

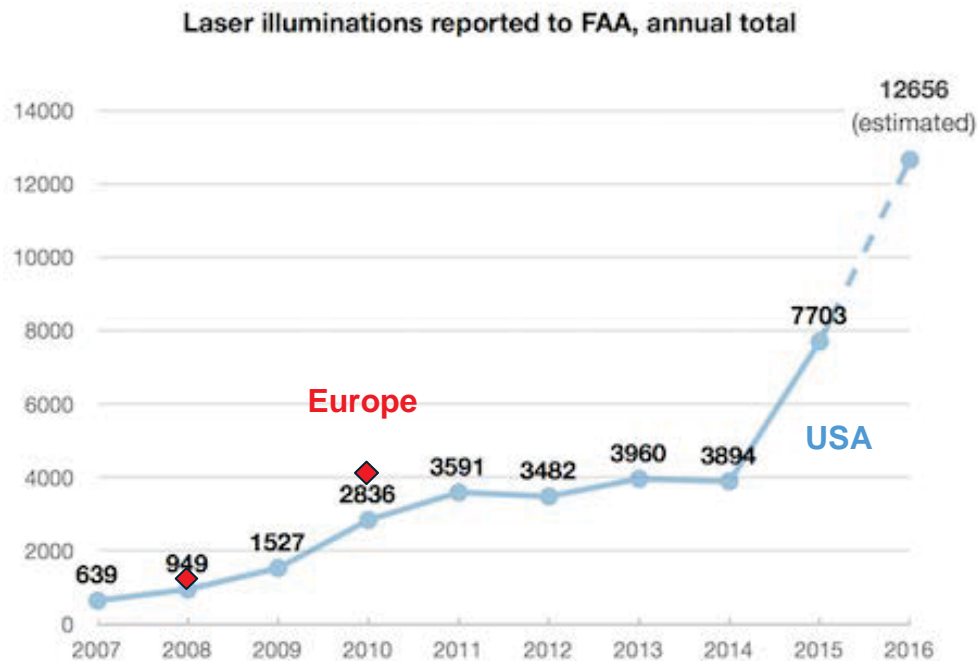
Safety and Security Innovations

1 Aircraft Ground Surveillance

2 Cockpit Laser Illuminations



Cockpit Laser Illuminations - Occurrences



FAA Simulations
(Steady Illuminations)

- 93% of attacks are **Green** Lasers
- Mainly at night, during approach & TO
- Possible eye injuries
- **MEDIUM** Risk but **HUGE** occurrence !

Cockpit Laser Illuminations – Laser Threat

- Laser power “class IV” easy to find (*more than 500mw*)
- General tendency for Power and availability increases ↗ while cost decreases ↘



Product ID: 2032233367 Big Discount!!!5mw 10mw 50 mw 100mw 200mw 500mw 1000mw Cheapest Pointer Laser Light Free Shipping

3 orders

Price: **US \$10.60** / piece

Shipping: **Free Shipping**
Estimated Delivery Time: 15-34 days (ships out within 5 business days)

Max. Output: 5mW 10mW 50mW 100mW 200mW 500mW **1000mW**

Power:

Color: **Green**

Quantity: 1 piece

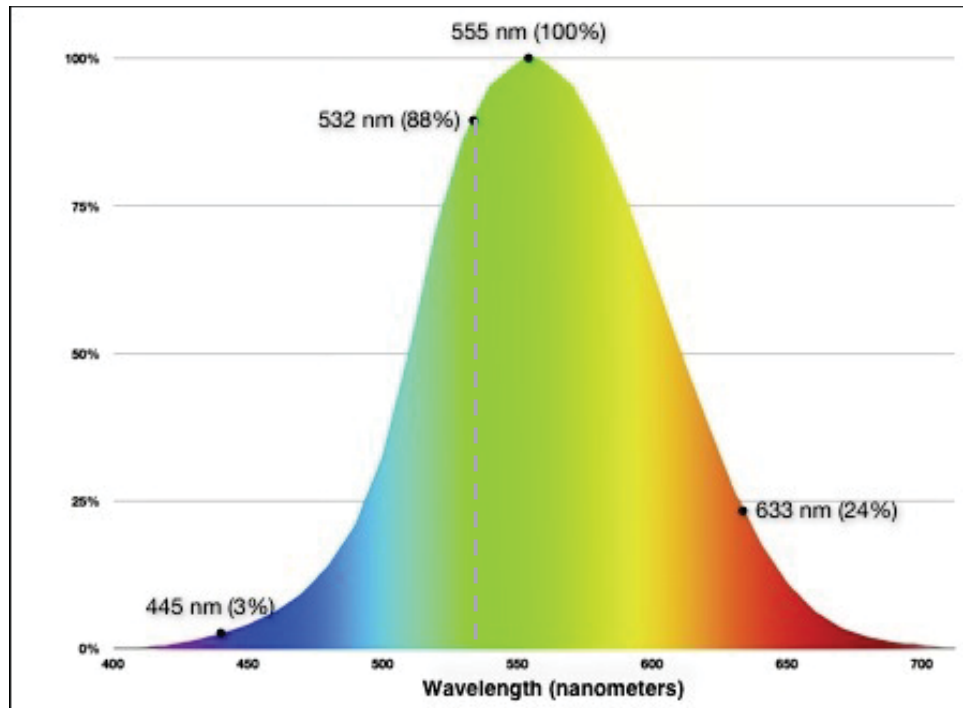
Total Price: **US \$10.60**

Buy Now **Add to Cart**

♥ Add to Wish List (2 Adds)

