

Analysis of Glare given to oncoming vehicles by Motorcycles DRLs at Night

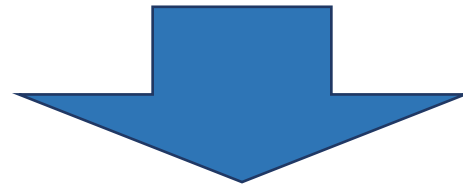
- Based on Actual State of Motorcycles DRLs -

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National Traffic Safety and Environment Laboratory

Analysis Background

- * Japan proposed that headlamps of motorcycles equipped with optional daytime running lamps (DRLs) shall automatically be switched ON at night based on “Research on Daytime Running Lamps of Motorcycles (Informal Document No. GRE-75-09)” at the 75th session of GRE.
- * The following comments were provided for our research by some experts in the last session.
 - Installation height of motorcycle DRL is high, compared to the actual state.
 - Luminous intensity of motorcycle DRL is high, compared to the actual state.



Reevaluate effects concerning the glare at night caused by Motorcycles DRLs suitable for the actual state by numerical analysis.

Analysis Method

A numerical analysis was performed to evaluate effects of motorcycle DRL glare to oncoming vehicle driver, depending on its lighting condition at night.

Model formula of Schmidt-Clausen and Bindels (1), which is often used to calculate De Boer rating scale was used for this analysis.

$$\text{Glare evaluation rating } W = 5.0 - 2 \log \Sigma (E / ((1 + (L_h / C_{pl})^{0.5}) \theta^{0.46} C_{poo})) \quad (1)$$

E: Illuminance at driver's eyes (lx)

L_h : Driver's adaptation luminance (cd/m²)

θ : Angle between driver's line of sight and direction of the lamp

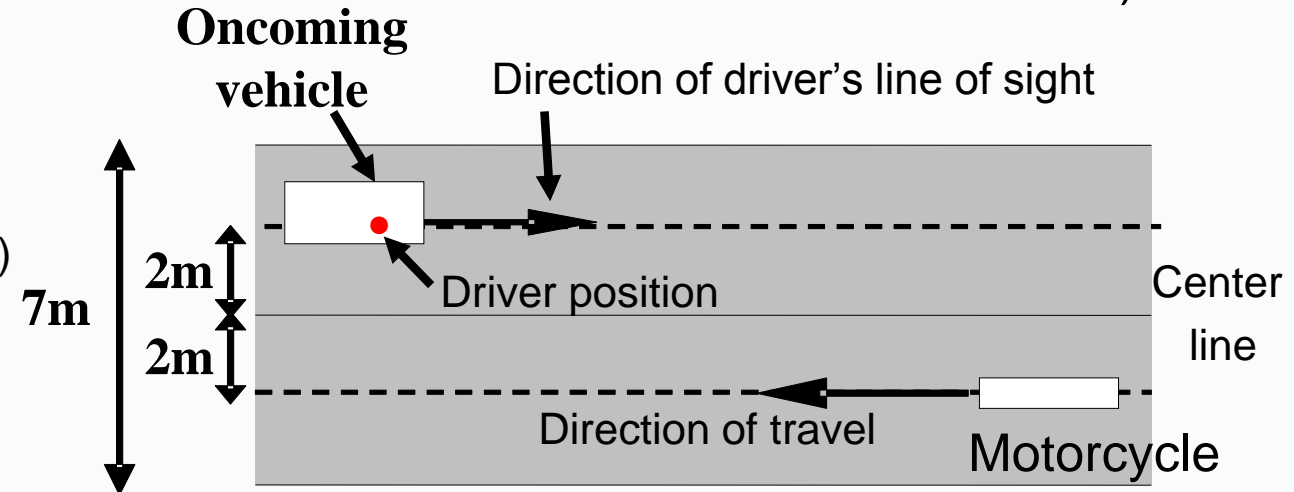
C_{pl} : 4.0×10^{-2} (cd/m²)

C_{poo} : 3.0×10^{-3} (lx·min^{-0.46})

If the glare evaluation rating “W” is below 4, it follows that the glare exceeding allowable limit is caused.

