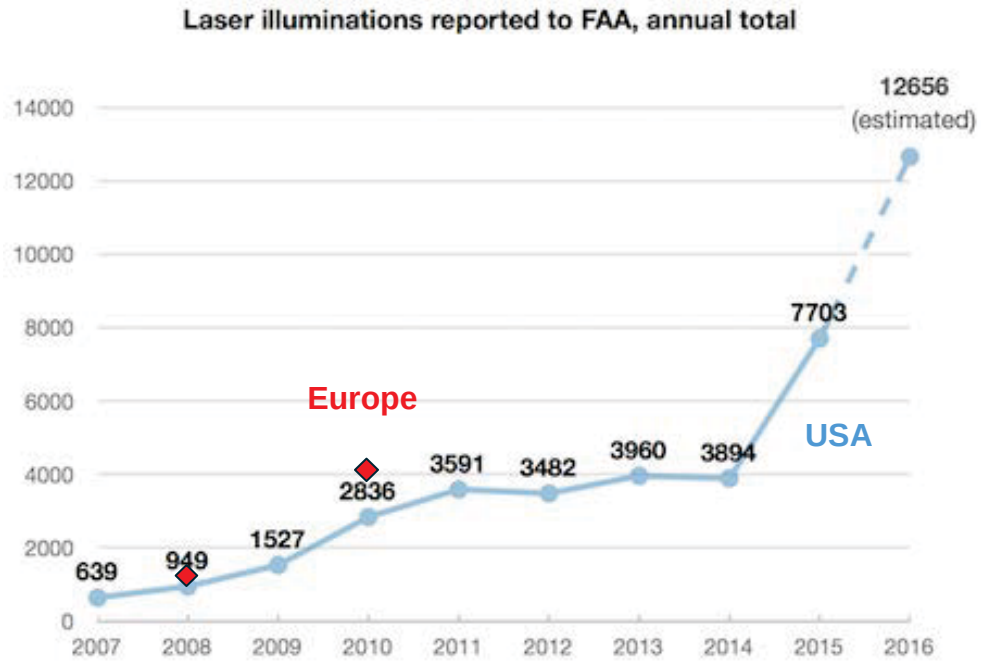
Safety and Security Innovations

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 !

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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 ↘

Example of worldwide website

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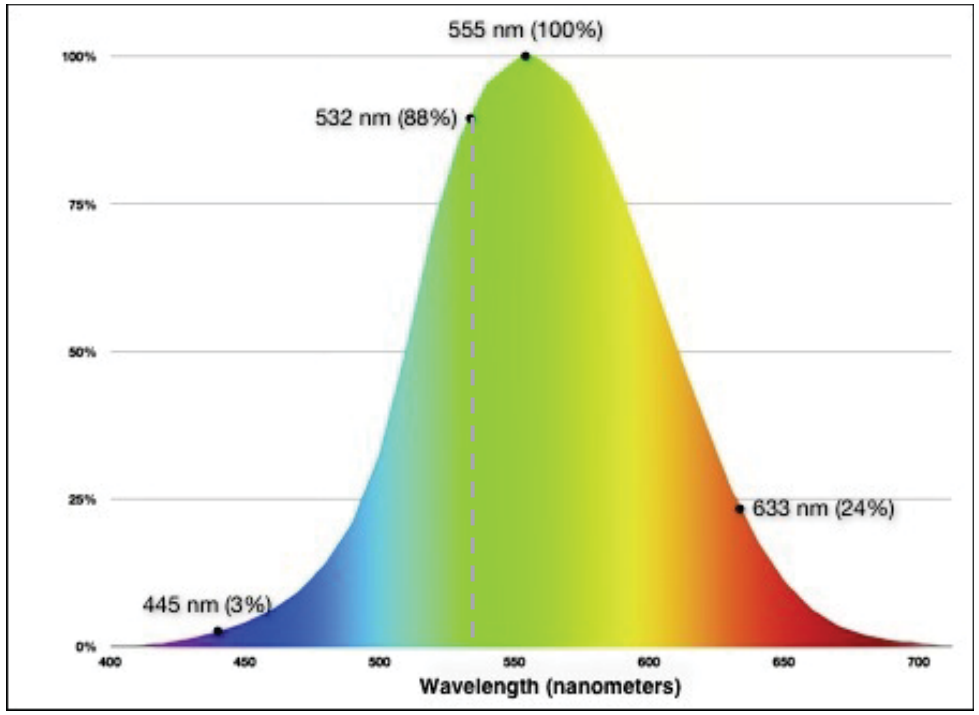
Cockpit Laser Illuminations – Laser Threat