Example of worldwide website

Cockpit Laser Illuminations – Laser Threat

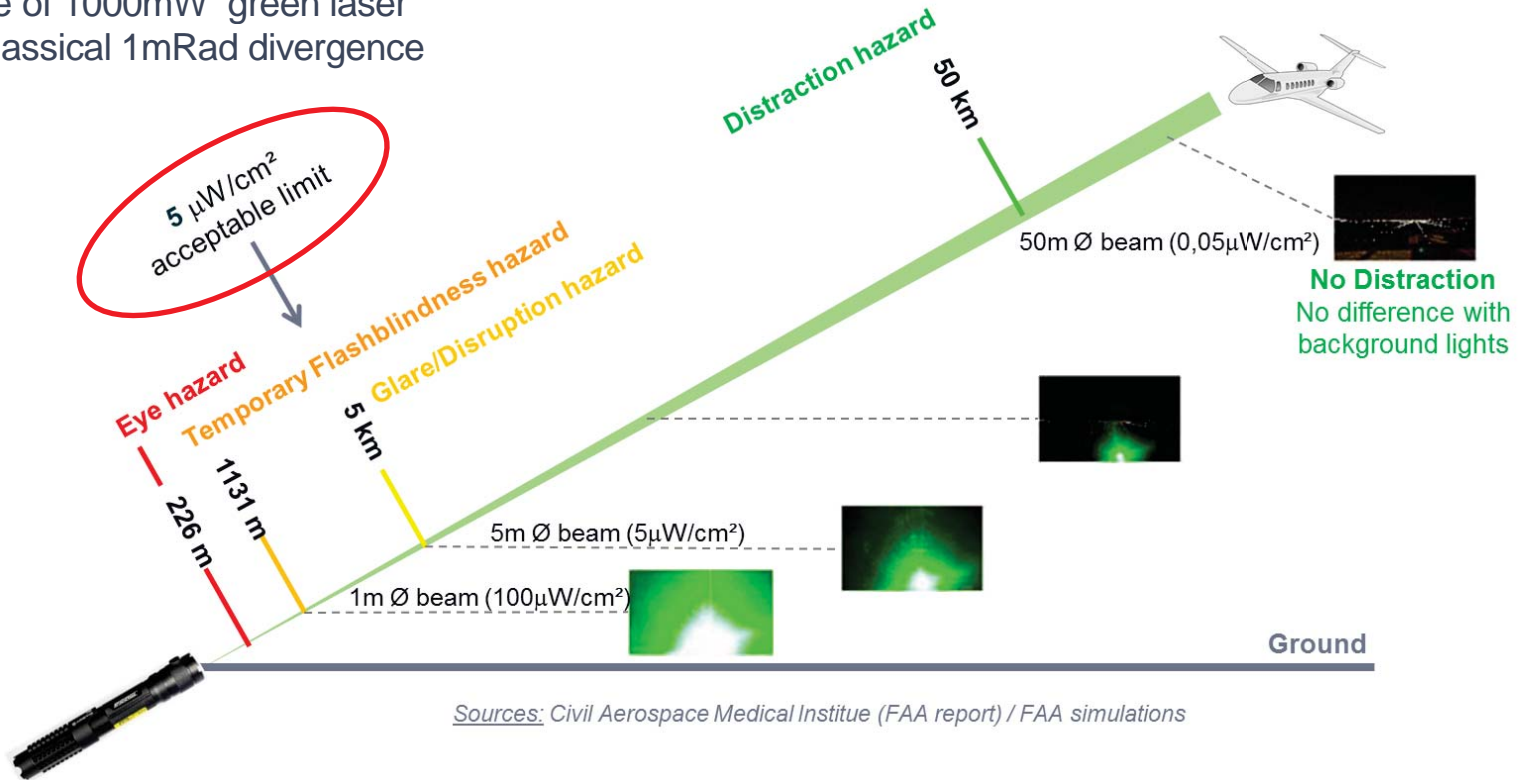


Green laser light is:

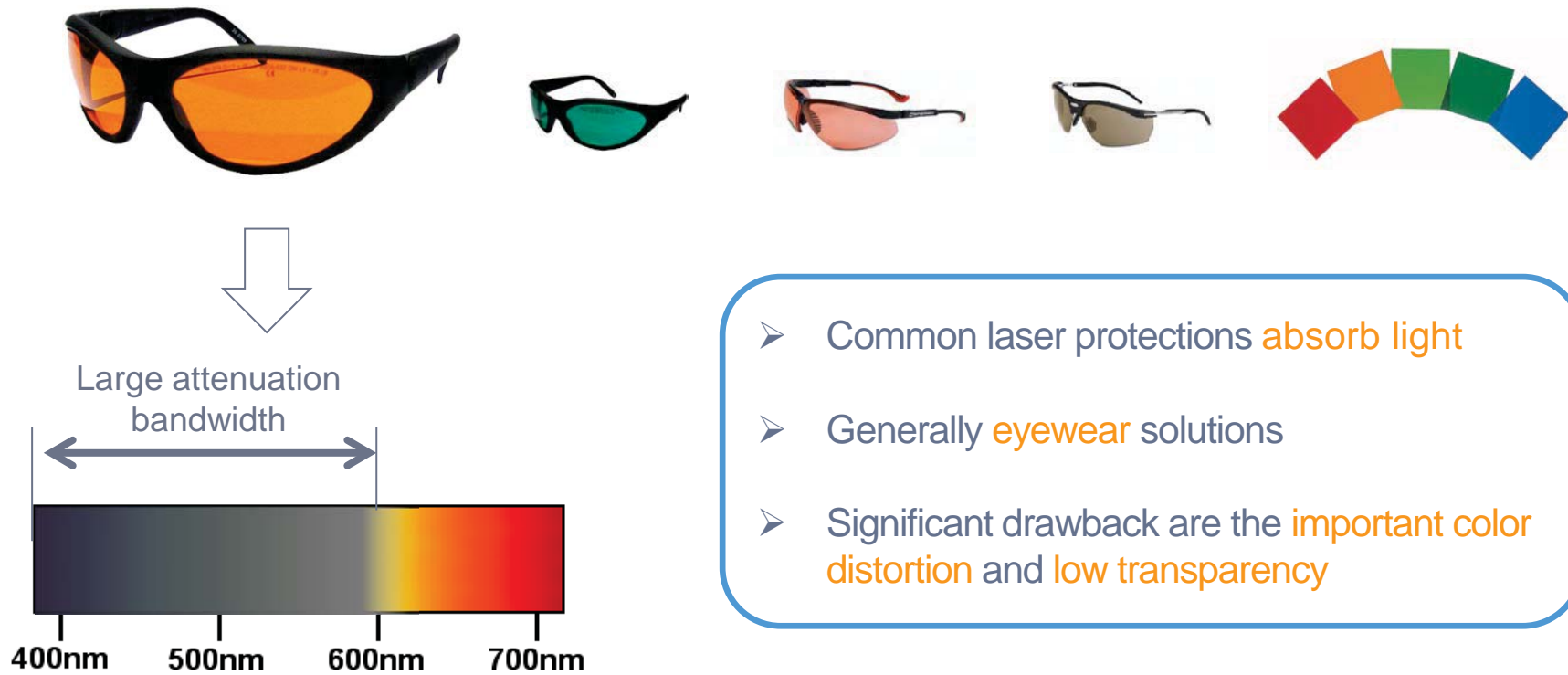
- very **narrow** wavelength (532nm)
- close to the **eye's peak sensitivity**
- appear **brighter** than other colors.

