

December 7, 2021

BY EMAIL

Michael Regan, Administrator
Environmental Protection Agency
Regan.michael@epa.gov

Re: Regulation of Visible Radiation

Dear Michael Regan,

The Soft Lights Foundation has contacted numerous federal agencies to determine which federal agency regulates radiation in the human-visible portion of the electromagnetic. We have concluded that no federal agency is regulating the radiation in that part of the spectrum. This oversight leaves a dangerous hole in the government's regulation of electromagnetic radiation. We are therefore requesting that the EPA properly regulate radiation from 350 nanometers to 800 nanometers.

Regulatory Meaning of Light and Illumination

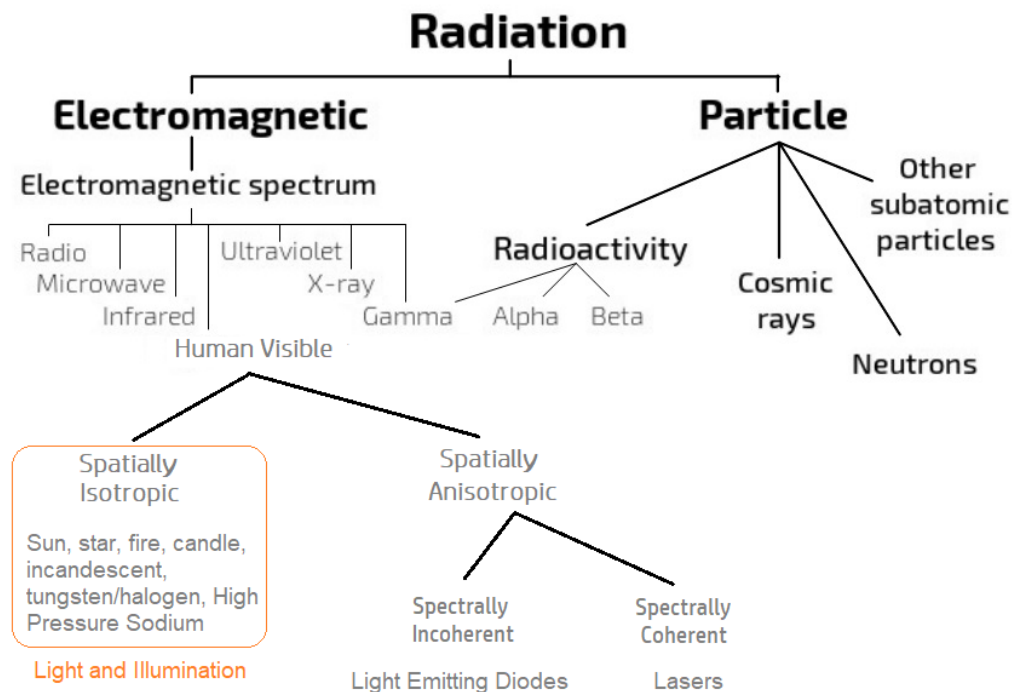


Figure 1 - Categorization of Radiation

Figure 1 shows the categorization of radiation. The regulatory meaning of light is confined to spatially isotropic radiation in the human-visible portion of the electromagnetic spectrum. Historically, spatially isotropic light has not been treated as radiation for regulatory purposes. However, we now know that artificial light is a toxic and hazardous substance that damages the natural night resource and must be regulated.

In addition, Figure 1 shows that spatially anisotropic visible radiation must also be regulated. Whereas spectrally coherent, spatially anisotropic visible radiation is regulated by certain government agencies such as the FAA, spectrally incoherent, spatially anisotropic radiation such as from Light Emitting Diodes is entirely unregulated by the federal government, and yet this radiation is highly toxic for everything in the environment. This visible radiation must be regulated by the EPA.

Figure 2 shows how the EPA would regulate all electromagnetic radiation in the visible portion of the spectrum.

