Soft Lights Foundation

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BY EMAIL

James Person, General Counsel
Texas Department of Insurance
james.person@tdi.texas.gov

Re: Spatially Anisotropic Visible-Radiation Devices

Dear James Person,

We wish to alert the Texas Department of Insurance to liability issues related to the use of LED radiation devices such as LED headlights.

English Common Law dating back to 1663 states that a property owner has an easement to allow *light* to enter their property.[1] Light referred to sunlight and starlight that could be seen by human eyes. We now know that human-visible *light* is the set of frequencies between approximately 380nm and 700nm on the electromagnetic spectrum. For regulatory purposes and unless otherwise stated, *light* is spatially isotropic, meaning that the shape of the radiation is the same in all spherical directions.

Biological systems have a long history of evolution with *light*. The substance emitted by the sun, stars, fire, candles, and fireflies is *light* and is a fundamental component of biological life. Humans use their visual receptors to see objects using reflected *light*, the different wavelengths of *light* provide color information, and *light* controls circadian rhythms and mood. *Light is spatially isotropic radiation in the human visible portion of the electromagnetic spectrum*.

The substance emitted by LEDs is spatially anisotropic visible radiation. Specifically, the shape of the radiation is a Lambertian ball which is created because the source of the radiation is a flat surface.[2] Since this substance is not the same as that emitted by the spherical sun, the substance emitted by LEDs does not meet the standard regulatory definition of *light*. The radiation energy is different at every point in space, which is very different than the spatially uniform energy of *light*. Light Emitting Diodes are misnamed because they emit visible radiation, but not *light*. LEDs should more properly be named Visible Radiation Emitting Devices or VREDs. The substance emitted by LEDs has theoretically unlimited peak radiance, interferes with the nervous system and can cause eye damage, pain, epileptic seizures, migraines, psychiatric trauma, and thoughts of suicide.

[1] https://www.britannica.com/topic/ancient-lights
[2] https://ieeexplore.ieee.org/document/8879542

Figure 1 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.

