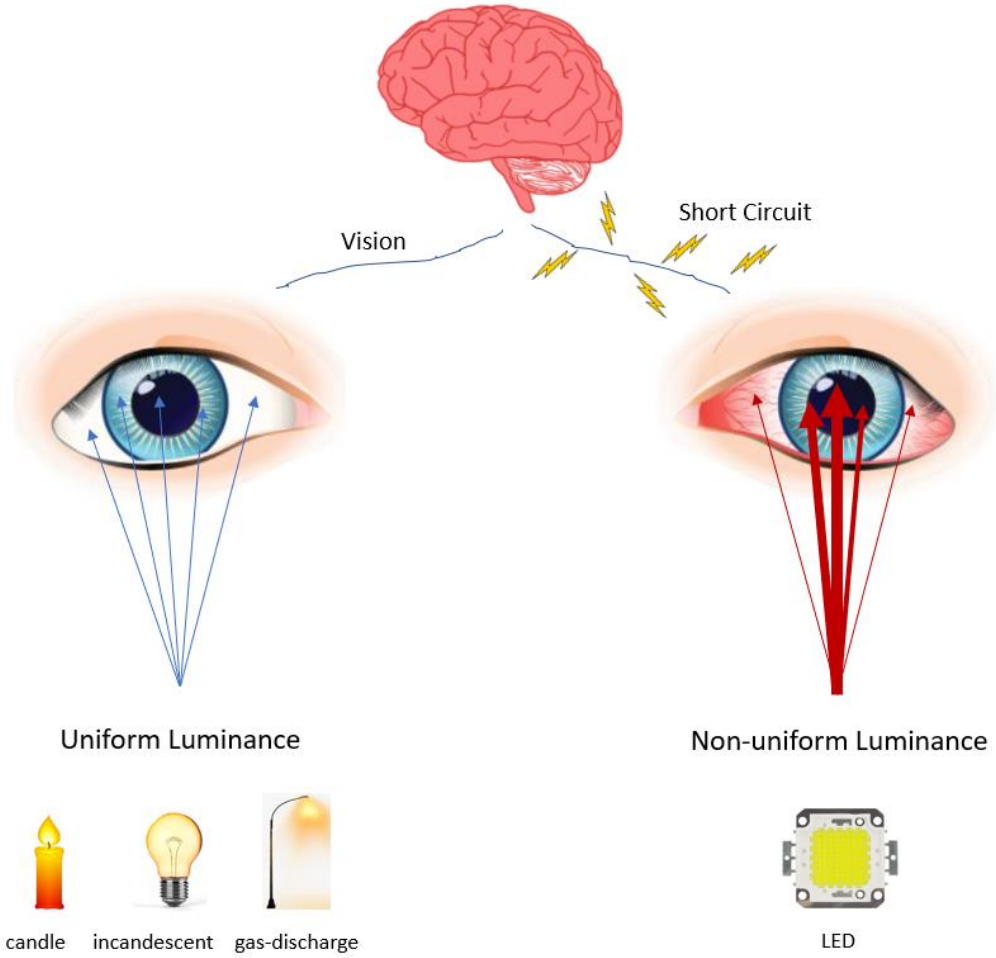

Figure 4 - Spatially Uniform v. Non-Uniform Radiation

Figure 5 is a diagram showing the categorization of radiation and shows that *light* and *illumination* are spatially isotropic radiation in the human visible portion of the electromagnetic spectrum. Radiation emitted by LEDs do meet the regulatory meaning of or comply with standards for the use of light as illumination.