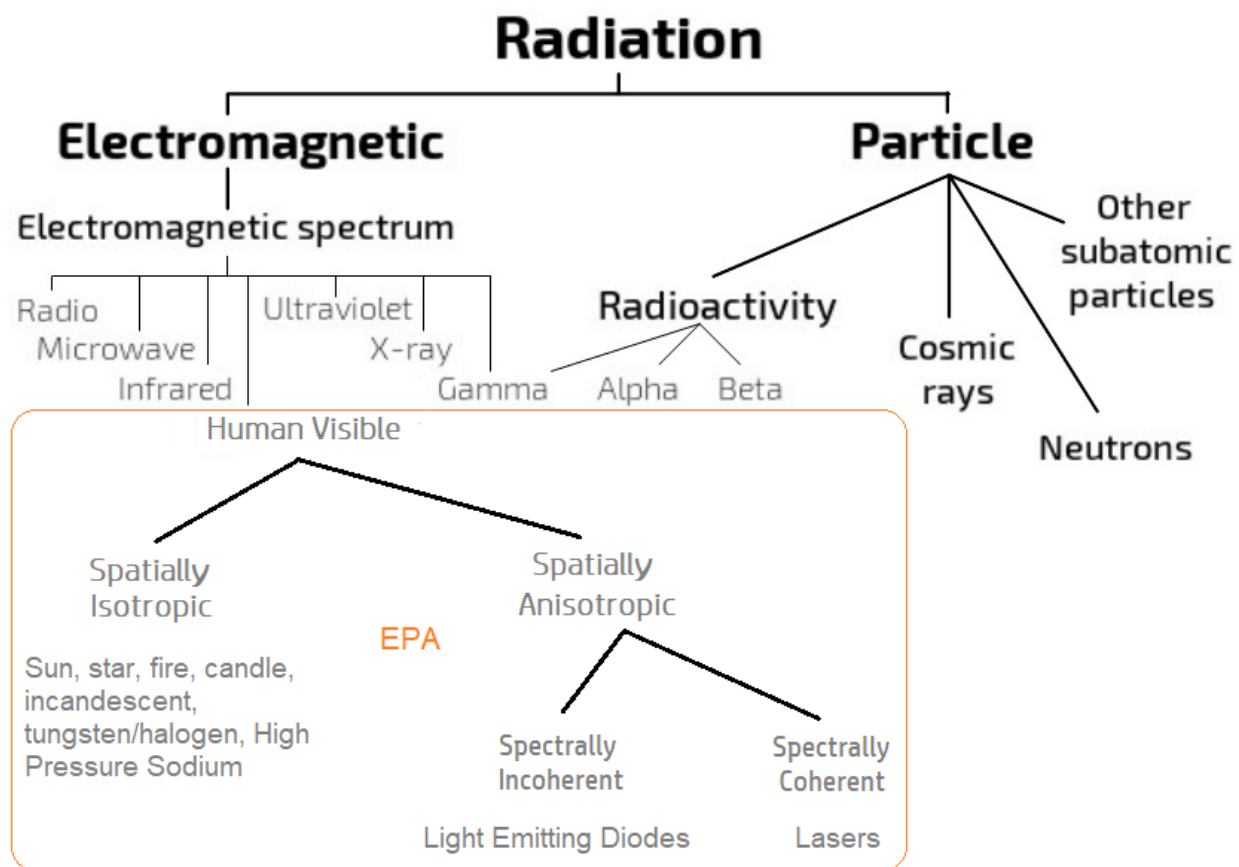


Figure 2 - EPA Regulation of Visible Radiation

Figure 3 shows the sky brightness for the United from the 1950's through the 2020's. As you can see, the pollution has been increasing at an astounding pace. There is no economic benefit from this pollution, but there is significant damage being done to the natural night resource that is a fundamental resource for nearly all biological systems, including humans.