Cockpit Laser illumination - Safety Impact (Human eye)

- Example of 1000mW green laser with a classical 1mRad divergence



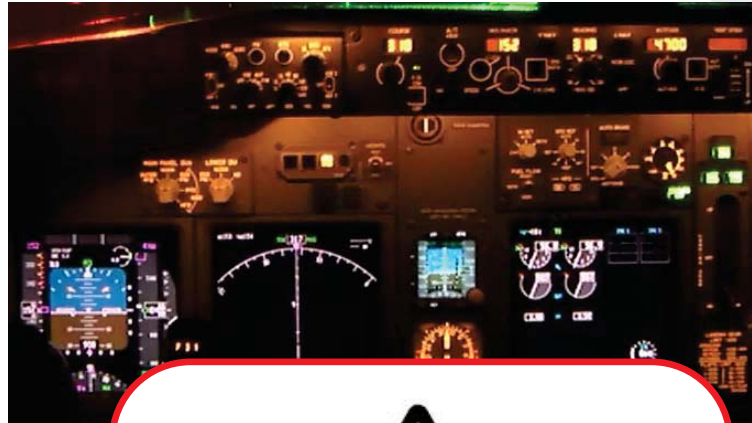
Cockpit Laser illumination – Classic optical protections



- Common laser protections **absorb light**
- Generally **eyewear** solutions
- Significant drawback are the **important color distortion** and **low transparency**

Cockpit Laser illumination – Classic optical protections

Example of « **Green** » filtering glasses.



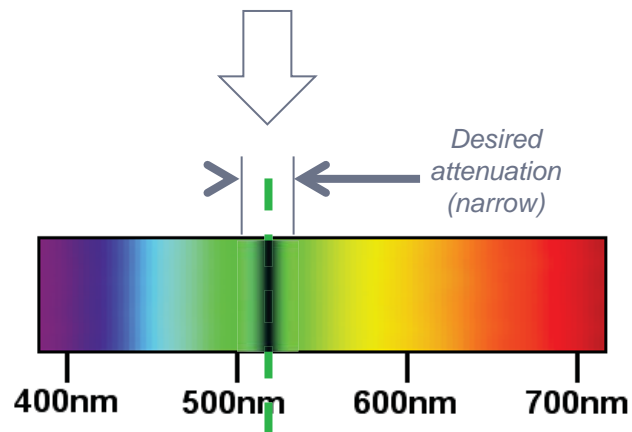
Example of « **Red** » filtering glasses.



Not compatible with
SAFE aircraft Operation



Cockpit Laser illumination – Innovative Metamaterial protections



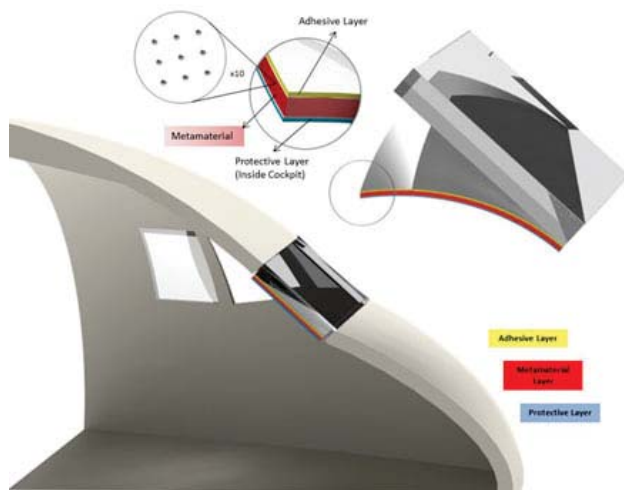
Green laser characterized by narrow 532nm wavelength

