

The logo for Quarton, featuring the word "Quarton" in white text on a red rectangular background.

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QUARTON INC.

Laser Safety Information

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Laser Regulation Introduction

Laser Hazard Classes

The Food and Drug Administration (FDA) recognizes four major hazard classes (I to IV) of lasers, including three subclasses (IIa, IIIa, and IIIb). The higher the class, the more powerful the laser and the more potential to pose serious danger if used improperly.

Approximate IEC equivalent classes are included for products labeled under the classification system of the International Electrotechnical Commission.

Laser Hazard Classes

Class FDA	Class IEC	Laser Product Hazard	Product Examples
I	1, 1M	Considered non-hazardous. Hazard increases if viewed with optical aids, including magnifiers, binoculars, or telescopes.	<ul style="list-style-type: none"> • laser printers • CD players • DVD players
IIa, II	2, 2M	Hazard increases when viewed directly for long periods of time. Hazard increases if viewed with optical aids.	<ul style="list-style-type: none"> • bar code scanners
IIIa	3R	Depending on power and beam area, can be momentarily hazardous when directly viewed or when staring directly at the beam with an unaided eye. Risk of injury increases when viewed with optical aids.	<ul style="list-style-type: none"> • laser pointers
IIIb	3B	Immediate skin hazard from direct beam and immediate eye hazard when viewed directly.	<ul style="list-style-type: none"> • laser light show projectors • industrial lasers • research lasers
IV	4	Immediate skin hazard and eye hazard from exposure to either the direct or reflected beam; may also present a fire hazard.	<ul style="list-style-type: none"> • laser light show projectors • industrial lasers • research lasers • lasers used to perform LASIK eye surgery

Are Class IIIa Laser pointers dangerous?

Class IIIa or IEC Class 3R lasers can be dangerous. Class IIIa lasers can cause temporary visual effects such as flash blinding, which could distract or startle the person exposed.

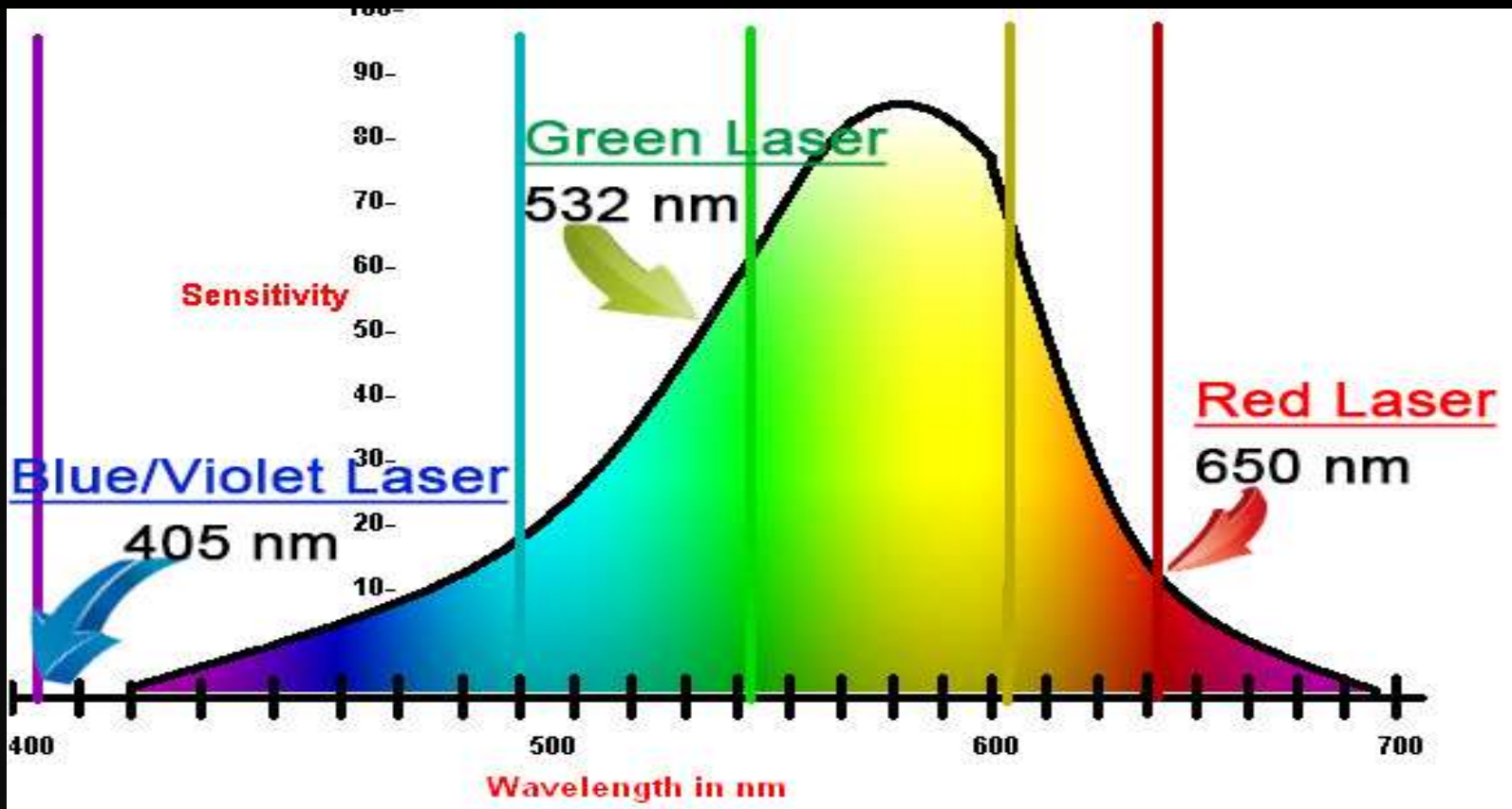
The risk of injury is very small when Class IIIa pointers are used responsibly because natural body motion of a person holding the pointer or motion of a person who might be exposed makes it difficult to expose the eyes for a long period of time.