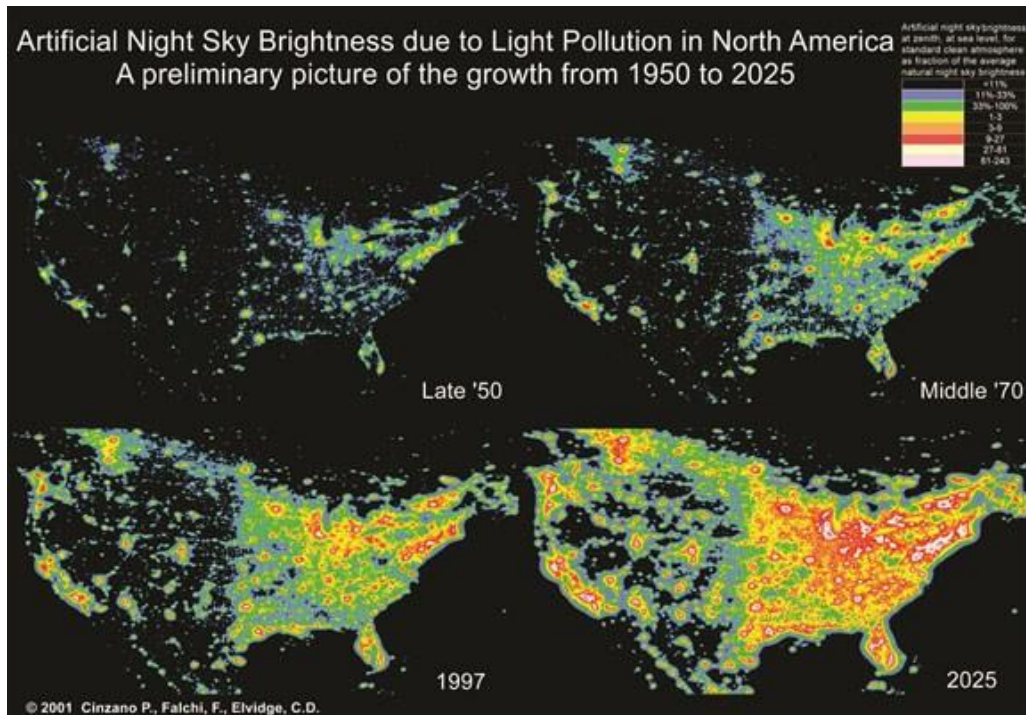


Figure 3 - USA Light Pollution¹

Light Emitting Diode radiation has made the visible radiation situation far worse since the 1990s. The rapid deployment of LED radiation devices has led to millions more visible radiation emitters, and this radiation is toxic to biological systems due to the spatially anisotropic shape and the excessive levels of high energy 450nm blue wavelength.

LED streetlights have made the visible radiation pollution is far worse. Figure 4 shows LED streetlights in Lee County, Florida. These LED radiation devices are toxic, hazardous, and discriminatory, causing injury to plants, animals, insects, amphibians, fish, and humans. The natural night is a resource that must be protected by the EPA, just as EPA currently protects water and air.

¹ <https://www.nps.gov/subjects/nightskies/growth.htm>



Figure 4 - LED Streetlights

As an example of how dangerous LED radiation is for the eye, consider this warning shown in Figure 5 from the company Gear Light.

WARNING: To avoid eye injury, do not stare directly into the light beam or shine the beam directly into anyone's eyes. This product is not designed, intended, or recommended for children or hazardous environments.



Figure 5 - LED Flashlight

An example of vehicle headlight visible radiation from LEDs is shown in Figure 6. This radiation causes eye damage, seizures, migraines, psychological trauma, and severe damage to the natural night resource, harming the biological creatures that depend on the low-light conditions of natural night.



Figure 6 - LED Headlights

Figure 7 show the intensity of LED radiation on a normalized scale. Note how the intensity is non-uniform, with the greatest intensity being in the center of the LED chip. This intensity is currently unregulated by any agency of federal government.

