

January 23, 2022

BY EMAIL

Jennifer Scanlon, CEO
Underwriters Laboratories
Jennifer.scanlon@ul.com

Re: The LED Fraud

Dear Jennifer Scanlon,

LED light beams are known to cause eye damage, agitation and anger, and interfere with human nerve signaling. LEDs are not “energy efficient” as claimed by the Underwriters Laboratories because LEDs do not emit uniform light. UL’s claim that LEDs are “point sources” is untrue. To protect public health and safety and UL’s business, you must publicly rebuke the claims that LEDs are point sources and that LEDs are energy efficient

LED electromagnetic radiation devices emit non-uniform radiation that is exceedingly intense in the middle of the chip. While human comfort level is approximately 300 nits of uniform luminance, today’s LED chips can have a peak luminance exceeding 100,000,000 nits¹ and an extreme variability between the peak luminance and the edge luminance. LEDs do not provide the same service as Incandescent or High-Pressure Sodium.

In 2016, the American Medical Association published ground-breaking recommendations regarding LED radiation with a document titled Human and Environmental Effects of Light Emitting Diode (LED) Community Lighting.² This document stunned the world as it alerted the public to the toxicity of LED radiation, and the AMA recommended setting limits on this radiation. The LED cartel fought the AMA’s recommendations and continues to do so. Since 2016, neither the government nor the LED cartel have taken appropriate steps to address the dangers of LED electromagnetic radiation.

The injuries caused by LEDs is being documented. MarieAnn Cherry is an adult who has epilepsy, a formally recognized disability, and who has been sickened by LED light beams many times. Her exposures to LED light beams, even for a fraction of a second, has led to hundreds of seizures resulting in broken bones, lost teeth, and psychological trauma. MarieAnn has researched the issue and

¹ <https://www.laserfocusworld.com/test-measurement/research/article/16555223/nonlaser-light-sources-highluminance-leds-target-emerging-automotive-lighting-applications>

² <https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/public/about-ama/councils/Council%20Reports/council-on-science-public-health/a16-csaph2.pdf>

has written up a synopsis of how the safety of LEDs has been ignored by the authorities.³ MarieAnn's document also contains links to 40 studies on the toxic effects of LEDs.

MarieAnn has compiled a list of verifiable quotes from persons who have been injured by LED exposure.⁴ Since it is unethical to directly study whether a technology triggers a life-threatening seizure in humans by exposing the person to the possible trigger and it is also unethical to involuntarily subject humans to medical experiments,⁵ a study does not necessarily have to be carried out in a laboratory. A study of verifiable reports of incidents related to LED light beam exposure is a valid study.

MarieAnn's efforts highlight the toxic effects of LED light beams on people with epilepsy, but the toxicity of spatially non-uniform electromagnetic visible radiation also impacts all members of the public and other creatures such as owls and insects because of the way it interferes with the proper functioning of nerves, and the damage to the eye caused by chemical and thermal damage.

The Soft Lights Foundation has concluded that the entire switch to LED is based on fraud. The idea that has been sold to the public is that LEDs are energy efficient or save energy compared to incandescent or High-Pressure Sodium and that LED radiation is safe and non-discriminatory. These are fraudulent claims.

To assist the UL with the technical details of why LED light beams are so toxic, we provide additional technical information. LEDs emit electromagnetic radiation from a flat surface which creates a non-uniform geometry of energies, and the result is a low quality, toxic, hazardous, and discriminatory type of visible electromagnetic radiation. According to the US Department of Energy's website, energy efficiency means "*using less energy to get the same job done.*"⁶ The job is to provide uniform illumination with minimal harm. LEDs do not produce uniform illumination⁷, but rather they emit radiation from a flat surface which creates a light beam rather than providing uniform illumination. Since LEDs do not do the same job as an incandescent or High-Pressure Sodium, the claim that LEDs are energy efficient cannot be made.

The left side of Figure 1 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 1 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.

³ http://www.softlights.org/wp-content/uploads/2022/01/One-Third-of-us-at-Risk_-The-Medical-science-of-LEDs.pdf

⁴ <http://www.softlights.org/wp-content/uploads/2022/01/Quotes-from-individuals-harmed-by-LED-exposure.pdf>

⁵ https://media.tghn.org/medialibrary/2011/04/BMJ_No_7070_Volume_313_The_Nuremberg_Code.pdf

⁶ https://www.energystar.gov/about/about_energy_efficiency

⁷ <https://ieeexplore.ieee.org/document/8879542>

An energy efficiency comparison between an incandescent or High-Pressure Sodium and an LED cannot be made, and thus LEDs are not “energy efficient”.