Green laser light is:

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

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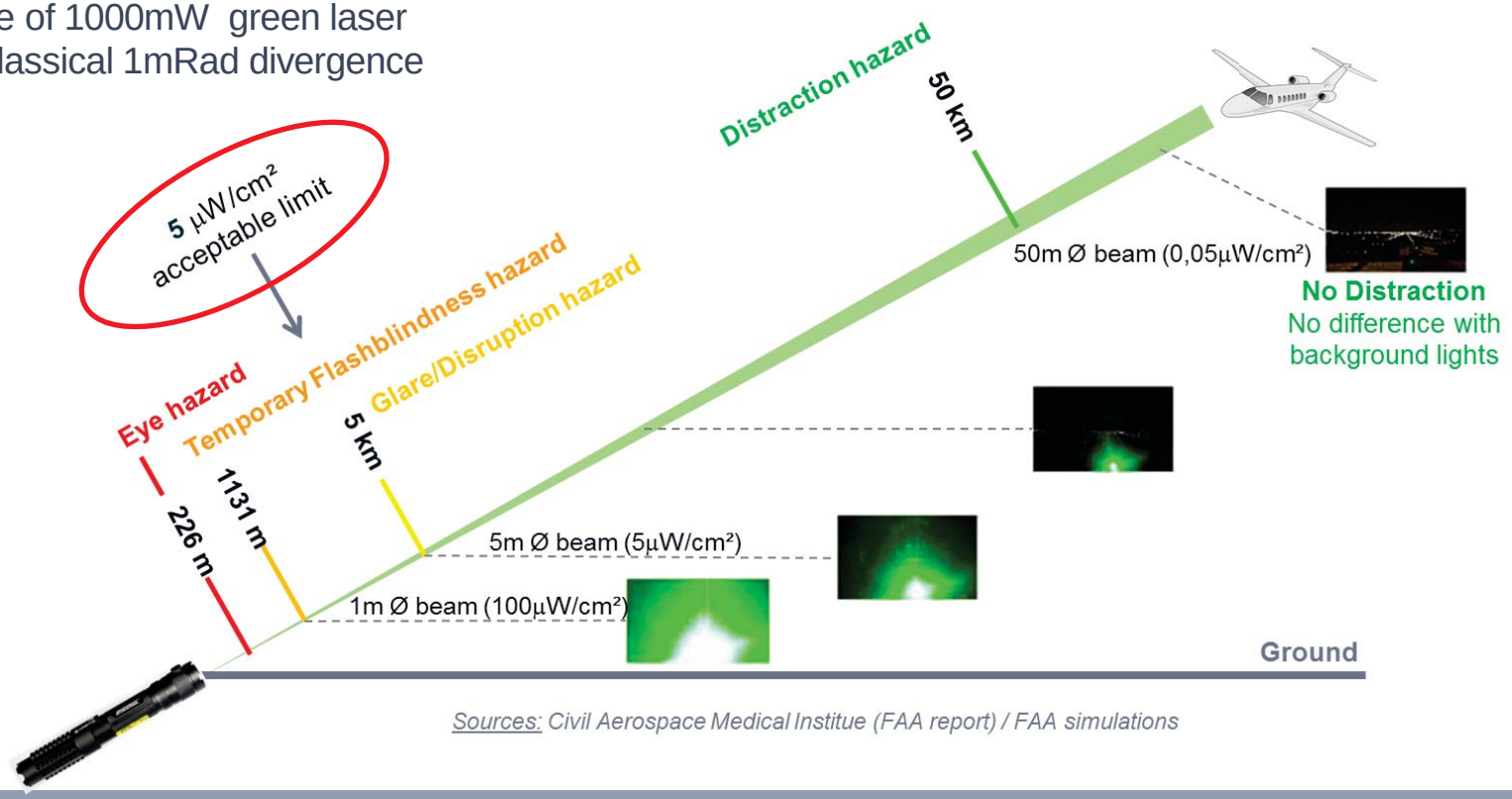
Cockpit Laser illumination - Safety Impact (Human eye)

