GTB Field Test

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Agenda

Introduction: Glare and Visibility
Klettwitz Field Test 2012
Discomfort Glare
Disability Glare
Special WGFL Meetings in Darmstadt (9/2013), Vienna (11/2013), and Torino (2/2014)
Summary
Introduction

- Influencing Parameters for discomfort glare in Night Time Driving *
  - Initial aiming of the headlamps
  - geometry of the road
  - weather conditions
  - dynamic behaviour of vehicle

* : GTB Lighting Forum Torino 1/2011
Introduction

- and loading condition of vehicles

- Report of statistical analysis of cars involved in accidents (France):
  - Accidental data: EACS + EDA
    - 74% of cars involved in an accident have an empty trunk
    - 21% of cars involved in an accident contain 0 - 40kg in the trunk
    - 4% of cars involved in an accident contain 40 - 100kg in the trunk
    - 0.5% of cars contain 100 - 190kg in the trunk
Questionnaire - de Boer Scale

Discomfort Glare Rating – (Please perform rating from top to bottom)

<table>
<thead>
<tr>
<th>Unnoticeable</th>
<th>Satisfactory</th>
<th>Just Admissible</th>
<th>Disturbing</th>
<th>Unbearable</th>
</tr>
</thead>
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<td>7 6</td>
<td>5 4</td>
<td>3 2 1</td>
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</tbody>
</table>
Results for Halogen, Xenon, LED

De Boer scale

Headlamp Type
- HAL
- HID
- LED

* Width of the bars covers app. 70% of all ratings
Results for all Light Sources

Histogram: Pitch with 50% loading

N=25 vehicles tested

Pitch in 10 m, measured from 1% cut-off dip / cm
Pitch Angle Results

* For all light sources and loading conditions
Disability Glare

- Findings from Discomfort Glare based on de Boer rating have been verified by studying the results on luminance and illuminance values of the tested vehicles.
Measured Quantities

- Luminance \(Lv\)
  - \(Lv\) @ 25 m and 50 m, driver position
- Illuminance \(Ev\)
  - \(Ev(t)\), driver- and co-driver position
Luminance

- Total luminance
  - \( L_{\text{mean}}, L_{\text{max}} \)

- Area with \( L_v > 310 \text{ cd/m}^2 \), adaptation was 3,1 cd/m\(^2\):
  - In this area: \( L_{\text{mean}}, L_{\text{max}}, \text{Size} \)

\[ L_{\text{mean}} = L_{\text{mean\_total}} - L_{\text{mean\_dark}} \]

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
  \hline
  Stat.Nr. & Parameter & Bild & Region & Klasse & Fläche & Min & Max & Mittelwert & Streuung \\
  \hline
  1 & Lumin Gr[1] & Leucht.dichte bild & 2 & Hel & 402 & 326,6 & 41000 & 5121 & 7509 \\
  \hline
\end{tabular}
Luminance VS Loading Condition

Luminance Max VS LC

Total Luminance Mean VS LC
Evaluation of Illuminance

- Maximum of illuminance $E_{v\_max}$
- Exposure in 400 m (Sprute): 80 km/h $\rightarrow$ 18 sec exposure time

$$H_v = \int_0^{18} E_v(t) \, dt$$
Illuminance VS Loading Condition

Max Illuminance VS LC

Exposure VS LC

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Summary

- Results of Discomfort Glare and disability glare show clearly, that the behaviour of the vehicle is the important factor for deciding on levelling needs.
- Light source is not significantly contributing.
- Pitch angle is a qualified parameter for new regulation criteria.
Summary

• The results show clearly, that the pitch angle as a parameter to measure the reaction of the vehicle according to loading could lead to a definition, where levelling is required and where it is not needed.

• Car makers have to analyze, how a prediction of the pitch angle of a car under development could be determined.
Action

- Special meeting in WGFL was organized in Darmstadt in 9/2013
Summary

- Input from various car makers to a prediction of the behaviour of future vehicles
- Discussion on a method to generate a classification with pitch angle to forecast the sensitivity of loading of newly developed vehicles
- Some car makers presented loading results on pitch angles of existing vehicles
- Statements from car makers have been collected
Summary

• Contributions from car makers show positive signals in being able to predict pitch angle of a vehicle in advance
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- Thanks to GTB / GRE participants
- Thanks to car makers

Project within GTB TF CAVGS