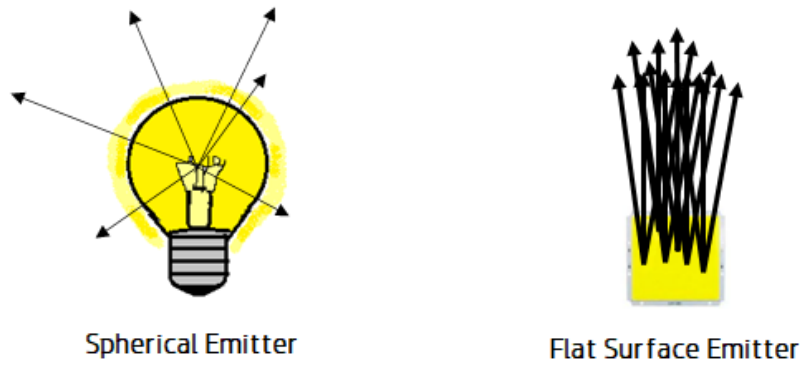


Figure 1 - Spherical vs. Flat Surface Emitter

Figure 2 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 the non-uniformity will overload the nerve signals to the brain because the information is not uniform. These negative outcomes are the effects of the toxicity of LEDs.

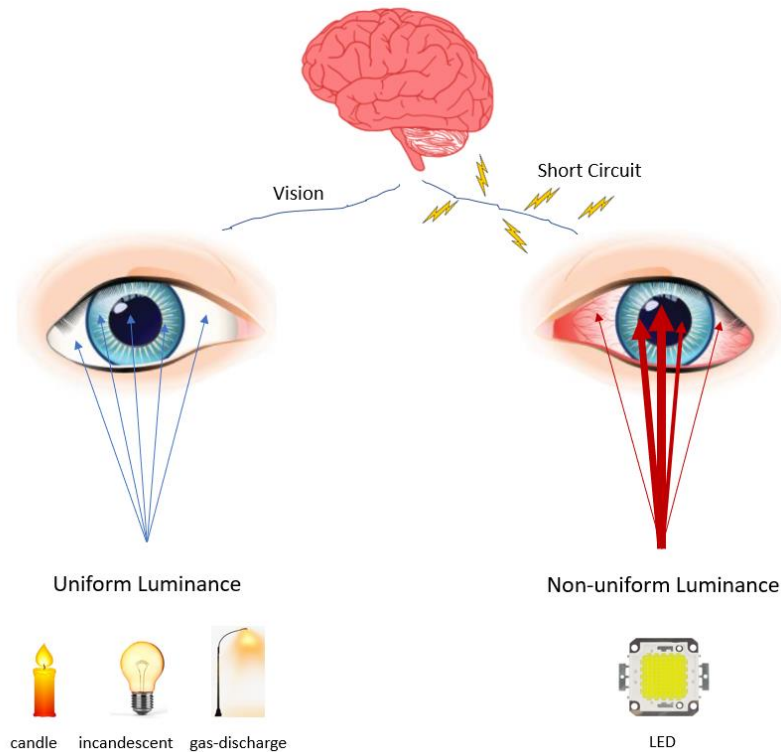


Figure 2 - Spatially Uniform v. Non-Uniform Radiation

Figure 3 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. For example, the Illuminating Engineering Society IES RP-8-18 for Roadway Lighting is only applicable for uniform emitters and cannot be used for LED light beams.