Analysis Condition

- * Sky illuminance: 0lx (Night)
- * Road luminance: 0.1 cd/m² (equivalent to the road illumination of urban streets with a little traffic)
- * Driver's line of sight: Direction of traveling
- * Vehicle positions: See the right figure.
(assuming that vehicles pass each other on a two-way street)
- * Eye-point height of vehicle driver: 1.2m
- * Lamps specifications : as the following table



	DRL	Low Beam
Number of lamps	2	1
Interval of lamps	40cm	
Installation height	0.6m to 1.2m	0.87m
Maximum luminous intensity	600cd or 1,200cd	9800cd
Light distribution patterns	Based on UN-R87	Based on UN-R113

In this analysis, “Maximum luminous intensity” and “Installation height” of the motorcycle DRL was varied.

The above condition for this numerical analysis was set based on “Research on Daytime Running Lamps of Motorcycles (Informal Document No. GRE-75-09)”.

Analysis Results

Glare evaluation rating of DRL (DRL central luminous intensity : 1200 cd)

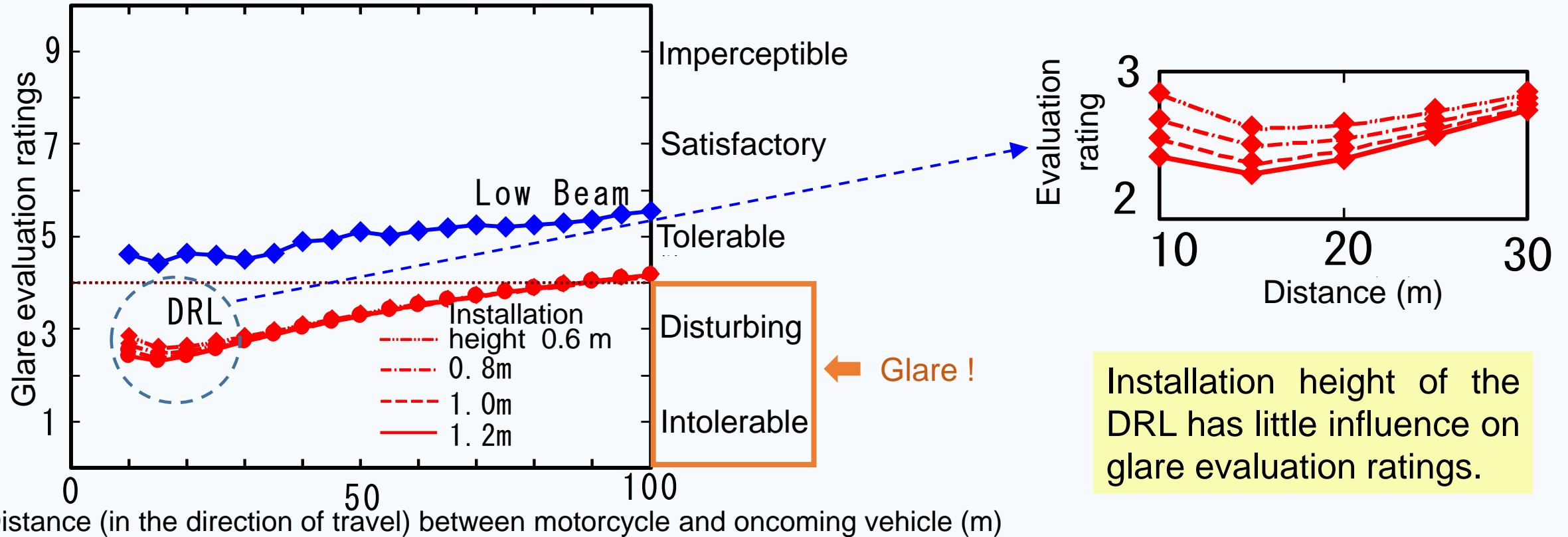


Figure: Effect of motorcycle DRL on the oncoming vehicle driver at night

When DRLs are on at night, glare exceeding the allowable limit (glare evaluation rating < 4) occurs to the oncoming vehicle driver regardless of the DRL installation height.