People also have a natural aversion to bright lights and are likely to close their eyes and turn their heads if exposed.

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Color of Laser & Human Eye Sensitivity

Human Eye Sensitivity Spectrum



Green laser (532 nm) is 10 times more visible than red laser (650nm).

Blue Laser (405nm) is not easy to be seen by human eye.

The background of the advertisement features a dark, almost black, field with a series of vibrant, curved light streaks. These streaks transition from a deep red on the left to a bright blue on the right, creating a sense of motion and energy. The streaks are thin and slightly blurred, giving them a dynamic, ethereal appearance.

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Red Laser Pointer

Why does red laser pointer need APC?



Higher Temperature :
Lower Laser Output Power



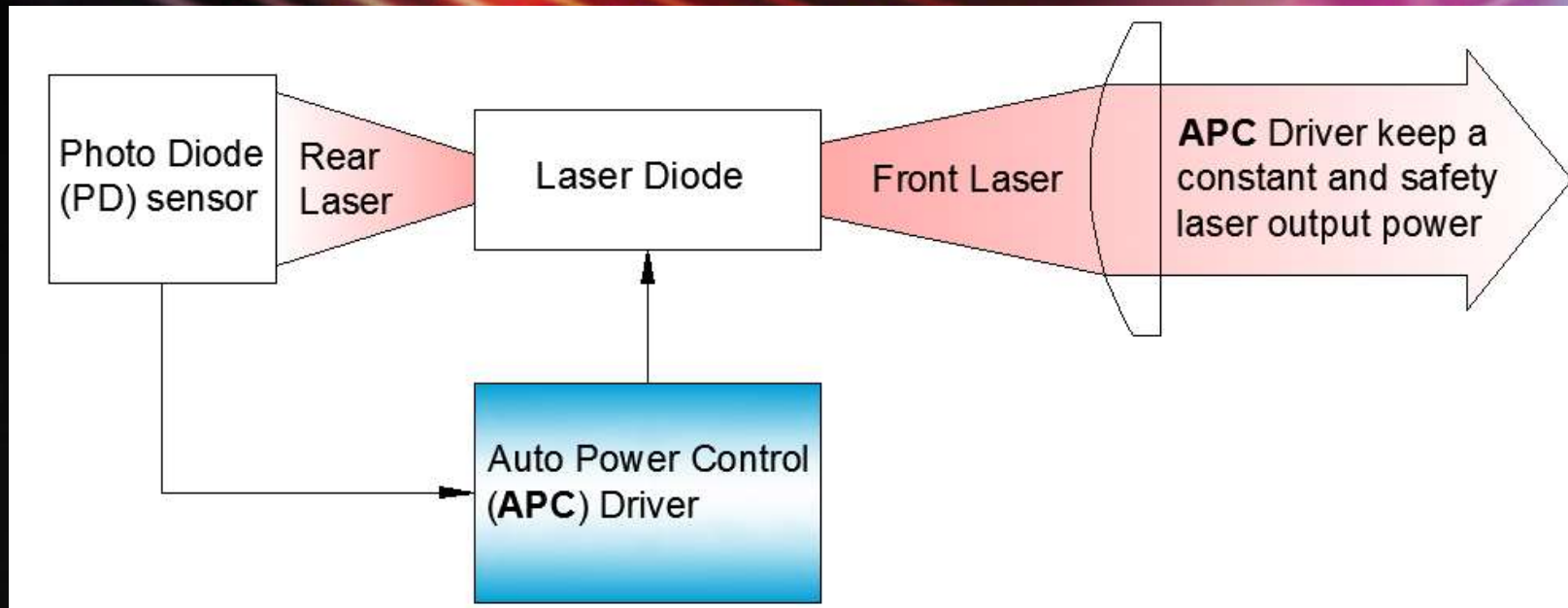
Lower Temperature :
Higher Laser Output Power