Regulatory Meaning of Light and Illumination

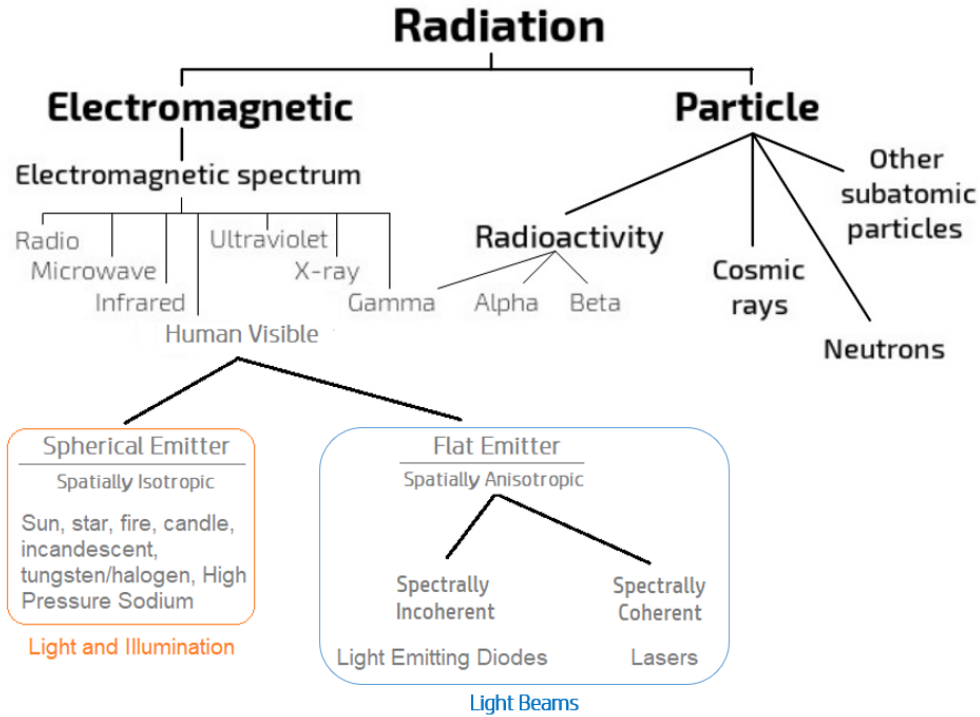


Figure 3 - Radiation Types

UL claims that LEDs are “point sources”.⁸ This is not a true statement since LEDs are flat surface emitters that cannot ever be modeled as a point source. The extreme variance in radiance values between the peak output and the edge output from an LED chip precludes any effort to claim that an LED is a point source. For a discussion on the shape of LED electromagnetic radiation and the mathematical proof that LEDs produce a Lambertian shape, refer to the IEEE paper by Dr. Nisa Khan.⁹ **The false claim that LEDs are point sources is a major source of liability for UL.**

⁸ <https://www.ul.com/news/shedding-light-led-testing>

⁹ <https://ieeexplore.ieee.org/document/8879542>

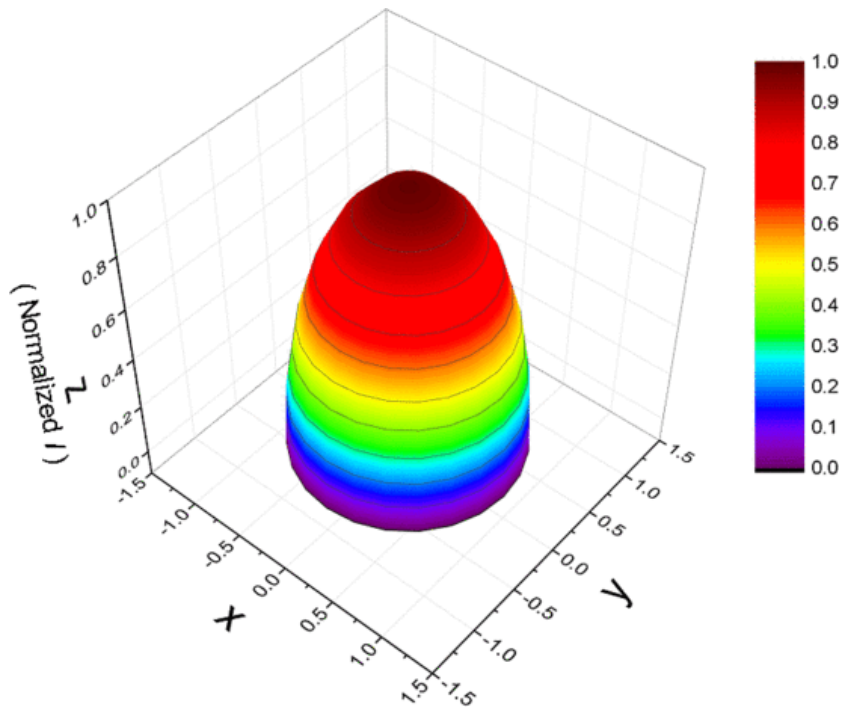


Figure 4 - Lambertian Shape of LED Emissions¹⁰

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. The parenthetical “(not even from a distance)” indicates a high level of danger.

