

Outdoor Evaluation Experiment Under Daytime and Nighttime Conditions on Perception of Automated Driving System Marker Lamps (Third Report)

—When Marker Lamps Are Installed Near Rear Signal Lamps—

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The Working Party on Lighting and Light-Signalling (GRE) is discussing technical requirements for “automated driving system marker lamps,” which indicate whether a vehicle is operating in an automated driving mode. As of May 2026, a draft proposal is under discussion for marker lamps installed at the front and rear of a vehicle (Table 1). This study investigated the visibility of blue-green marker lamps installed near the rear lamps of a vehicle and their effects on the visibility of existing signaling lamps.

The experiment was conducted outdoors at the National Traffic Safety and Environment Laboratory in Tokyo in February 2026 under daytime (11:00 to 15:00, ambient illuminance of 10,000 lx or higher) and nighttime conditions (18:00 to 21:00, ambient illuminance of 1 lx or lower). A blue-green marker lamps, 200 mm wide and 80 mm high, were installed near the rear lamps of an experimental vehicle (Fig. 1). An observation vehicle was positioned 20 m behind the experimental vehicle, and participants observed the experimental vehicle from the driver's or front passenger's seat.

Four luminous intensity levels were evaluated during the daytime: 20, 39, 86, and 115 cd. At night, 5, 20, 39, and 86 cd were evaluated. The 86 cd nighttime condition exceeded the proposed upper limit and was included for comparison. Lamp widths of 50 and 100 mm were tested at luminous intensities of 39 cd or less, while widths of 100 and 200 mm were tested at 86 cd. For the 115 cd daytime condition, only a width of 200 mm was used. The participants had a valid driver's license and normal color vision. Eighteen participants took part in the daytime experiment, and 20 participated in the nighttime experiment. For each condition, participants evaluated the visibility, annoyance, and glare of the marker lamp. The visibility of the brake lamp and direction-indicator lamp was also evaluated when these lamps were illuminated. Visibility was rated on a five-point scale from 1 to 5.

Figure 2 shows the visibility evaluation result for the marker lamps at night. At 20 cd or higher, most responses were rated 4 or higher, and the marker lamps were generally considered sufficiently visible at 39 cd, which is close to the proposed upper limit of 42 cd. Figure 3 shows the visibility evaluations results for the brake lamp and direction-indicator lamp at night when the marker lamp was illuminated. Except under the 86 cd condition, most responses were rated 4 or higher for both lamps, suggesting that the marker lamp had little effect on their visibility under the tested conditions. Under daytime conditions, no substantial decrease in marker lamp visibility or adverse effect on the visibility of the brake lamp or direction-indicator lamp was observed at any of the tested luminous intensities.

The visibility of blue-green marker lamps and their effects on existing signaling lamps were evaluated using an actual vehicle under outdoor daytime and nighttime conditions. Within the proposed luminous intensity ranges, the marker lamps were generally rated as easy to see under both daytime and nighttime conditions, and their effects on the visibility of other signaling lamps were small. These results suggest that the proposed intensity ranges are appropriate under the conditions tested. In addition, 20 and 39 cd were tested under both daytime and nighttime conditions. The results suggest that it may not be necessary to change the marker lamp intensity between daytime and nighttime within this range.

Table 1 Draft technical characteristics

Lamp Position	Daytime [cd]		Nighttime [cd]	
	min	max	min	max
Front	50	300	10	125
Rear	20	120	4	42

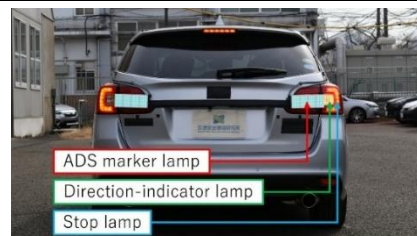


Fig.1 Rear lamps layout

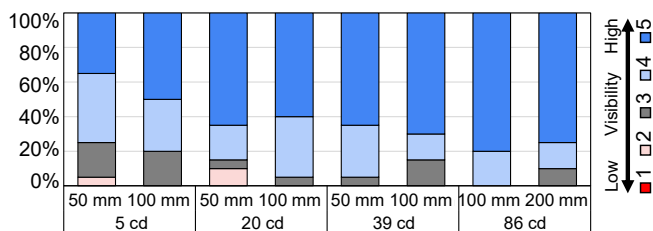


Fig.2 Visibility evaluation of marker lamps at night

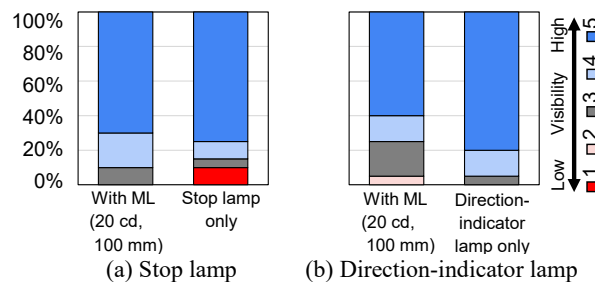


Fig.3 Visibility evaluation of other signaling lamps at night