Therefore,

The laser module without APC (auto power control) driver would have much higher output power (higher than 5 mw), when the temperature is low. This is not safe.

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Why does red laser pointer need APC?



The APC (auto power control) Driver controls the photo diode (PD) so the laser output keeps at a constant and safe power level

Those cheap red laser pointers on the market do not integrate APC into their lasers in order to save the cost.

The logo for the brand 'Quarton' is displayed in white text on a red rectangular background in the upper left corner of the image.

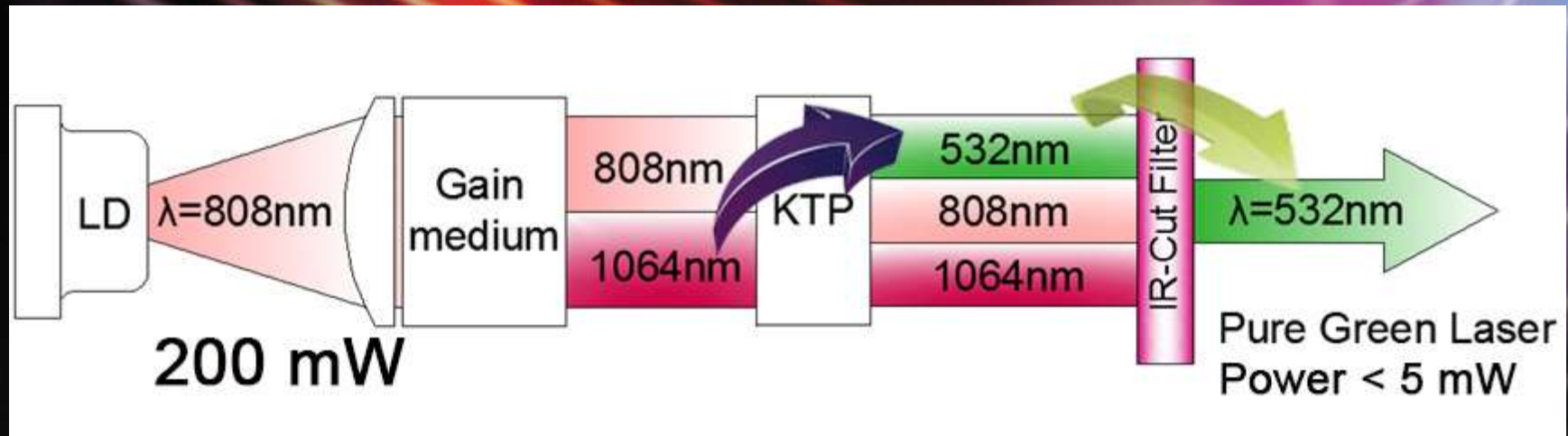
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The main title 'Green Laser Pointer' is centered in the lower half of the image. The text is rendered in a bold, yellow-orange font with a white outline, set against a dark background with abstract, colorful light trails in shades of red, orange, and blue.

Green Laser Pointer

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Why does green laser pointer need IR filter?



Without IR-cut filter, three wave lengths will come out of the aperture: 808 nm IR, 1064 nm IR, and 532 green laser

Most of cheap green laser pointers do not have IR-cut filter so that the manufacturer can save cost.

The output power of these illegal lasers are all above 50-100 mW that include green lasers and IR lasers.