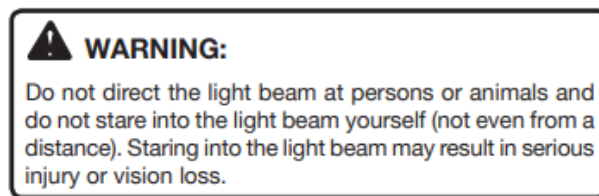


Figure 5 - LED Warning Label

LED light beams, whether the light beam is static or flashing, can trigger epileptic seizures. Businesses that wish to protect themselves from liability may place a sign at the entry way to their business to alert people with epilepsy of the danger. UL is missing such warnings in its documentation and certifications.

¹⁰ <https://ieeexplore.ieee.org/document/8879542>



Figure 6 - Epilepsy Warning Sign

An example of the difference between Tungsten and LED headlights is shown in Figure 7. A tungsten light falls uniformly onto the eye, not counting lensing. LEDs emit an extreme variability in luminance values, such that the difference between luminance values at each angle is different, and the difference between the peak luminance and the edge luminance is extreme.

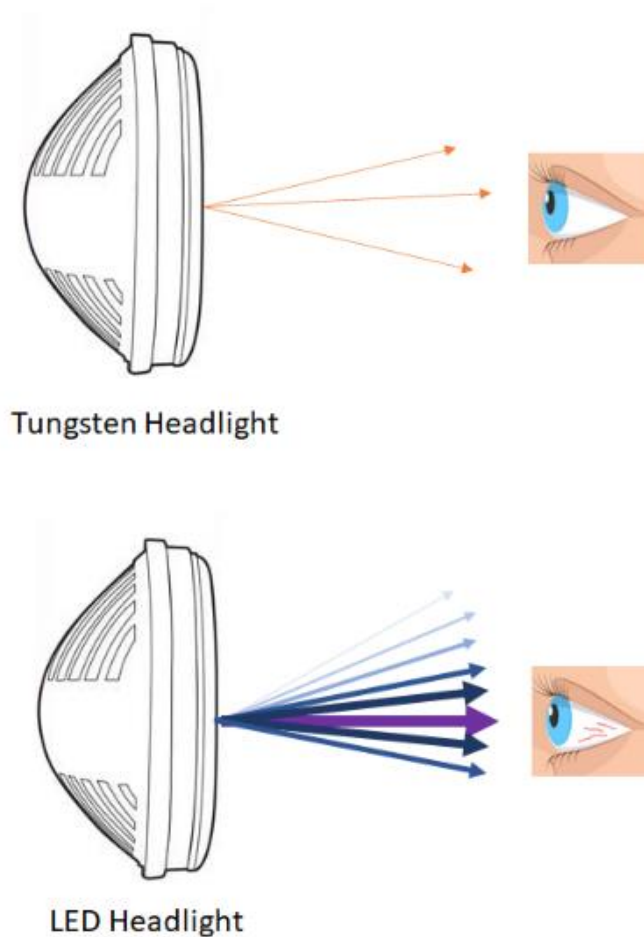


Figure 7 - Headlight Comparison

Figure 8 is a photograph taking in October 2021 showing the impacts of using LED headlights.



Figure 8 - LED Headlight Glare

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 headlights¹¹ The auto industry fraudulently self-certifies LED headlights by failing to measure with enough precision. If the auto industry measured at the picometer or femtometer scale, the readings would clearly show that the luminous intensity far exceeds the maximums set in NHTSA FMVSS-108. Therefore, all LED headlights and Daytime Running Lights illegal.

Figure 9 is a quote from Underwriters Laboratories' website.¹² The statement that an LED has superior energy efficiency is a fraudulent claim, as energy use by an HPS and an LED cannot be compared because they don't provide the same service. Incandescent and HPS provide uniform illumination, while LEDs are a light beam incapable of providing uniform illumination.

¹¹ <http://www.softlights.org/wp-content/uploads/2021/12/Leroy-Angeles.pdf>

¹² <https://www.ul.com/news/laser-diode-lighting-potential-future-high-efficiency-solid-state-illumination-new-ul-white>

Executive Summary

For more than a century, incandescent bulbs have been the dominant technology for producing artificial light. Though the efficiency of modern incandescent bulbs has improved, other lighting technologies have been rapidly replacing them in most applications. Fluorescents and CFLs exhibit improvement in efficiency relative to incandescent lighting but, in recent years, have been supplanted by light emitting diode (LED) technologies. This is due to the superior energy efficiency, controllable light spectral output, instant-on performance, and longevity of LEDs.