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



Sources: Civil Aerospace Medical Institue (FAA report) / FAA simulations

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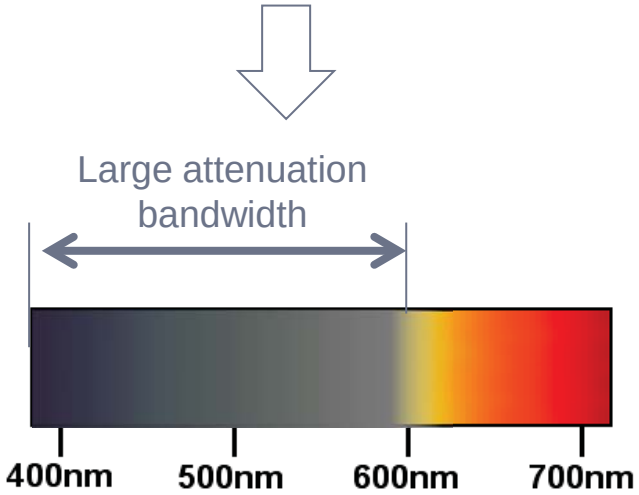
Cockpit Laser illumination – Classic optical protections







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

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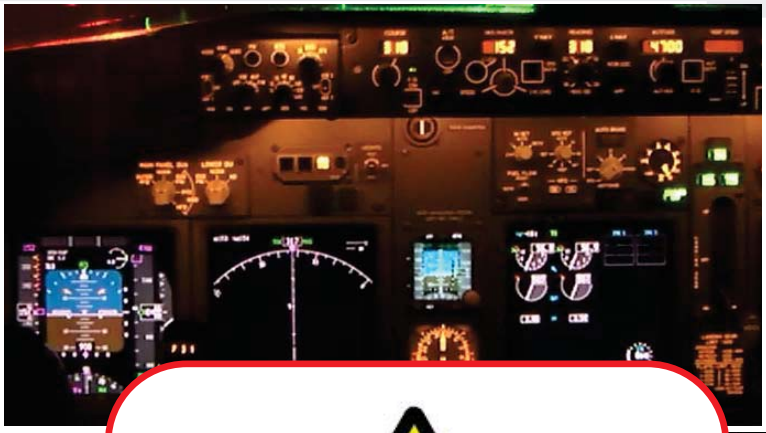
Cockpit Laser illumination – Classic optical protections

Example of « Green » filtering glasses.



Example of « Red » filtering glasses.

Not compatible with

SAFE aircraft Operation

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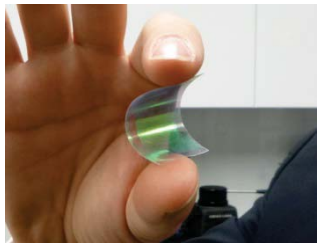
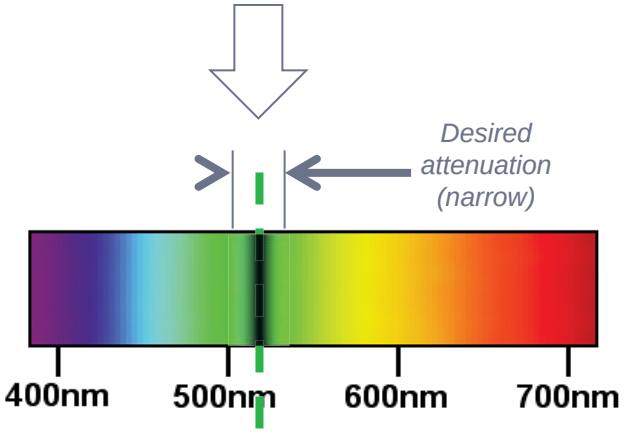
Cockpit Laser illumination – Innovative Metamaterial protections





