

November 26, 2021

BY EMAIL

Erin McSherry, City Attorney
City of Santa Fe, New Mexico
ekmsherry@santafenm.gov

Re: Spatially Anisotropic Visible-Radiation Devices

Dear Erin McSherry,

English Common Law dating back to 1663 states that a property owner has an easement to allow *light* to enter their property.¹ As artificial radiation devices did not exist at that same, it is clear that 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 400nm and 700nm on the electromagnetic spectrum. For regulatory purposes, *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.*

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 is spatially anisotropic visible radiation. Because the substance emitted by LEDs is not *light* and is directed-energy radiation, this substance interferes with the nervous system and can cause eye damage, pain, epileptic seizures, migraines, psychiatric trauma, and thoughts of suicide. The substance that LEDs emit is not legally entitled to be called *light*.

Figure 1 is a diagram showing the categorization of radiation. Figure 1 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*.

¹ <https://www.britannica.com/topic/ancient-lights>

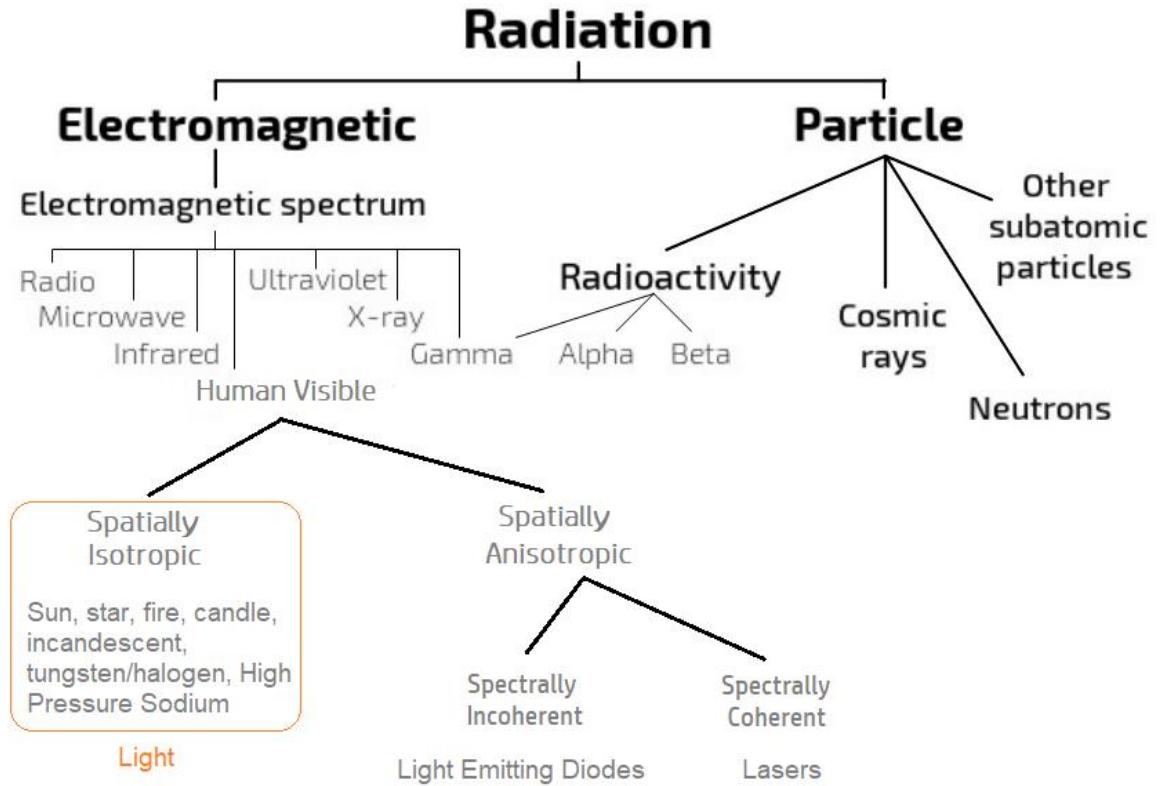


Figure 1 - Radiation Types

We wish to alert the city of Santa Fe to liability issues related to the installation and operation of LED radiation devices. Figure 2 shows an LED radiation device (left side) in Santa Fe subjecting persons in the area to toxic, hazardous, and discriminatory radiation from LED streetlights, and a High-Pressure Sodium device (right side) providing light.