Figure 9 – Underwriters Laboratories Fraudulent Statement

Figure 10 highlights the fraudulent claims. A uniform illumination device that is compatible with the human nervous system is shown on the left side of the diagram. In the middle portion of Figure 10 is what the Underwriters Laboratories' fraudulently claims is the shape of the LED light beam. Underwriters Laboratories' claims that the beam is directed, but uniform, therefore saving energy. The reason this claim is fraudulent is because UL knows that this middle diagram is not a truthful representation of the actual shape of the LED light beam. The real pattern of an LED light beam is shown on the right side of the figure which demonstrates the non-uniformity of the light and shows that the middle of the light beam is exceedingly intense, far beyond human tolerance levels and that there is extreme variability between the peak luminance in the middle, and the luminance at the edges.



Figure 10 - Streetlight Comparison

LED flashing lights meet the legal definition of assault¹³ and they violate basic human rights. LED flashing lights turn on and off nearly instantly and have a dangerous peak radiance. These LED flashing lights are being used on radio towers, utility vehicles, police cars, ambulances, fire engines, stop signs, and bridges. The non-uniform radiation and extreme variability between peak radiance and edge radiance triggers seizures, causes migraines, interferes with human nerve functioning, reduces vision, increases agitation, and endangers the lives of the public and first responders. Multiple encounters with LED flashing lights will lead to Complex PTSD.

¹³ <https://www.law.cornell.edu/wex/assault>

The link to the video for Figure 11 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 11 - Non-LED Hazard Lights

The links to the videos for Figure 12, Figure 13, Figure 14, and Figure 15 show the misuse of technology, where flashing LED radiation devices 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.

Rectangular Rapid Flashing Beacon: <https://youtu.be/KBltx0Argag>



Figure 12 - RRFB

Utility Truck: <https://youtu.be/ma0hGwHivO4>



Figure 13 – Utility Truck

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



Figure 14 - Utility Truck

Ambulances: <https://youtu.be/amoR1QSIBHw>



Figure 15 - New York City Ambulances

Figure 16 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 and extreme variability of luminance interferes with the human nervous system.

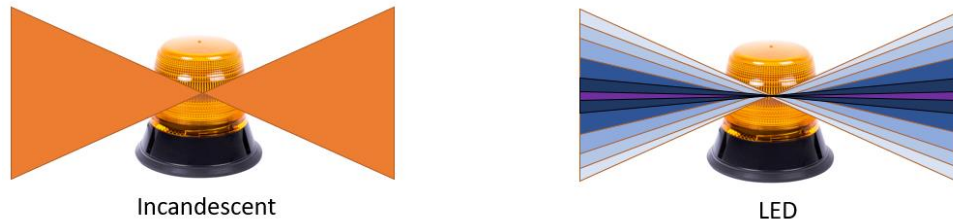


Figure 16 - Incandescent vs. LED Flashing Lights

Neither the FHWA nor NHTSA currently have regulations for the LED flashing lights, including a lack of regulation for flash rate, quantity of devices, peak radiance, or protection for eyes, vision, or neurology, and neither agency has made an effort to ensure that LED flashing lights do not violate the Americans with Disabilities Act. Both human drivers and Artificial Intelligence drivers rely on sensors to receive input from the world about them and a communication channel to send that input to a processing center. LED flashing lights interfere with this system, degrading vision, and increasing the likelihood of vehicle crashes, injury, and death.

The result of exposure to LED electromagnetic radiation, both static and flashing, 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.

This electromagnetic visible radiation from LEDs 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. The LED lights and LED flashing lights greatly increases violence and endanger the lives of the public who cannot adequately see, think, or concentrate when inundated by LED light beams.

Underwriters Laboratories is liable for injury and discrimination caused by use of UL-certified LED devices because of the fraudulent claim that LEDs are point sources and that LEDs are more energy efficient compared to incandescent and High-Pressure Sodium.

Sincerely,

Mark Baker

Mark Baker

President

Soft Lights Foundation

www.softlights.org

mbaker@softlights.org

9450 SW Gemini Drive PMB 44671

Beaverton, OR 97008