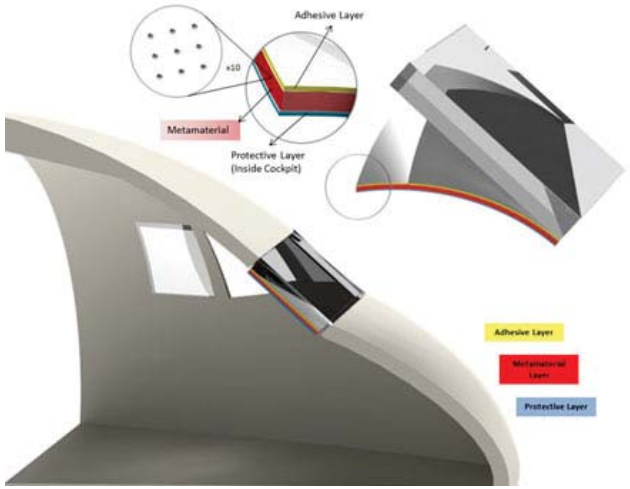
Green laser characterized by narrow 532nm wavelength

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

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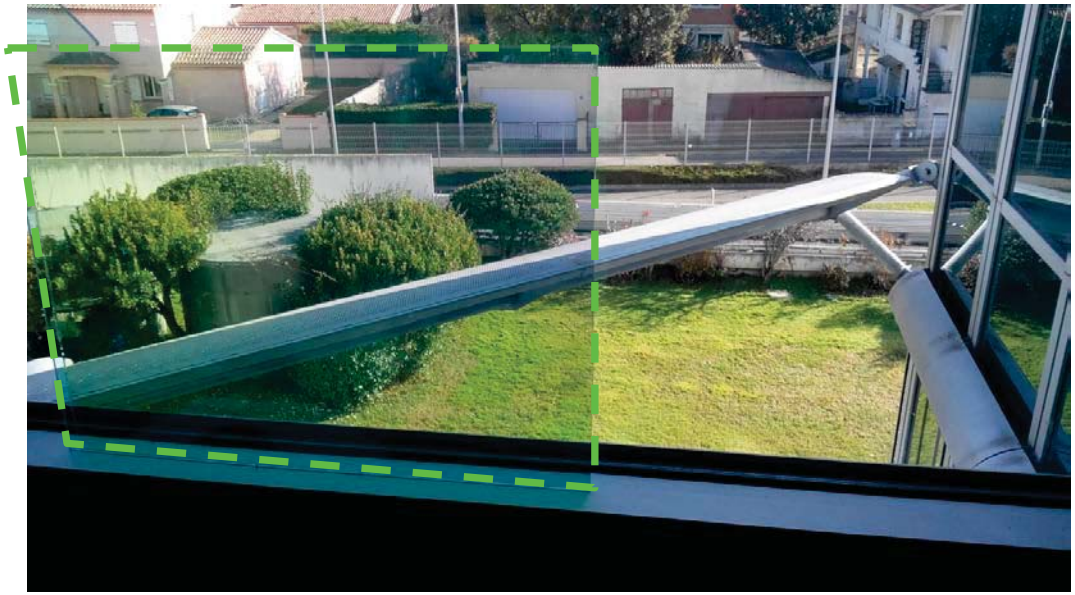
Cockpit Laser illumination – Cockpit protection prototypes



30cm x 30cm prototype (mid 2015)

