

## Optical radiation protection in the BAuA

The BAuA is involved in many different ways in the field of optical radiation protection. Alongside the work on protection against laser radiation, the following main topics are dealt with:

- **Protection of eyes during welding**  
Working comfort and occupational safety can be enhanced by improved electro-optical welder protection filters.
- **Laser protection filters for the ns and fs ranges**  
The protective effect of laser filters may be impaired by non-linear light-material interactions, such as induced transmission.
- **Participation in the nationwide UV measuring network for the determination of the UV Index**  
The UV Index is a simple measure of UV radiation which causes sunburn and can be obtained by anyone at the present time on the Internet ([www.bfs.de](http://www.bfs.de)).
- **Drawing up of specifications relating to the solar UV exposure of workers working in the open**  
Using personal dosimetry information is obtained on the load experienced by certain occupational groups and the influence of work and leisure behaviour.
- **Protection of eyes from dazzle due to power LEDs**  
The BAuA is involved in developing specifications for the measurement and risk assessment of different radiation sources and types.

## Healthy, safe and competitive

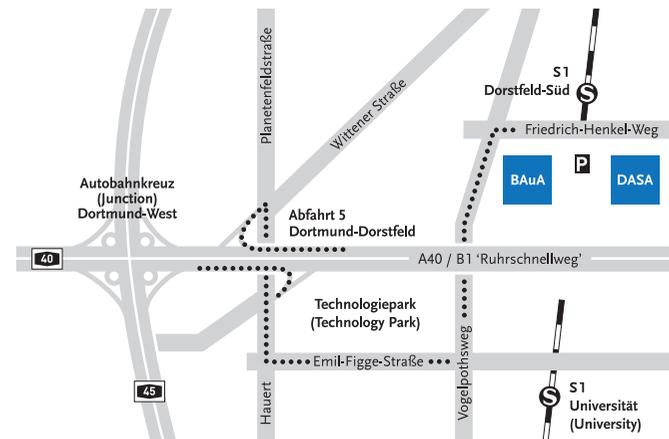
The Federal Institute for Occupational Safety and Health (BAuA), as a knowledge provider in matters of safety and health at work, offers advice and practical assistance to the general public, the social partners and policy-makers. We research, analyse, inform, publish, co-ordinate, develop, train and advice for a human world of work with safe, healthy and competitive workplaces.

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## Dazzle: blind for a moment

Protection against optical radiation



## Blind for a moment

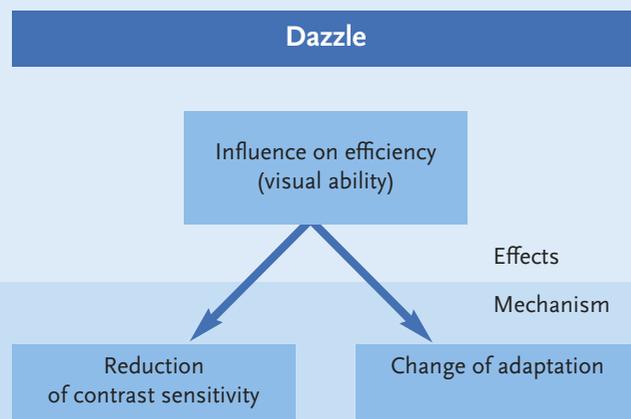
Dazzle means an interference with visual perception due to one or more very bright light sources within the field of vision. When the consequence is a measurable impairment of the visual capacity, one speaks of physiological dazzle.

Even in Goethe's theory of colour there is a somewhat prosaic, and for the time highly precise description of the consequence of being dazzled, the so-called after-image:

*"(...) It persists for a long time until the colourless boundary completely displaces the blue and the whole space becomes colourless. The image then recedes gradually in such a way that it simultaneously grows weaker and smaller."*

Concerning the duration of the phenomenon Goethe makes certain assumptions: "Future observers will find this time shorter or longer according to whether their eyes are stronger or weaker. But it would be very remarkable if, regardless of this, one managed to definitively discover a certain numerical ratio."

But in this the famous poet is mistaken. The BAuA's research project 'Studies of workplace-related impairments due to dazzle caused by optical radiation sources' has yielded fresh knowledge in this respect. The project is being conducted by the Medical Technology and Non-ionising Radiation Research Division of the Fachhochschule Köln (Cologne University of Applied Sciences) under the leadership of Prof. Dr. Reidenbach.



## Research into the basics

A well lit workplace is a major prerequisite for working safely. If dazzle occurs, however, the advantage becomes a drawback, especially in the case of safety-related activities such as driving a vehicle or operating a machine.

The BAuA therefore studies the phenomenon of dazzle more closely in a research project. To date the data situation regarding impaired visual capacity due to dazzle and colour falsification has been inadequate. New optical sources in particular, such as lasers and LEDs, which are being used more and more in the occupational and private domains, have not been adequately researched with respect to their impact.

The aim of the BAuA research project was to learn more about the effects of dazzle due to artificial optical sources. On the one hand the extent and duration of after-images were examined. Furthermore the impairment of colour vision due to dazzle was checked. The aim here was to analyse the functional link between parameters such as the form and extension of the source, power, impact time, chronology of the exposure, wavelength or wavelength range, ambient brightness and adaptation brightness of the subject exposed.

The data determined forms the basis of the hazard assessment required by the EU directive 'Artificial Optical Radiation'. According to this, an assessment has to be made to establish what secondary effects can arise from dazzle due to artificial sources during activities at the workplace. The results of the research project also serve as the basis for requirements in the standards.

### Initial results of the study

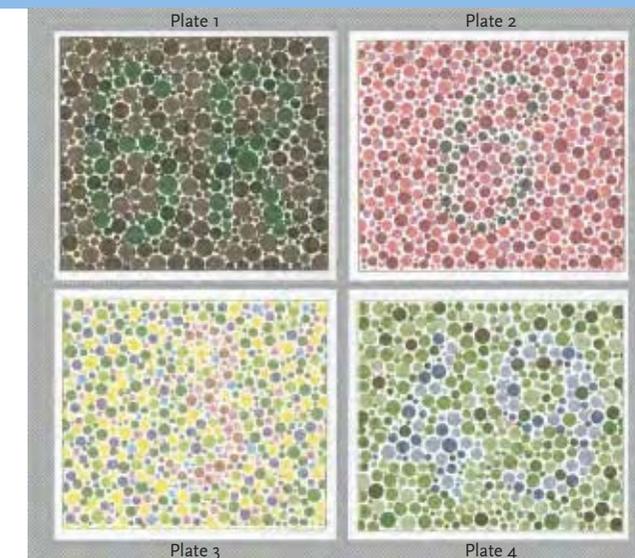
One result of the study was the development of measuring procedures which can be used to determine the effects of dazzle.

The measurements show that the impairment of text recognition after dazzle can last up to 20 seconds.

Colour vision may even be impaired for up to 150 seconds.

From this it can be concluded that dazzle occurring during safety-related activities must not be ignored and is a hazard.

With the help of the pseudo-isochromatic plates, colour recognition can be examined.



### Thoughts on the implementation of the research results in standards

When implementing the results from the BAuA research project, classification of the optical sources according to dazzle properties should be discussed.

Proposal for classifying optical sources according to dazzle properties:

Degree of dazzle 0 ( $B_0$ ): not blinding, only slight impairment of the visual function for a maximum of 1 to 2 seconds.

Degree of dazzle 1 ( $B_1$ ): slight blinding, impairment of the visual function for up to 10 seconds.

Degree of dazzle 2 ( $B_2$ ): severe blinding, visual function is impaired for longer than 10 seconds.