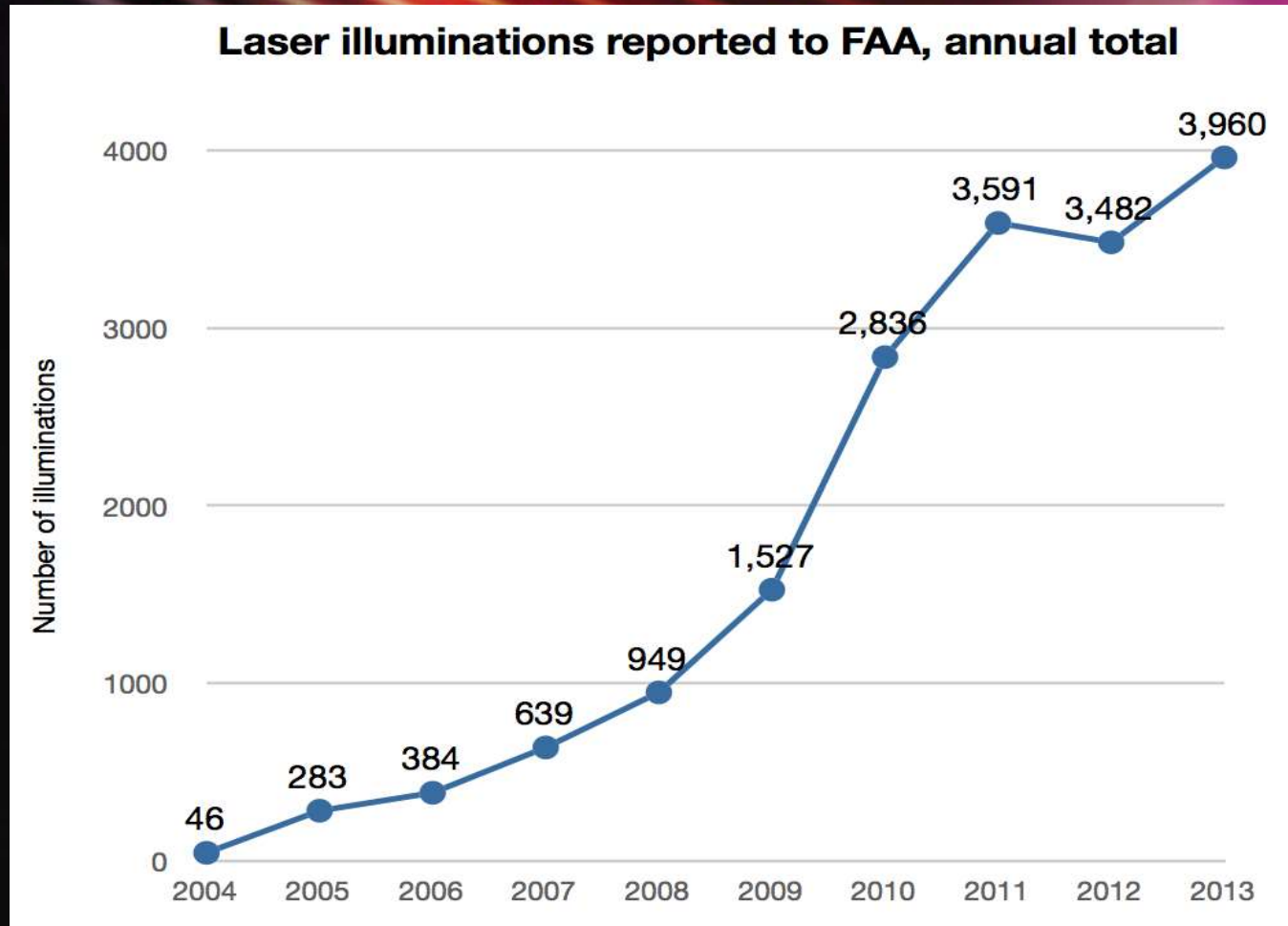
The background features a series of curved, overlapping light trails in shades of red, orange, yellow, and blue, creating a sense of motion and depth against a dark background.

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The danger of Cheap Green Laser Pointer

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Laser / Aircraft Incident statistics



Non-Aircraft Incident new:

<http://www.laserpointersafety.com/news/news/nonaviation-incidents.php>

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The background of the slide features a series of curved, glowing lines in shades of red, orange, and blue, creating a sense of motion and light. The text is centered in the lower half of the image.

Blue/ Violet Laser Pointer

Why are most blue/violet laser pointers dangerous and illegal?