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

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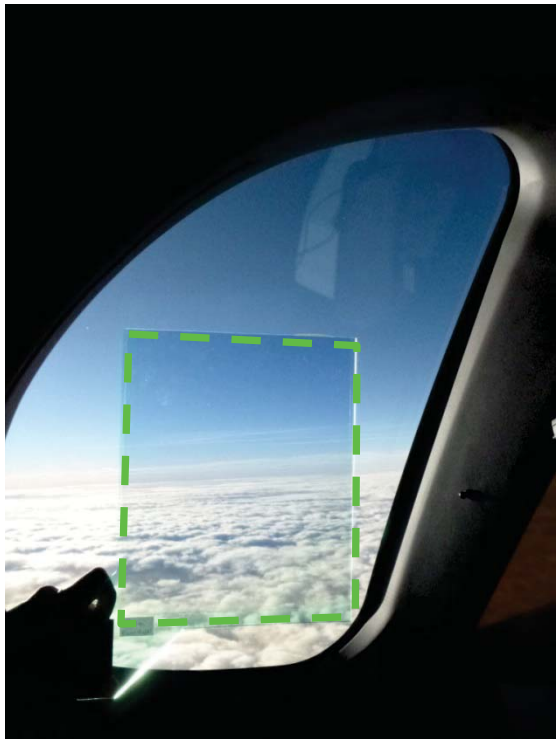
Cockpit Laser illumination – Cockpit protection prototypes

A350 flight test *(January 2016)*



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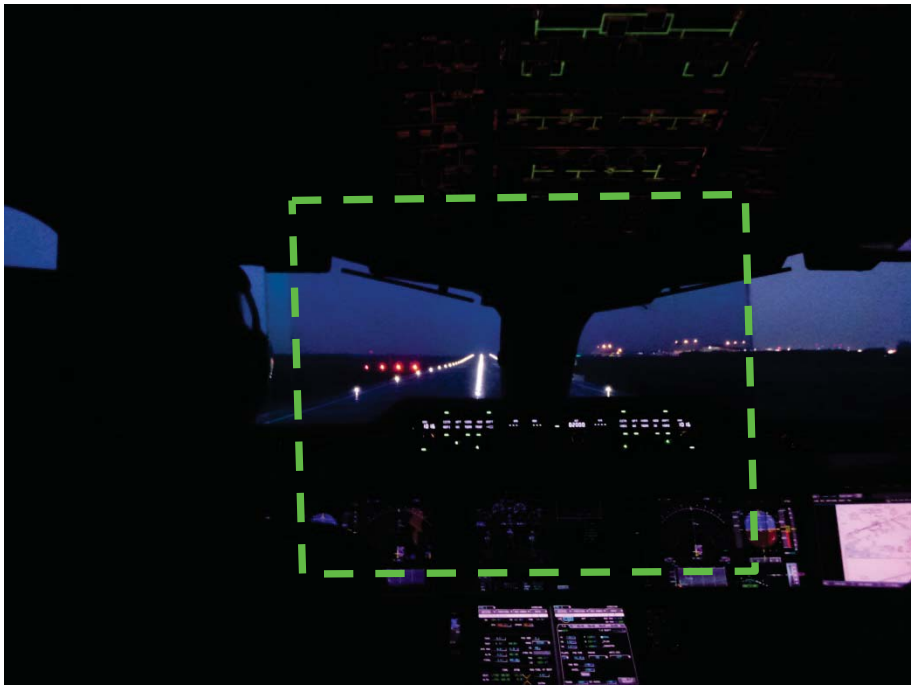
Cockpit Laser illumination – Cockpit protection prototypes

A350 flight test *(January 2016)*



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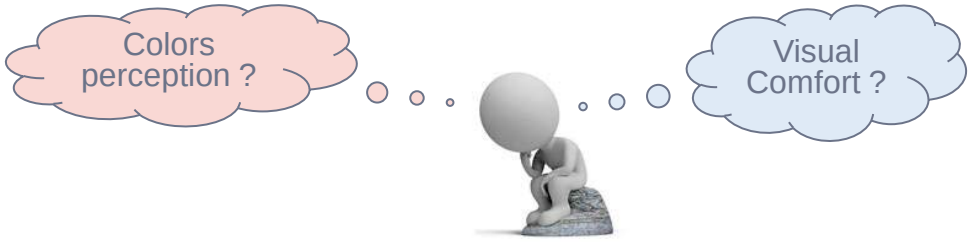
Cockpit Laser illumination – Possible products and integration to aircraft

From low to high A/C integration

Protective Goggles

Retractable shields

Permanent windscreen fliter



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