

Laser Blinding...

Structure and latest results from our
research project at the
Laserzentrum FH Münster (LFM)

Helge Homann; laser blinding
21.11.2013

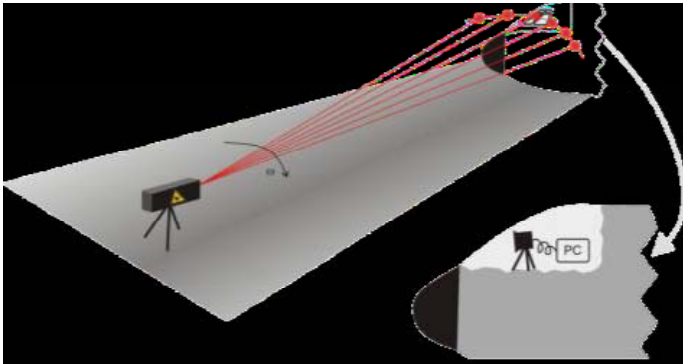


Who is involved?

- Deutsche Gesetzliche Unfallversicherung (DGUV)
- BG Energie, Textil, Elektro, Medienerzeugnisse
- **BG Transport u. Verkehrswirtschaft**
- Deutscher Verkehrssicherheitsrat
- Fachhochschule Köln
- Polizeitechnisches Inst. der Deutschen Hochschule der Polizei
- Bundespolizei-Fliegerstaffel Fuhlendorf
- **Laserzentrum FH Münster (LFM) – lead management**

Method for the research project

- Selection and procurement of laser pointer
- Search for registered incidents and their effects
- Laboratory setup, utilization
- Measurements with different sample material



Method for the research project

- Evaluation of retina incidents
- Evaluation of blinding incidents
- test in place with equipment
- specification of the hazard
- recommendation of precaution
- research for applicable solutions



Initial situation

- Risk of pilots and drivers of public transport*by irradiation of laser pointers has **increased greatly** in the last few years...
- New wavelengths, increasing performance and **availability** in online trades lead to higher abuse by *blockheads*.



newspaper...



*Pilots of transport and cargo aircraft as well as helicopters and drivers of metro, tram, train, bus and taxi

reported incidents in aviation

	2008	2009	2010	2011	2012
<i>France</i>	-	-	600	612	598
<i>Netherlands</i>	-	270	470	492	498
<i>Germany</i>	1	33	273	404	464
<i>Norway</i>	5	119	155	135	146
<i>Sweden</i>	5	87	128	125	132
<i>UK</i>	206	739	1494	1560	1614
<i>USA</i>	-	1527	2836	2950	3058

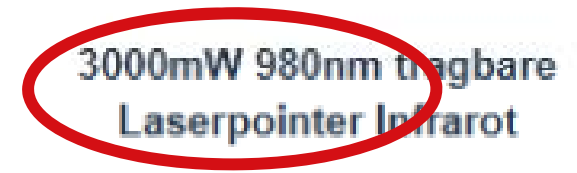
(FAA)

Main Target of the research project

- investigate how things are now (market, utilities)
- discover the kind of hazards
- determine measures (technical, organizational, personnel)
- report to interested circles



what can you buy on the global market?



200mW 980nm Serie
Laserpointer Infrarot

179,43 €

93,62 €

ab: 79,57 €

In den Warenkorb

Auf den Wunschzettel
Auf die Vergleichsliste

300mW 980nm Serie
Laserpointer Infrarot

233,18 €

117,02 €

ab: 99,47 €

In den Warenkorb

Auf den Wunschzettel
Auf die Vergleichsliste

5mW 808nm Laserpointer
Infrarot

81,55 €

54,37 €

ab: 46,54 €

In den Warenkorb

Auf den Wunschzettel
Auf die Vergleichsliste

100mW 808nm Laserpointer
Infrarot

93,37 €

62,25 €

ab: 53,04 €

In den Warenkorb

Auf den Wunschzettel
Auf die Vergleichsliste

3000mW 980nm tragbare
Laserpointer Infrarot

~~807,49 €~~

538,33 €

ab: 495,26 €

In den Warenkorb

Auf den Wunschzettel
Auf die Vergleichsliste

comparison

it is very interesting that most of the laser “pointers“ had more power than specified by the manufacturer...

measured / specified

Leistung/mW	Leistung/mW
	1
	1
	1
	1000
	1000
	500
	100
	500
	100
	500
	100

Hazards

- **primary** hazard: eye injury (**retina**) in the case of laser beam
- **secondary** hazard: temporary blinding in the case of spreading the beam through the cockpit-screen – pilot / pilots are „blind“ for a few seconds – important seconds...



Photos from the FAA study to illustrate four test scenarios



No laser exposure. This gives a baseline for a “normal” approach.

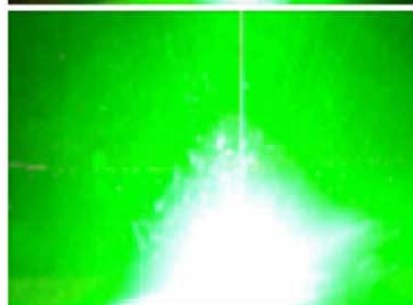
Example:
5 mW, 532 nm,
1 s



0.5 $\mu\text{W}/\text{cm}^2$: This corresponds to a **5 mW** (milliwatt) laser pointer at 3,700 feet, or a 50 mW pointer at 2.2 miles.



5.0 $\mu\text{W}/\text{cm}^2$: This corresponds to a 5 mW pointer at 1,200 feet, or a 50 mW pointer at 3,800 feet.



50 $\mu\text{W}/\text{cm}^2$: This corresponds to a 5 mW pointer at 350 feet, or a 50 mW pointer at 1,100 feet. The animation simulates flashblindness and a slowly fading afterimage.

Modified; <http://www.pangolin.com/faa/laser-aircraft-animation-and-explanation.htm>

EUROCONTROL

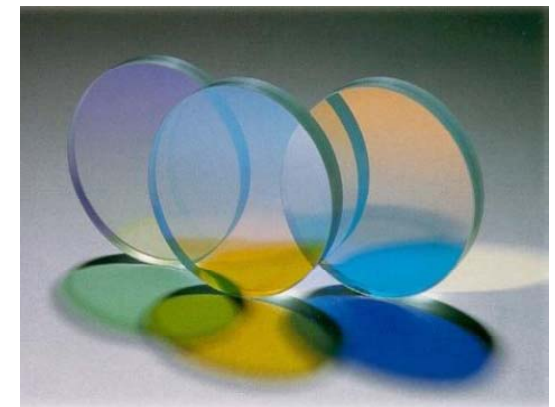
determine measures / intermediate data

- PPE: laser protection glasses
laser protection vizor (Distorted reading of instruments)



Determine measures / intermediate data

- Technical solutions:
 - Coating of screens with dielectric interference coatings
 - Disc material with absorber layers for specific wavelengths
 - night vision camera (low acceptance while testing with military staff)



future prospects

Electro-optical sensor with spectral and spatial filtering – with very quick reaction time - is tested by the federal police flying squadron for protection visors.

Next step is the testing of this equipment in coating sheets for screens. Results will follow....

BEST: prohibition / restriction on the import, sell or ownership of lasers above a certain power unless authorised (response to the market surveillance by government)

Thank you for your attention!

Any questions?