- Human eyes barely can see blue/violet laser dot, because it is 405 nm laser, very close to UV light.
- **The only way** to let humans see a visible blue/violet laser dot is to make the output power more than 5 mW. However, it is illegal to make the output power of laser pointer more than 5 mW.
(According to our tests, the output power of this kind of laser pointers on the market are over 60 mW.)
- If the strong UV light is able to damage our skin, then it is not hard to image how dangerous when the blue/violet laser is shot into eyes.

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News about Eye Injury

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News about Eye Injury

Hobbyist injures self with 1 watt blue laser Dec 19 2011

A laser hobbyist was injured by a 1 watt 445 nanometer (blue) laser on December 6 2011. The injury required unspecified surgery, possibly removal of intraocular blood via needle. Two days after the surgery, the hobbyist reported a blurry dark circle in his central vision. His doctor told him he would always have a small off-center blind spot, and that his brain would “auto-correct” to fill in the spot.

(UPDATE March 14 2012: The hobbyist reported “I still have the blind spot, and was effectively told by the ophthalmologist that it would probably be there the rest of my life. That doesn't bother me TOO much, since it isn't very inhibiting.”)

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News about Eye Injury

Hobbyist injures self with 1 watt blue laser Dec 19 2011

How the injury occurred

The hobbyist's laser was on a chair, creating a "liquid sky" effect. This involves having the beam scan or expand into a line, in order to illuminate a thin cross-section of smoke or fog.

The laser fell off the chair. As it fell, the beam hit the hobbyist for "about 1 second" in his right eye. He experienced a dark red blur in the center of his vision. There was no pain. (This is to be expected, at least initially, since the retina has no pain receptors.)

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News about Eye Injury

Hobbyist injures self with 1 watt blue laser Dec 19 2011

Initial medical treatment

After a few hours with no improvement in vision, he posted his experience to the website. A number of persons advised him to immediately seek medical attention.

The hobbyist took their advice and drove to an emergency room. “Driving with one eye was a new experience in itself,” he stated. He waited five hours for a doctor, who told him to go to an “eye foundation hospital”. He did so.

At the eye foundation hospital, a retina specialist said the loss of vision was due to blood covering the retina, and it could clear up within a month or so.

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News about Eye Injury

Hobbyist injures self with 1 watt blue laser Dec 19 2011

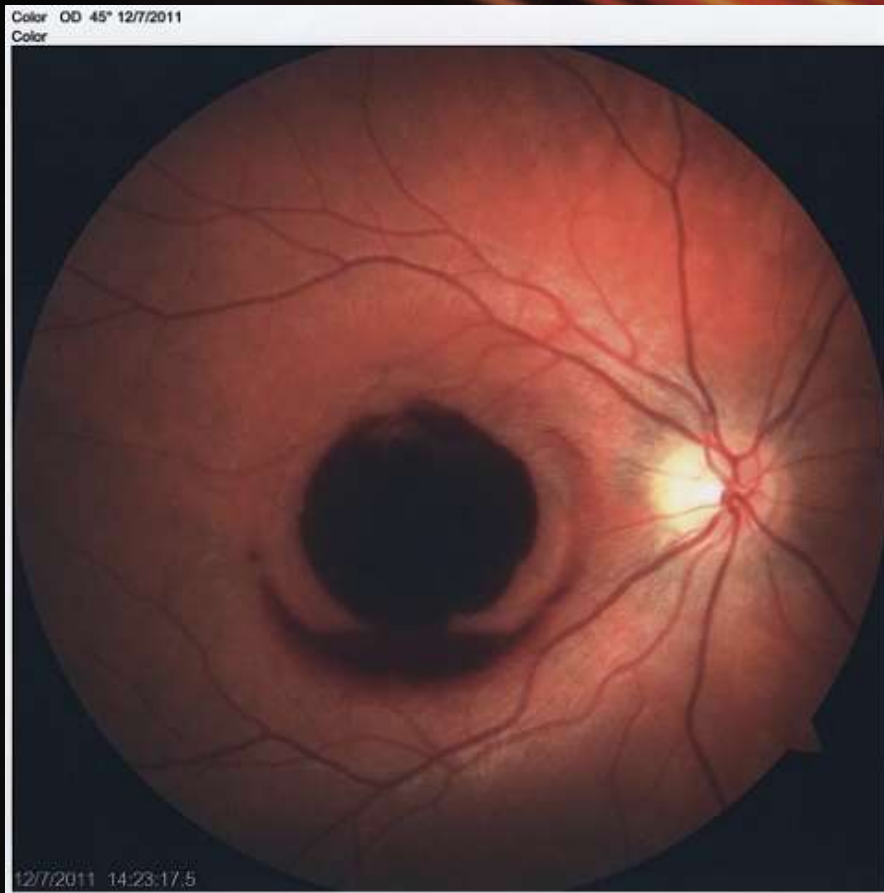


Photo of the hobbyist's retina, with blood covering the center of the retina.