Analysis Results

Glare evaluation rating of DRL (DRL central luminous intensity : 600 cd)

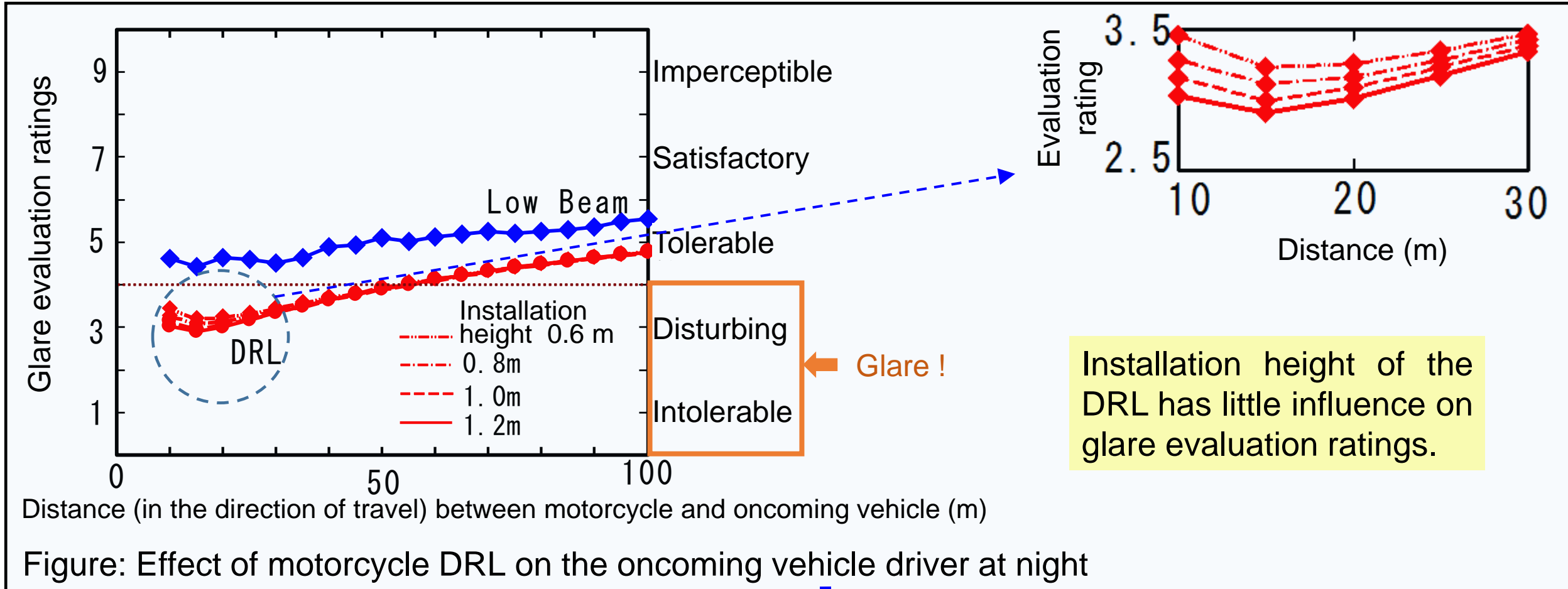


Figure: Effect of motorcycle DRL on the oncoming vehicle driver at night

Even when the DRL central luminous intensity is 600 cd, glare exceeding the allowable limit (glare evaluation rating < 4) occurs to the oncoming vehicle driver.

Conclusion

Glare exceeding the allowable limit (glare evaluation rating < 4) occurs to the oncoming vehicle driver, even when the motorcycles DRLs is suitable for the actual state.



Motorcycles DRLs need to be securely switched to Low Beam at night.