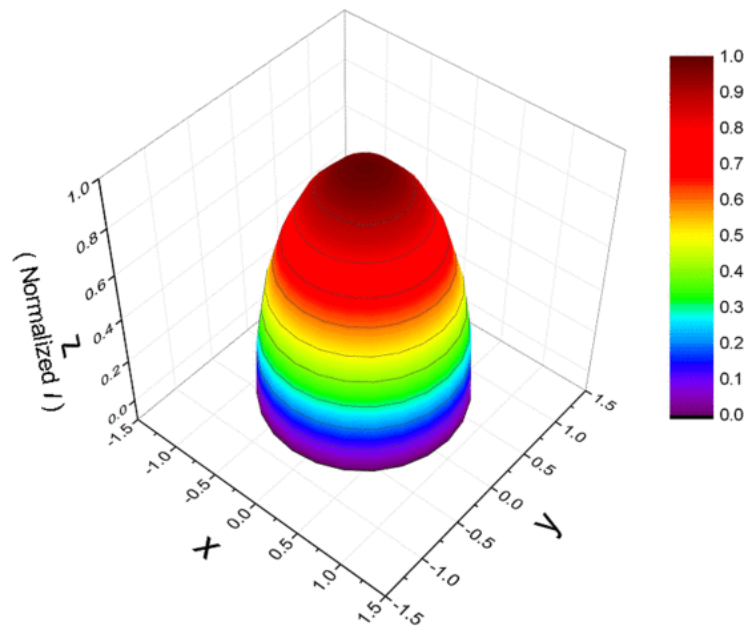


Figure 7 - LED Radiation Profile²

² <https://ieeexplore.ieee.org/document/8879542>

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. Because the luminance and radiance of LEDs can be exceedingly dense, LEDs are causing eye damage, pain, nausea, psychological trauma, seizures, migraines, loss of vision, distraction, vehicle crashes, and thoughts of suicide.

There are several significant federal laws that protect civil rights and prohibit discrimination. These laws include the 14th Amendment of the US Constitution which guarantees the right to liberty⁵, the Enforcement Act of 1871 which makes government liable for deprivation of civil liberties⁶, the Rehabilitation Act of 1973 which addresses the notion of equal access for all⁷, and the Americans with Disabilities Act prohibits discrimination against persons with disabilities, including anything that prevents seeing, thinking, or concentrating.⁸ LED radiation violates civil liberties by interfering with the human nervous system, preventing people from seeing, thinking, concentrating, and communicating. LED radiation devices violate these federal laws.

There is a very long list of research articles that detail the toxicity of visible radiation.

[Street lighting has detrimental impacts on local insect populations](#)

[First Estimation of Global Trends in Nocturnal Power Emissions Reveals Acceleration of Light Pollution](#)

[Light pollution drives increased risk of West Nile virus](#)

[Light-Induced Retinal Ganglion Cell Damage and the Relevant Mechanisms](#)

[Ensuring safety in LED lighting](#)

[Do no harm: the beginning of the age of healthy hospital lighting](#)

There are many, many more research articles showing that artificial visible radiation is a toxin.⁹

The natural night is shown in Figure 8. This starlight and the cyclical moonlight are of critical importance for human health. The loss of natural night and the increase in artificial light has led to

³<https://alamembers.com/DesktopModules/EasyDNNNews/DocumentDownload.ashx?portalid=1&moduleid=1059&articleid=232&documentid=42>

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

⁵https://www.constituteproject.org/constitution/United_States_of_America_1992

⁶<http://www.antibiaslaw.com/list/enforcement-act-of-1871#n2953>

⁷<https://www.eeoc.gov/statutes/rehabilitation-act-1973>

⁸<https://www.law.cornell.edu/uscode/text/42/12102>

⁹www.softlights.org/resources

significant increases in breast, thyroid, and prostate cancer, mood disorders, and premature births.^{10,11,12,13}



Figure 8 - Natural Night

Figure 9, on the other hand, shows a typical over lit urban street. We note that this photo shows a crime scene where someone was shot. The bright streetlights and gas station lights did not make the area safer. Upon inspection on the photo, we can see the toxic visible radiation from the streetlights, the gas station, the police vehicles, street signals, and office buildings. Just as sewage pollutes a river, and just as car exhaust pollutes the air, artificial visible radiation pollutes the natural night resource shown in Figure 8.

¹⁰ <https://acsjournals.onlinelibrary.wiley.com/doi/abs/10.1002/cncr.33392>

¹¹ <https://www.nature.com/articles/s41598-020-75622-4>

¹² <https://www.hindawi.com/journals/ije/2018/3271948/>

¹³ <https://news.ucdenver.edu/light-pollution-linked-to-preterm-births-reduced-birth-weights/>



Figure 9 - Urban Street at Night¹⁴

Light pollution has been growing rapidly over the past few decades. The invention of LED radiation devices has accelerated and intensified this trend for the worse. Research makes it clear that the natural night is a fundamental resource that must be protected. Therefore, we request that the EPA regulate artificial light, radiation from LEDs, and all visible electromagnetic radiation.

Sincerely,

Mark Baker

Mark Baker
President

Soft Lights Foundation

www.softlights.org
mbaker@softlights.org

¹⁴ <https://wgntv.com/news/chicagocrime/1-killed-at-least-4-wounded-in-evanston-shooting-near-gas-station/>