Innovative Metamaterial Protection

- Highly selective and transparent
- Allow safe aircraft navigation
- Possible to produce large surfaces

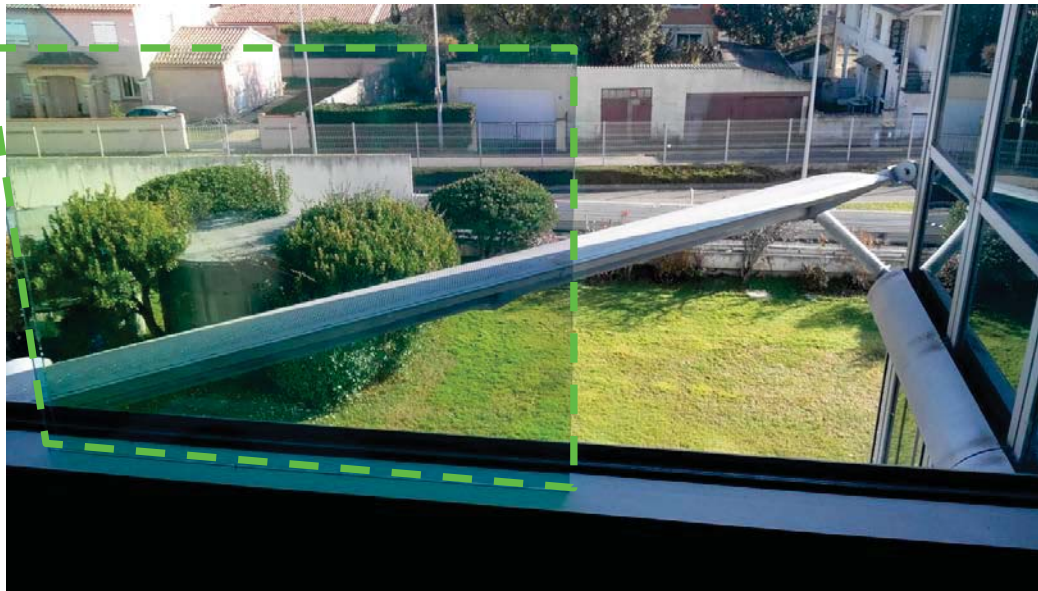
Cockpit Laser illumination – Cockpit protection

Objective is to develop the technology to an **aircraft integrated cockpit protection**...



- ✓ Reduce laser illuminations to a safe optical level
- ✓ Comply with safe flight operations (*even at night*)
- ✓ Be compliant and integrated to aircraft environment
- ✓ Retrofit on all aircraft

Cockpit Laser illumination – Cockpit protection prototypes

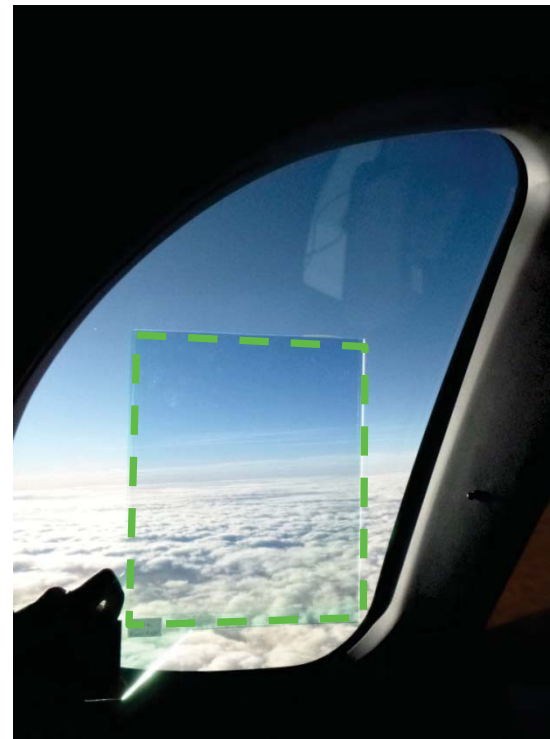


30cm x 30cm prototype (mid 2015)

