November 11, 2021

To:

Phillip Schaedler, City Attorney
Cambridge Township, Michigan
adratty@comcast.net

Re: Spatially Anisotropic Visible Radiation

Dear Phillip Schaedler,

We wish to alert the Cambridge Township to liability issues related to spatially anisotropic radiation from Light Emitting Diodes. Figure 1 is a diagram showing the categorization of radiation. As we can see in the chart, candles, incandescent light bulbs, and High-Pressure Sodium lamps are all spatially isotropic radiation sources. LEDs, on the other hand, emit spatially anisotropic radiation.

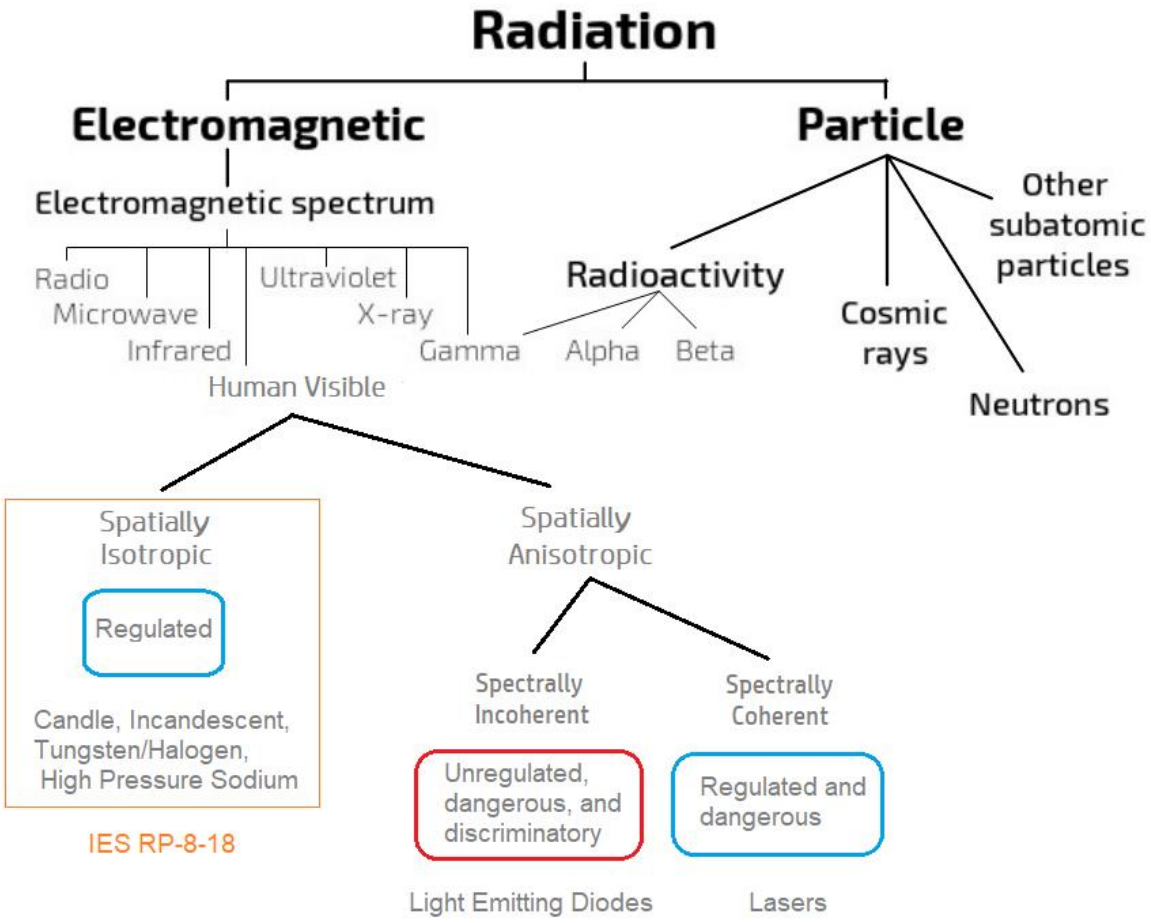

Figure 1 - Radiation Types

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. The references to "light" in IES RP-8-18 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, laser beams, or spatially anisotropic, spectrally incoherent radiation such as LEDs.

The reason this is important is because Cambridge fails to enforce its nuisance and public health codes as they apply to LED radiation such as from LED streetlights and floodlights. LED streetlights and other LED outdoor lights that do not comply with existing standards, emit dangerous radiation, discriminate against persons with light sensitivity disabilities and have unregulated spatial, temporal, and spectral characteristics. Even more serious is the use of directed energy LED flashing lights on police and other emergency vehicles which place lives in immediate danger due to the anisotropic radiance and flash rate. LED lights have been shown to cause pain, sickness, eye damage, seizures, migraines, psychological 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 Cambridge Township attempts claim that they followed standards for LED streetlighting or parking lot lighting and are therefore not liable for the harms caused by LED lighting, Cambridge's claim will fail, both because IES RP-8-18 is not applicable to LED streetlights, and because IES has warned that their standards are not trustworthy enough to be guaranteed or relied on.

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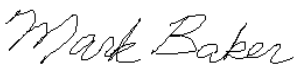
To our knowledge, there are no ocular exposure standards for LEDs. In his 2009 presentation, Senior Engineer Michael Shulman of Underwriters Laboratories wrote, "Currently, neither the U.S. nor

Canada have mandatory standards or regulations for ocular exposure to LEDs emitting incoherent visible light."[1] In the research article, titled Light Emitting Diode Induced Retinal Damage[2] 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 fact that LEDs are unregulated and lack standards, cause sickness and eye damage, interfere with the human nervous system, and discriminate against people with light sensitivity disabilities makes Cambridge liable for the harm and discrimination they cause because Cambridge does not protect persons from LED radiation.

To protect human health and reduce liability, Cambridge Township must protect the natural night resource, and set policy to limit visible radiation. Any lighting must be fully shielded and use only spatially isotropic radiation with a Correlated Color Temperature of 2700 Kelvin or less, with 2000K preferred to protect the natural night resource. Pulsing LED radiation such as on emergency vehicles and utility trucks must be eliminated completely due to the excessive danger they pose.

Sincerely,



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[1] http://www.softlights.org/wp-content/uploads/2021/10/MichaelShulman_LEDFireElectricalSafety.pdf
[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5313540/