

November 26, 2021

BY EMAIL

Robert Long, General Counsel
Donegal Insurance Group
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Re: Spatially Anisotropic Visible-Radiation Devices

Dear Robert Long,

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. *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, LED radiation interferes with the nervous system and can cause eye damage, pain, epileptic seizures, migraines, psychiatric trauma, and thoughts of suicide.

We wish to alert Donegal Insurance Group to liability issues related to the use of LED radiation devices in vehicles such as LED headlights. 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*.

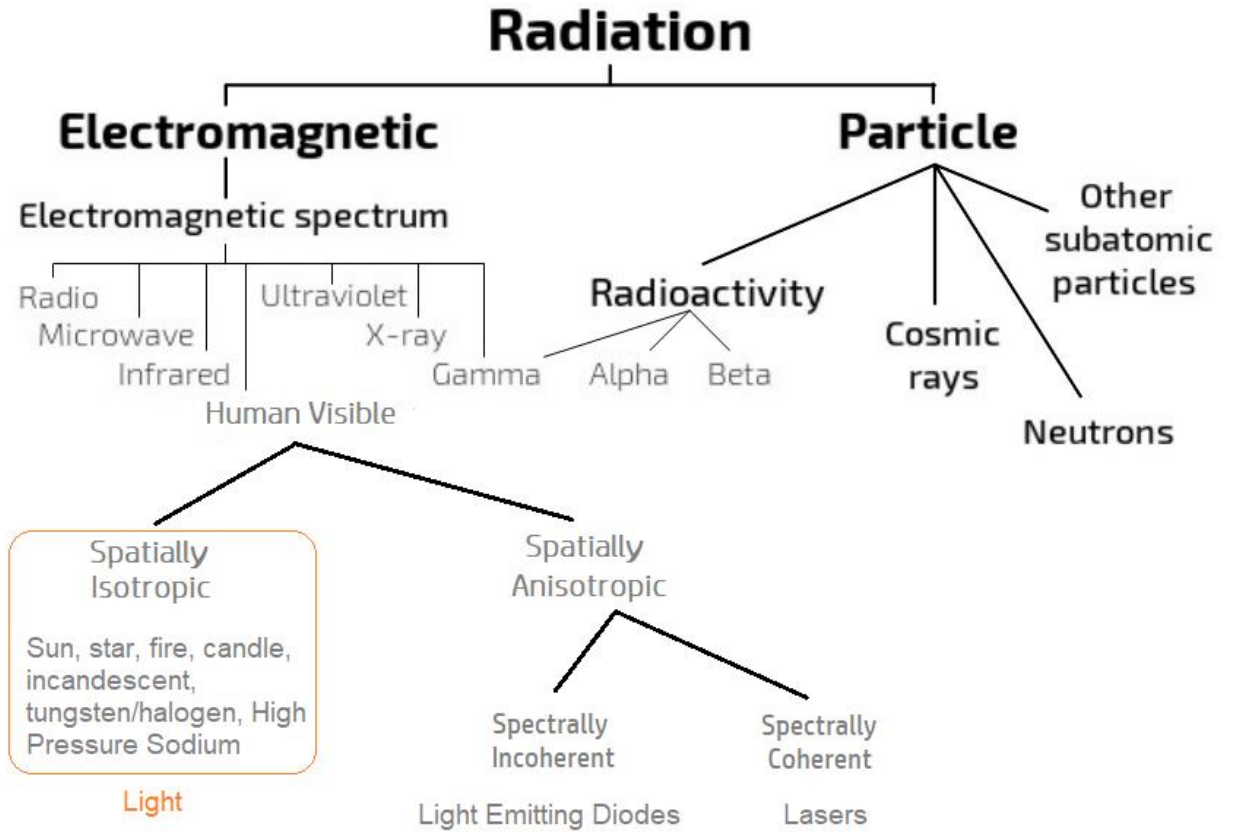


Figure 1 - Radiation

Figure 2 shows the dangerous blinding glare from an LED headlight.

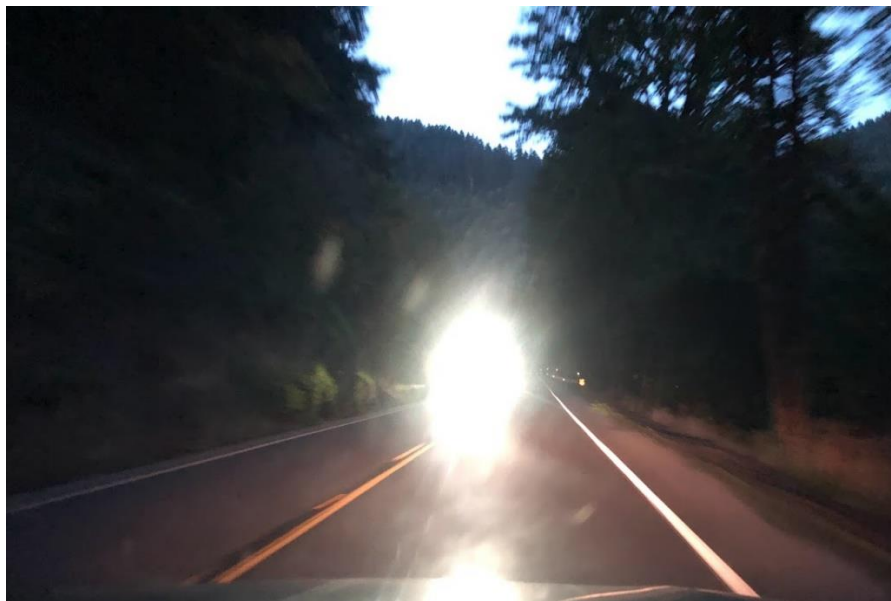


Figure 2 - LED Headlights

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 2018.¹

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 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. There is a liability issue if Donegal Insurance Group insures a vehicle using illegal LED radiation devices and that vehicle causes an accident due to the blinding glare from LED radiation or if the vehicle headlight causes eye damage or other harm to a driver or pedestrian.

Sincerely,

Mark Baker

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¹ focusworld.com/test-measurement/research/article/16555223/nonlaser-light-sources-highluminance-leds-target-emerging-automotive-lighting-applications