- ✓ x80 times attenuation at 532nm
- ✓ Very narrow attenuation (15nm)
- ✓ >85% Light transmission

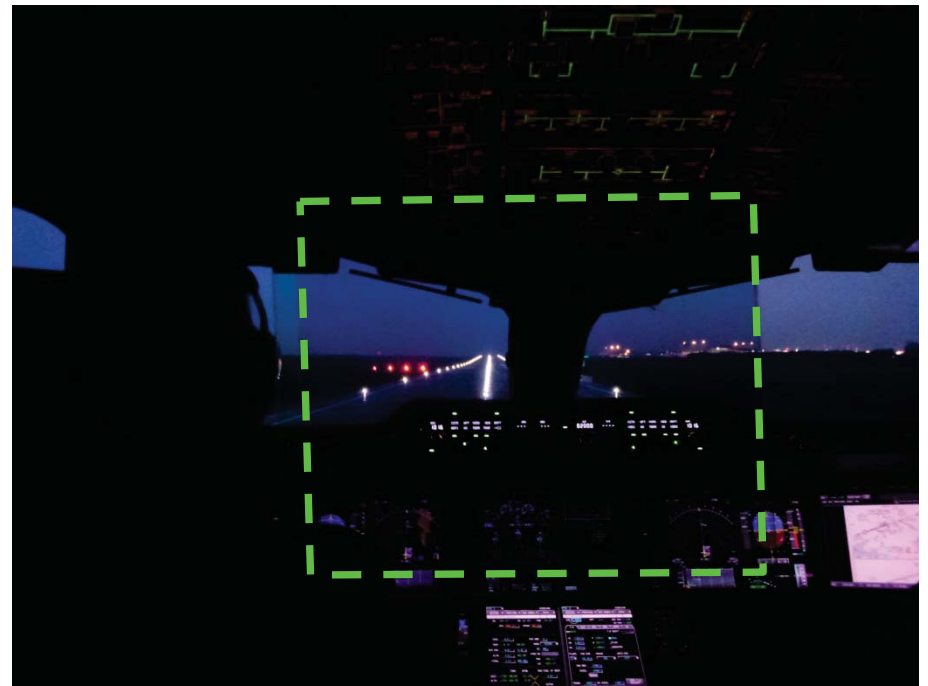
Cockpit Laser illumination – Cockpit protection prototypes

A350 flight test (*January 2016*)

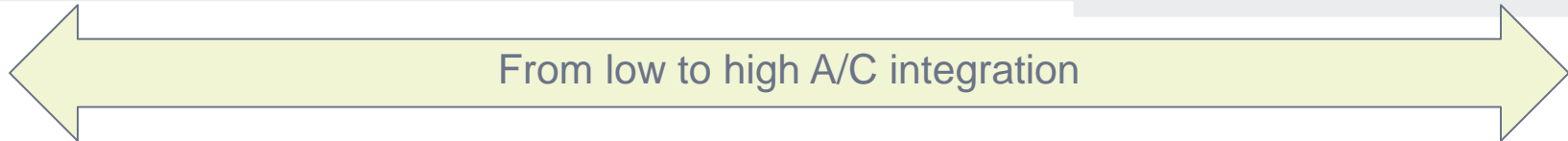


Cockpit Laser illumination – Cockpit protection prototypes

A350 flight test (January 2016)



Cockpit Laser illumination – Possible products and integration to aircraft



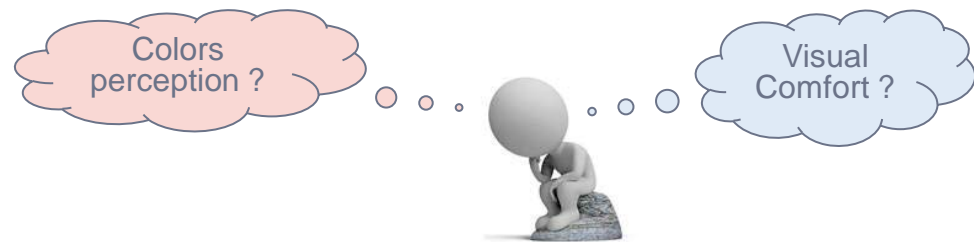
Protective Goggles



Retractable shields



Permanent windscreen filter



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