Figure 2 – LED and HPS Streetlights²

² <https://www.sfreporter.com/news/2021/05/05/light-up-the-streets/>

The Illuminating Engineering Society Recommended Practice for Design and Maintenance for Roadway Parking Facility Lighting (IES RP-8-18) is the de-facto standard for outdoor lighting for streets and parking lots. Section 2.1 of this document states, “Radiant energy that is capable of exciting the retina and producing a visual sensation is consider *light*.” However, the contents of IES RP-8-18 assume the radiation to be spatially isotropic, so the IES definition is inaccurate, as it is missing the words “spatially isotropic”. The references to *light* in IES RP-8-18, therefore, are for *spatially isotropic radiation in the visible portion of the electromagnetic spectrum*. The word *light* in IES RP-8-18 does not refer to microwaves, x-rays, or spatially anisotropic radiation such as LEDs and lasers.

The reason this is important is because Santa Fe has installed or is planning to install LED radiation devices that do not comply with existing standards, emit dangerous radiation, discriminate against persons with disabilities and have unregulated spatial, spectral, and temporal characteristics. Even more serious is the possible use of directed energy LED flashing radiation on police and other emergency vehicles which place lives in immediate danger due to the anisotropic radiance and flash rate. LED radiation has been shown to cause pain, sickness, eye damage, seizures, migraines, emotional trauma, and thoughts of suicide.

The Illuminating Engineering Society does not guarantee their own standards and disclaims any liability for the use of their standards. Thus, if Santa Fe claims that they followed standards for LED radiation and are therefore not liable for the harms caused by LED lighting, Santa Fe’s claim will fail, both because IES RP-8-18 is not applicable to LED radiation devices, and because IES has warned that their standards are not trustworthy enough to be guaranteed or relied on.

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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."³ In the research article, titled Light Emitting Diode Induced Retinal Damage⁴ 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 technology⁵. 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 do not emit light, and the radiation that LEDs do emit is not uniform. Instead, LEDs emit spatially anisotropic visible radiation that is sending people to the hospital, causing eye damage, and violating civil rights. The claim of "energy efficiency" by the LED lighting industry is fraudulent.

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. Santa Fe cannot claim that LEDs comply with the ADA just because 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. We do not see any information on Santa Fe's website that indicates that Santa Fe authorized studies or even reviewed the impacts of LED radiation on those with disabilities.

As an example of how dangerous LED radiation is, consider this warning shown in Figure 3 from the company Gear Light.



Figure 3 - LED Flashlight

³ http://www.softlights.org/wp-content/uploads/2021/10/MichaelShulman_LEDFireElectricalSafety.pdf

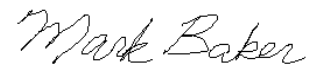
⁴ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5313540/>

⁵ https://www.energystar.gov/about/about_energy_efficiency

The fact that LEDs do not emit *light*, are unregulated and lack standards, cause sickness and eye damage, interfere with the human nervous system, and discriminate against people with disabilities makes Santa Fe liable for the harm and discrimination they cause because Santa Fe authorizes the installation and operation of LED radiation devices.

To protect human health and reduce liability, Santa Fe must protect the natural night resource, and set policy to limit visible radiation. Any artificial radiation used for illumination must use *only spatially isotropic* radiation with a Correlated Color Temperature of 2700 Kelvin or less, with 2000K preferred to protect the natural night resource, and be fully shielded (not just full cutoff). Pulsing LED radiation such as on police cars, other emergency vehicles and utility trucks, and signs must be eliminated completely due to their civil rights violations and the excessive danger they pose.

Sincerely,

A handwritten signature in black ink that reads "Mark Baker". The signature is written in a cursive, slightly slanted style.

Mark Baker
President
Soft Lights Foundation
mbaker@softlights.org