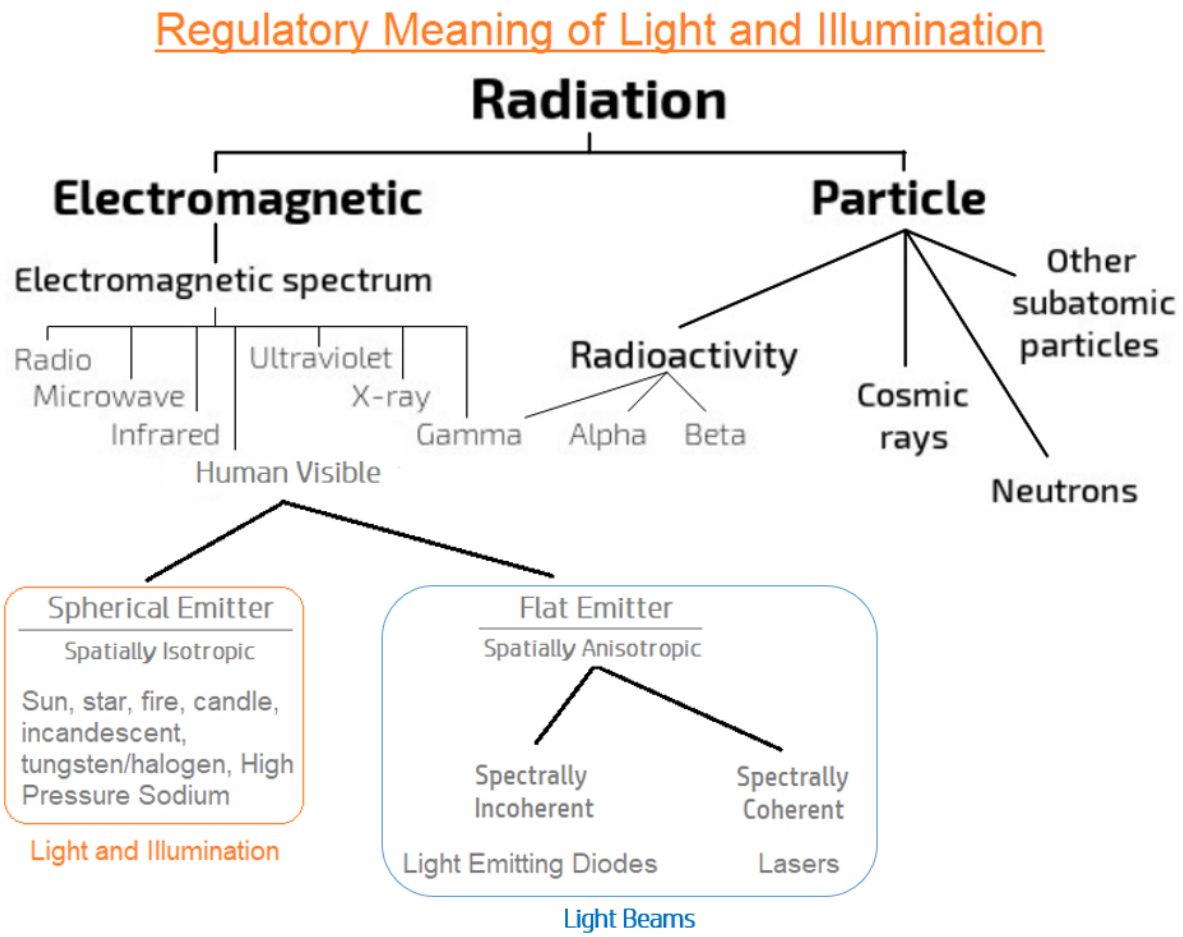

Figure 5 - Radiation Types

As an example of how dangerous LED radiation is, the operator's manual for the Ryobi P705 Flashlight includes the following: "*WARNING: Do not direct the light beam at persons or animals and do not stare into the beam yourself (not even from a distance) Staring into the light beam may result in serious injury or vision loss.*" The warning also refers to children, who along with infants are an identified high-risk population vulnerable to LED-exposure harm. Babies often lack an adult's automatic, self-protective aversion response to bright or intense light, and will stare directly at the source.

WARNING:

Do not direct the light beam at persons or animals and do not stare into the light beam yourself (not even from a distance). Staring into the light beam may result in serious injury or vision loss.

LED flashing lights turn on and off instantly and have a dangerous peak radiance. The non-uniform and intense peak radiance triggers seizures, causes migraines, interferes with human nerve functioning, reduces vision, increases agitation, and endangers the lives of the public.

Figure 6 is a diagram showing why the spatial distribution of LED radiation is so toxic and dangerous. The peak luminance of an LED can be hundreds of thousands or even hundreds of millions of nits, far exceeding human thresholds, and the non-uniform shape interferes with the human nervous system.