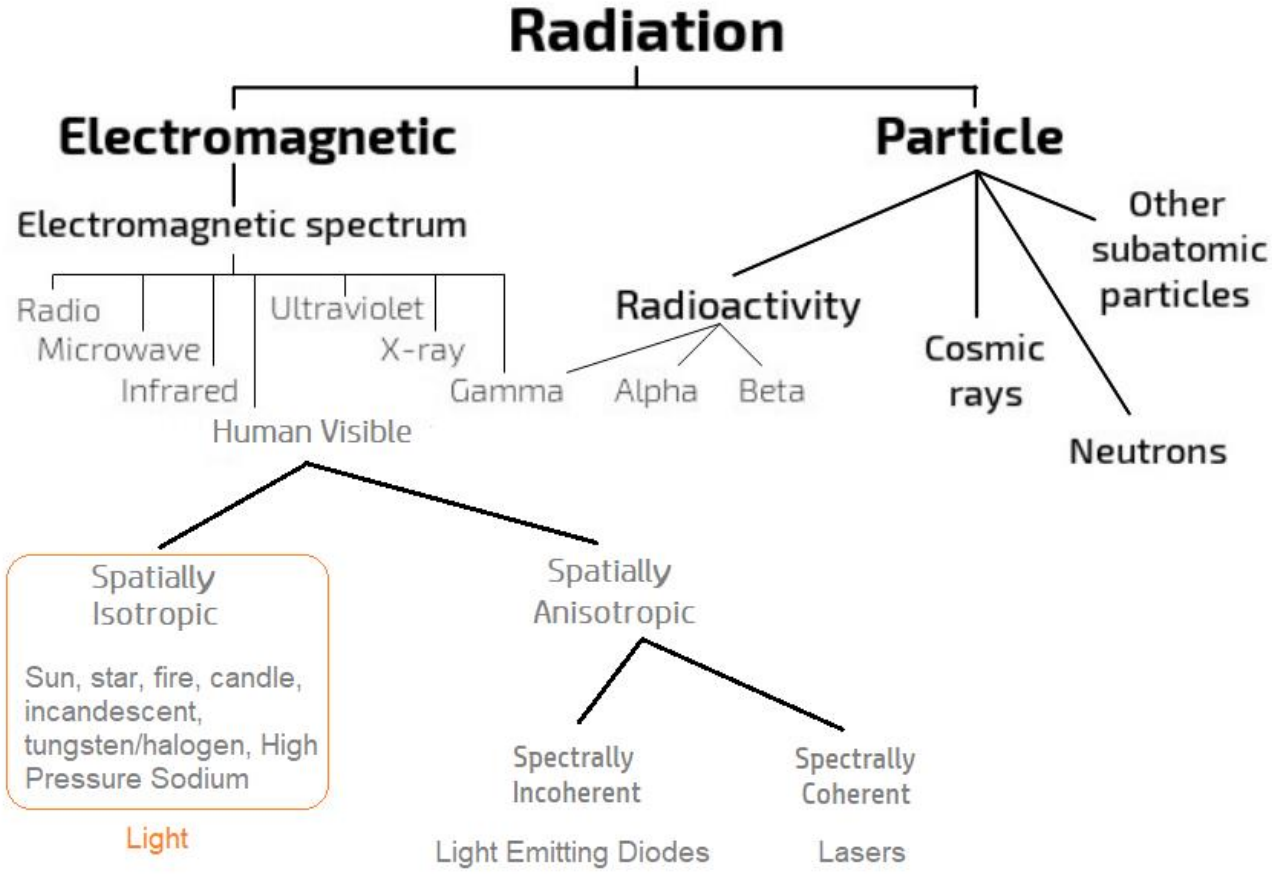

Figure 1 - Radiation

The National Highway Transportation Safety Administration publishes FMVSS-108 which regulates vehicle headlights. FMVSS-108 was originally written in 1967 and is applicable to *spatially isotropic radiation in the human-visible portion of the electromagnetic spectrum*. FMVSS-108 is not applicable to spatially anisotropic radiation sources such as LEDs and lasers and is not applicable to non-visible radiation such as microwaves and x-rays. NHTSA has never approved any type of visible radiation device for use in headlights where the source radiance is non-uniform.

LED headlights and daytime running lights are illegal in the USA because they emit spatially anisotropic radiation that is not compliant with NHTSA FMVSS-108. Auto makers have been using a self-certification process to certify LED headlights to be compliant with FMVSS-108, even though they are not. These unsafe and illegal LED headlights are sending people to the hospital, causing eye damage, psychological trauma, road rage, loss of work, pain, sickness, loss of civil rights, vehicle crashes, and thoughts of suicide.

Figure 2 is a photo from an article that quoted the Texas Department of Insurance.[3] The photo shows typical headlights on the left side of the photo, and the dangerous blinding glare from LED headlights. As quoted in the article, TDI states, “During the brief time your eyes are making these adjustments, your vision is impaired.”

Figure 2 - 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."[4] In the research article, titled Light Emitting Diode Induced Retinal Damage[5] 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.

LEDs are not “energy efficient”. To be energy efficient, a technology must provide the same quality of service and perform the same task as the previous technology[6]. The task in this situation is to provide *light* and uniform illumination while using less energy and not causing harm. Since LEDs do not emit spatially isotropic radiation, LEDs are not illumination devices, as the radiation that LEDs emit is not uniform. Instead, LEDs emit spatially anisotropic visible radiation that causes sickness and eye damage, endangers lives, and violates civil rights. The claim of “energy efficiency” by the LED lighting industry is fraudulent.

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[3] https://www.safetyandhealthmagazine.com/articles/21964-driving-in-the-dark-avoid-night-blindness
[4] http://www.softlights.org/wp-content/uploads/2021/10/MichaelShulman_LEDFireElectricalSafety.pdf
[5] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5313540/
[6] https://www.energystar.gov/about/about_energy_efficiency

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 3 from the company Gear Light. LED chip makers exceeded 100,000,000 nits of peak luminance as of 2018.[7]

Figure 3 - LED Flashlight

Neither the Insurance Institute for Highway Safety nor the National Highway Traffic Safety Administration has addressed the use of LED radiation devices. NHTSA regulation FMVSS-108 applies only to the subset of visible radiation called *light*. FMVSS-108 is not written for x-rays, microwaves or spatially anisotropic radiation from lasers or LEDs. Therefore, all LED headlights, both OEM and aftermarket, are illegal. Texas insurance companies will be involved If a vehicle that uses LED radiation devices causes an accident by dazzling an oncoming driver with LED radiation or if the LED vehicle headlight causes eye damage or other harm to a driver or pedestrian.

Sincerely,

Mark Baker

Mark Baker
President
Soft Lights Foundation
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[7] focusworld.com/test-measurement/research/article/16555223/nonlaser-light-sources-highluminance-leds-target-emerging-automotive-lighting-applications