PHOTO TRAFFIC ENFORCEMENT

APPLICATION NOTE **#5**

XENON FLASH vs LED

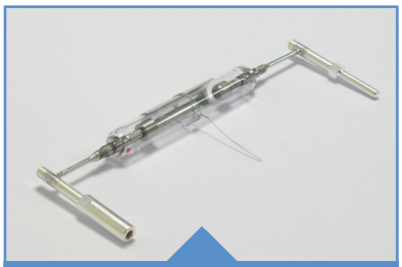
The advent of LED technology a decade ago or so, put a milestone on the way of illumination tools and LEDs are becoming usual sources for many applications such as street lighting, home lighting, industrial vision or even car's headlights.

But illuminating traffic enforcement scene differs from other usages in 2 key aspects:

- to freeze the movement, the image integration time is in the range of 1 ms,
- in that limited integration time, the quantity of light must be sufficient to capture an interpretable image.

The following sections of this document draw a **comparative evaluation of Xenon flash and LEDs technologies.**

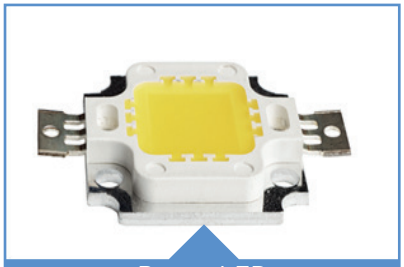
Quick technical background



Xenon Flash

Xenon Flash is an electric arc lamp producing intense light thanks to gas ionization. Xenon flash work in pulsed mode only.

LEDs are semiconductors able to produce light when submitted to a current. They mostly operate in continuous mode.

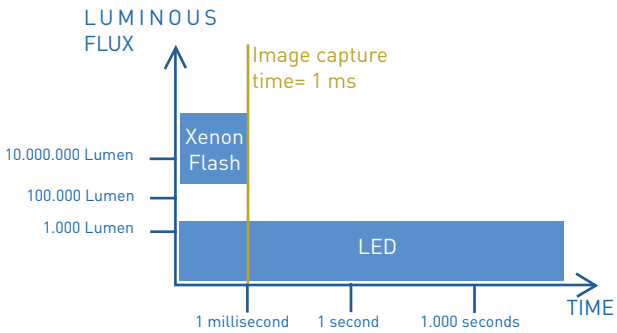


Power LED

Comparison of luminous flux

Luminous flux (in lumen) is a measure of the total amount of light produced by a device and the luminous efficacy (in lumen / watt) is the ratio of luminous flux to power consumption. By definition, whatever the technology converting electricity into white light, 350 Lm/W is the maximum achievable efficacy .

Typical operating area Luminous Flux / Time : Xenon flash is far more luminous than LED



Practical example: evaluation of the luminous flux generated by 2 devices currently on the market

	LEDs *	Xenon Flash **
Typical power per light source	4,6 W	250 000 W
Typical luminous efficacy	125 Lm/W	50 Lm/W
Luminous Flux (Power x Efficacy)	575	12.500.000

*data from LED Ref CREE XM-L2 Coolwhite- group U2
** data from Xenon Flash Phoxene Fx-1

In 1 ms the Xenon Flash generates about 20 000 times more luminous flux than LEDs

Comparison of overall illuminator dimensions

For a given illuminator, the beam intensity is directly proportional to the light source surface brightness. To balance their lower surface brightness, LEDs are assembled into large panels. The Xenon Flash brighter source leads to smaller illuminator than the LED's one.

Practical example: comparison of sizes of 2 illuminators producing same beam intensity

	LEDs *	Xenon Flash **
Typical surface brightness	35 Lm/mm2	11 250 Lm/mm2

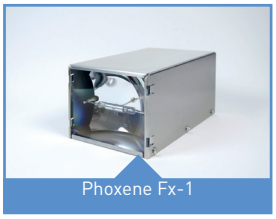
*data from LED Ref CREE XM-L2 Coolwhite- group U2
** data from Xenon Flash Phoxene Fx-1

In 1 ms, for similar beam sizes and intensities, a LED illuminator would be 320 times larger than a Xenon Flash illuminator

Practical illustration

To confirm the calculations detailed here-above, an experiment was conducted with 2 commercial illuminators designed for Road Traffic applications : one LED and one Xenon Flash.

Illuminators are of comparable size and power
Pictures of both beams projected on a black wall


Phoxene Fx-1


Commercial LED illuminator

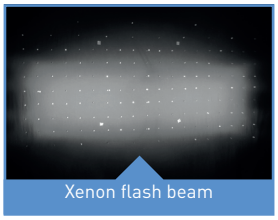

Xenon flash beam

Image of Xenon flash is **3 times** larger than LED beam one

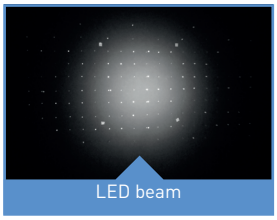

LED beam

Image amplified **100 times** to simulate a comparable light intensity

Confirmed by experiment, in Traffic enforcement and an integration time of 1ms to freeze the movement, a Xenon Flash illuminator produces 300 times more light than an LED illuminator

Xenon flash is the designated technology for speed traffic enforcement application:

- **it produces, in a short timeframe, much more light than other technologies,**
- **it meets the requirements of high speed vehicles image capture by freezing the movement in an integration time shorter than 1 ms.**