The logo for 'Quarton' is displayed in white text on a red rectangular background in the top-left corner of the slide. The background of the entire slide is black with a series of curved, glowing lines in shades of red, orange, and blue that sweep across the frame from the top-left towards the bottom-right.

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**Aiming lasers at aircraft
is not safe**

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Aiming lasers at aircraft is not safe

The beam CAN hit an aircraft

If you aim a laser beam into the sky, it may seem to end, as shown in this unretouched photo:



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Aiming lasers at aircraft is not safe

The beam CAN hit an aircraft

However, this is a visual illusion, as detailed here. The beam actually continues even if the light is no longer scattered back to your eyes. Some people have been arrested because they thought the beam could not reach an aircraft -- but it definitely can! From the air, the beam can look like this:



The background of the slide features a series of colorful, curved lines that resemble laser beams or light trails. The colors transition from dark purple and blue on the left to bright yellow and orange on the right, creating a sense of motion and energy.

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Aiming lasers at aircraft is not safe

The beam CAN hit an aircraft

Obviously, seeing such a beam is distracting to pilots. This is one reason you should never aim at or near an aircraft.

Also, notice that the beam points right back down to the laser's location. This makes it easy for a police helicopter to direct ground officers for an arrest, as described later on this page.

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Aiming lasers at aircraft is not safe

Distracting or flashblinding pilots is dangerous

Another problem is that the beam is much larger at long distances than you might think. Even though the laser projects a small, millimeter-sized dot close up, at longer distances the beam can be many inches across.

When the beam hits the windscreen of a cockpit, or the bubble of a helicopter, imperfections in and on the glass spread the light out even

more:



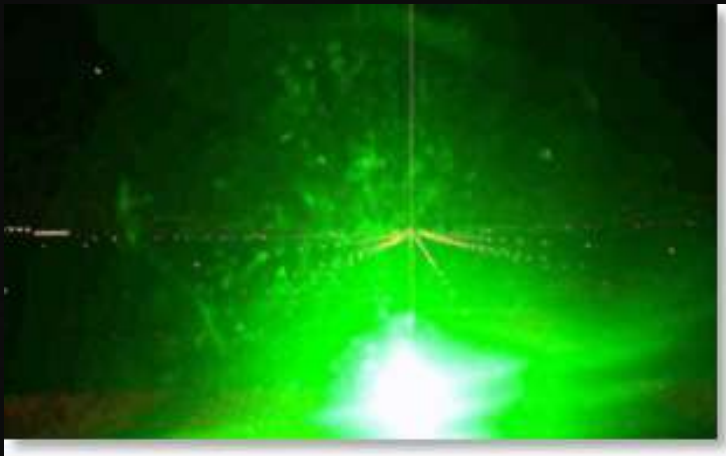
The two pictures above are from a video of a police helicopter incident.

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Aiming lasers at aircraft is not safe

Distracting or flashblinding pilots is dangerous

Laser light in the pilot's eyes causes glare (inability to see past the light). At higher power levels, it can also cause temporary flashblindness and afterimages (like when you look at a bright camera flash, and cannot see for a many seconds afterwards). Since the beam can't be held completely steady on the cockpit, pilots experience one or more of these bright flashes:



Glare -- the pilot cannot see past the light as long as the laser is on the cockpit windscreen.

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Aiming lasers at aircraft is not safe

Distracting or flashblinding pilots is dangerous

Flashblindness and afterimage -- the pilot cannot see until the afterimage has faded.



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Aiming lasers at aircraft is not safe

Distracting or flashblinding pilots is dangerous

To make things even worse, a pilot being targeted may also be worried about eye damage and eye injuries, and the possibility of the laser being an aiming device on a weapon. A worried pilot is a distracted pilot -- not a good thing during critical flight phases such as landings, takeoffs and emergency maneuvers.

For all these reasons -- and especially due to the distraction, glare and flashblindness effects -- you should **NEVER** point a laser towards an aircraft

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THE END.

THANK YOU.