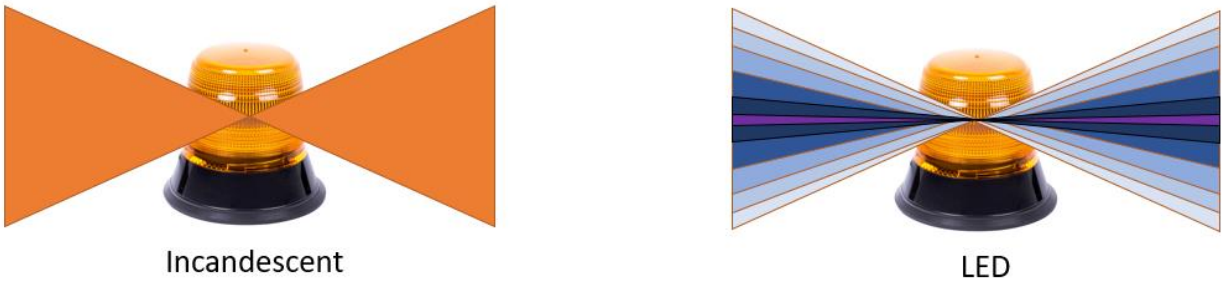

Figure 6 - Incandescent vs. LED Flashing Lights

The video example below shows how incandescent hazard lights work. They give a slow, general, soft warning and let people know that the vehicle is in an unusual situation without detracting from the task of driving or walking.

Non-LED Hazard Lights: https://youtu.be/DHJZTb7qXQo

Figure 7 - Non-LED Hazard Lights

The video below shows the misuse of technology, where flashing LED light beams do not carefully warn, but rather assault people, violating their civil rights, damaging their eyes, interfering with the functioning of their nerves, and endangering their lives.

Utility Truck: https://youtu.be/0MLDA6too1Q

Figure 8 - Utility Truck

The Soft Lights Foundation Petition to ban blinding LED vehicle headlights has tens of thousands of signatures. Here are a few recent comments.[2]

"These new bright headlights are dangerous and blinding to other drivers."

"I'm tired of being blinded with these bright lights! It's painful!"

"I can barely drive at night anymore. I'm afraid of an accident because I am constantly blinded by LED lights aimed into my vehicle"

The National Highway Transportation Safety Administration has never approved a flat surface emitter, such as an LED, for use as a vehicle headlight. The substance emitted by LEDs is spatially anisotropic visible radiation with orders of magnitude difference between the peak radiance at zero degrees along the center axis of the LED chip and angles greater than zero degrees. Mathematically, the shape of the radiation is a Lambertian which is created because the source of the radiation is a flat surface.[3] The radiation energy from an LED is different at every point in space, which is very different than the spatially uniform energy of *light* as used in regulatory filings. Because the radiation emitted by LEDs is spatially anisotropic, and because the peak radiance is so dense, this LED radiation causes eye damage and reduced vision. The auto makers such as General Motors and Toyota and the headlight

[2] https://www.change.org/p/u-s-dot-ban-blinding-headlights-and-save-lives
[3] https://ieeexplore.ieee.org/document/8879542

suppliers such as Hella have fraudulently certified LED headlights as compliant with NHTSA FMVSS-108 when they are not.

Figure 9 - LED Headlights on a Toyota

The result of exposure to LED radiation is immediate sickness in the form of headaches, nausea, eye pain, loss of balance, migraines, panic response, altered vision, epileptic seizures, disorientation, and other neurological disturbances. Each of these symptoms is being verifiably reported by an increasing number of individuals and constitute medical evidence of LED-induced harm. LED visible radiation exposure is causing catastrophic physical harm, subjecting at-risk individuals to illness and injury, and plunging formerly healthy, independent people into crisis levels of stress, hopelessness, psychological trauma, and persistent thoughts of suicide.

LED radiation is discriminatory because it interferes with human nerves and disrupts 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 prevents safe access to public services such as roads, sidewalks, and government facilities. Use of LED radiation devices violates the federal Americans with Disabilities Act.

The AAA company is at risk because not a single LED headlight on American roadways is legal. Any person who is involved in a vehicle crash where an LED headlight was a contributing factor to the crash can hold AAA responsible for having insured a vehicle with illegal headlights. Similarly, any vehicle accident where AAA tow truck LED flashing lights or aftermarket LED headlights were a contributing factor in the crash makes AAA liable.

Sincerely,

Mark Baker
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