

# ***ADAC Symposium Glare in Road Traffic***

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## **1. Abstract**

An ADAC survey of motorists conducted at the end of 2023 showed that glare in road traffic affects a large proportion of road users. Parallel surveys in other European countries came to a similar conclusion.

In the end, around three-quarters of all respondents were in favour of adapting the legislation so that there is less glare.

On 25 and 26 March 2025, the ADAC organised a symposium on glare in road traffic to discuss the factors that cause glare in road traffic through lectures and discussions. The aim was not necessarily to present the latest research results, but to compile and communicate results and findings in a way that is easy to understand and to overcome the ‘language barriers’ between scientists, technicians and decision-makers.

The presentations were interspersed with discussion rounds. The aim was to understand glare from a number of perspectives in order to find solutions.

The symposium was divided into the following topics:

- Survey results and accident data
- How vision works and the biological and medical processes involved in glare
- Physical and technical causes of glare
- Measures to reduce glare

In addition, measurements of luminance and colour spectrum were carried out on current vehicle models and traffic situations in which glare can occur were simulated.

## 2. Call to action based on consumer survey

With over 22 million members, ADAC e. V. is currently the largest automobile club in Europe and the second largest in the world. The four letters ADAC stand for an association that offers its members round-the-clock assistance, protection and advice and acts as an advocate for all issues relating to mobility. As a recognised consumer protection organisation, the ADAC is particularly active in the areas of individual mobility, consumer protection, road safety and traffic education. Tests and investigations are also financed by membership fees, which means that ADAC is completely independent.

At the end of 2023, the ADAC conducted a representative consumer survey on glare in road traffic after an increasing number of members complained about glare in road traffic. Mobility clubs from nine other European countries joined the campaign. The survey, which actively approached motorists, asked about the extent to which glare is perceived and what reactions and impairments it causes. This was the only way to determine whether it was just a few individuals who felt glare or whether it affected a large proportion of road users and required further investigation.

The results for Germany:

- 27% of respondents feel dazzled almost always or regularly
- 67% find the glare unacceptable or disturbing
- 49% of respondents squint when exposed to glare or even close their eyes briefly
- 27% said they continued to see an image of the light source for a limited time after passing it (afterimage) or even felt pain
- 23% feel stressed or annoyed by glare
- Young drivers feel more dazzled than older drivers
- The most common sources of glare were high beam, low beam and rear fog light
- 73% of respondents believe it is necessary to review and update regulations to reduce glare from vehicle lighting

The findings for the other mobility clubs in Europe that took part in the survey were almost similar. In Germany, 1,089 driving licence holders were surveyed.

The results are subjective impressions of the respondents and therefore primarily relate to psychological (discomfort) glare. However, psychological glare also reduces road safety, for example through reflexive and uncontrolled defensive reactions by the driver, distraction from driving and loss of concentration due to overstimulation over long distances at night. It should therefore not be underestimated.

### 3. ADAC Symposium "Glare in Road Traffic"

On 25–26 March 2025, the ADAC held a symposium on glare in road traffic, as a result of the consumer vote to take action. Over 60 scientists and experts from Europe took part in more than 20 presentations and in six discussion panels to debate the causes and effects of glare from motor vehicle lights and to present possible solutions.

One approach was to give ophthalmologists and scientists the opportunity to present their views on glare mechanisms in humans and in the eye in order to give developers, engineers and lighting technicians a better understanding of these processes. Due to the international participation and the significance of glare in road traffic in many parts of the world, the symposium was held in English.

The media also took an interest in the topic. Representatives from various editorial offices and television stations were present and reported on the event.

The aim of the event was to promote networking between the various fields involved and to initiate a constructive discussion on glare in road traffic and possible measures to reduce it. The presentations also served as a basis for discussion for the GRE Task Force on Glare Prevention, which was established at UNECE level in October 2024.



Picture 1: Rear light of a truck trailer with unnecessarily high luminance. The visibility is based on glare effects in the eye. (© ADAC/Böttcher)

## 4. Findings from the presentations and discussions at the ADAC symposium "Glare in road traffic"

- Psychological (discomfort) glare is based on personal perception. Physiological (disability) glare can also occur in addition.
- From greater distances (appr. more than 50 m), luminance plays a lesser role than illuminance at the eye.
- The colour spectrum of the light source has an effect on psychological glare [1].
- Incorrectly adjusted headlights contribute significantly to glare. Even new vehicles can show considerable deviations [2].
- Dirty headlights cause significant glare, especially with adaptive LED headlights [3].
- Bright front lighting causes high glare on wet roads [4].
- Approximately one in every ninety vehicle encounters in the dark is associated with a very strong glare event [5].
- On average, the topography is a significant factor in glare situations on more than five percent of the route [2].

## 5. Possible measures to reduce glare in road traffic from the ADAC's perspective

The aim should be to establish a sensible balance between optimum illumination for the driver and the risk of glare for oncoming traffic. Higher illuminance levels generally mean more glare for other road users, especially in poor weather conditions. Maximum values may be necessary for illuminance in the main light cone.

Optimising the lights' design with regard to glare-promoting parameters would reduce glare, especially at short viewing distances and long viewing times. Maximum luminance values may be necessary, as very high luminance levels are not technically necessary in many applications, especially for signal lights.

Reducing the number of glare events through better functioning adaptive lighting systems would contribute to less glare in road traffic. Some traffic situations are not covered or are inadequately covered.

Reducing light output at low speeds and vehicle distances in urban areas would help to avoid unnecessary glare. Here, viewing distances are short, but viewing times are long. High headlight ranges are not necessary, especially in illuminated urban traffic.

Effective headlight cleaning systems should be provided for LED headlights regardless of their light output, especially for adaptive high beam systems and high colour temperatures similar to xenon light.

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It is essential that glare-reducing measures are incorporated into the regulations applicable to type approval. Without legal requirements, there will be no changes, as manufacturers are economically oriented and compete with each other.

## 6. References

- [1] Prof. Dr. Stephan Völker, TU Berlin: ADAC symposium on glare in road traffic 2025, presentation no. 12 “Glare due to headlights – Jealousy of expensive cars or a real risk for traffic safety?”
- [2] Dr. Michael Hamm, TU Darmstadt: ADAC symposium on glare in road traffic 2025, presentation no. 18 “Glare Contributors in Automotive World”
- [3] Prof. Dr. Tran Quoc Khanh, TU Darmstadt: ADAC symposium on glare in road traffic 2025, presentation no. 17 “Soiling of the headlight cover as a cause of glare”
- [4] Prof. Dr. Benedikt Lamontain, Magdeburg-Stendal University of Applied Sciences: ADAC symposium on glare in road traffic 2025, presentation no. 16 “Glare from Headlamps on Wet Roads and the Potential to Increase Road Safety“
- [5] Dr Ernst-Olaf Rosenhahn, Marelli: ADAC symposium on glare in road traffic 2025, presentation no. 16 “Nighttime Traffic Glare Analysis by Measurements and new Statistical Evaluations”