

## Measurement of Motorcycle Posture Change by Loads

### 1. Purpose

The purpose of this research item of the present study was to determine the change in motorcycle posture under different load conditions such as the carriage of a rider and a passenger.

### 2. Method

Motorcycle posture change by a load was determined by measuring a change in the beam irradiation angle of a small laser installed on the test motorcycle (Fig. 1).

#### 2.1. Test Motorcycles

A total of four test motorcycles, one each, were selected from the four categories of motorcycles that were considered likelier to adopt an HID headlamp. The four categories were touring, sports, American, and scooter. The major specifications of the test motorcycles were as follows:

(Category)	(Wheelbase)	(Displacement)	(Maintenance weight)
Touring	1,690 mm	1,832 cc	415 kg
Sports	1,505 mm	1,164 cc	271 kg
American	1,658 mm	399 cc	257 kg
Scooter	1,575 mm	499 cc	217 kg

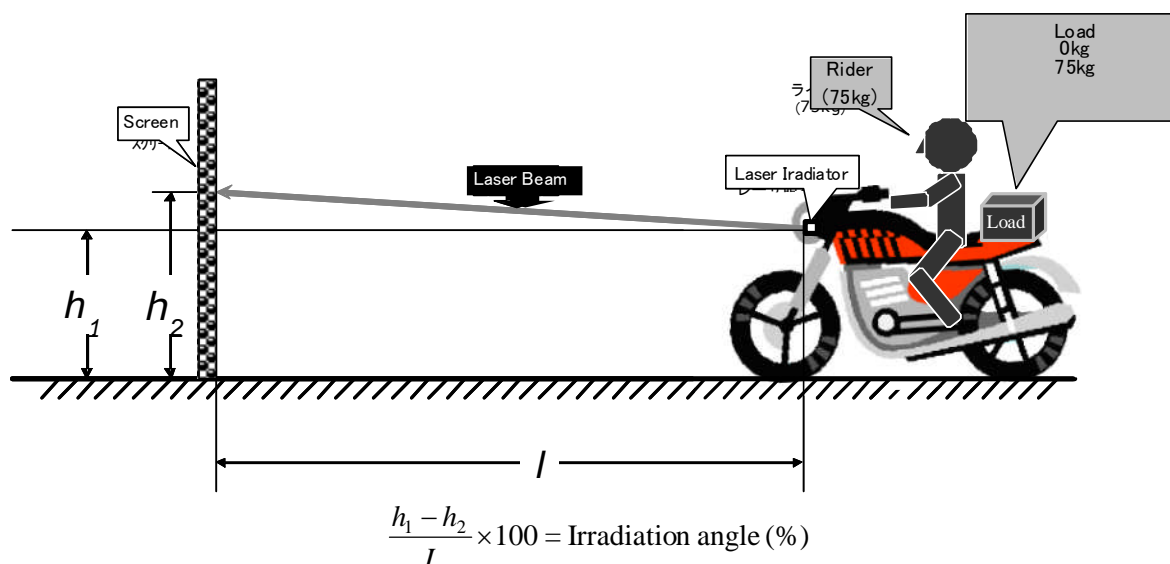


Fig. 1 Method of measuring motorcycle posture change by loads

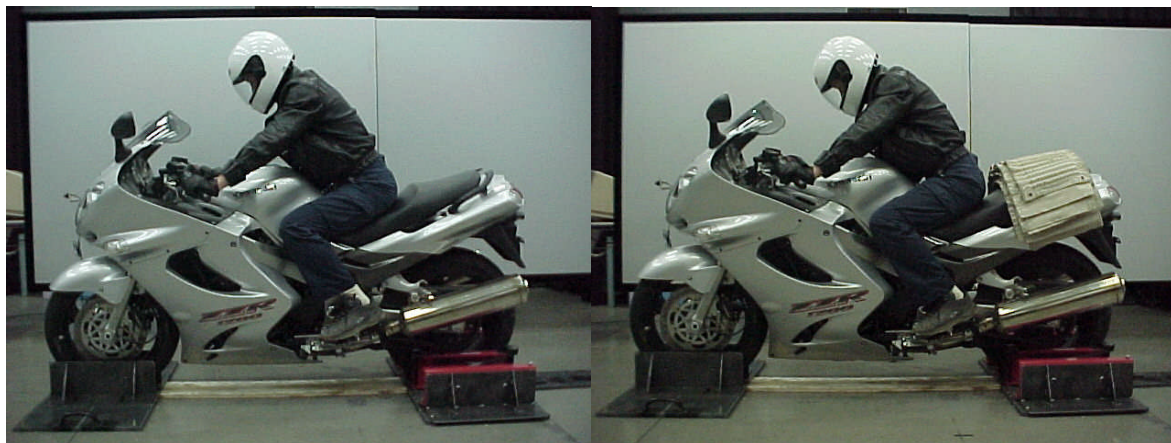
## 2.2. Loading Conditions

The following motorcycle loading conditions were tested with respect to the loads on the front and back seats:

	Front seat	Back seat
(1) 1 rider	Rider (75kg)	No load
(2) 1 rider +1 passenger	Rider (75kg)	Load (75kg)

## 2.3. Measurement Procedure

- (1) Before measurement, the rider weighing 75 kg including his riding gear made a preliminary 5 km run.
- (2) After the run, the test motorcycle was stopped and held vertical by a pair of vehicle holding jigs in a test room.
- (3) With the rider in his seat, a load is placed on the back seat at its center area.
- (4) A load equivalent to a passenger or goods was served by a weight placed on the back seat at its center area (Fig. 2).
- (5) After stabilization of the motorcycle posture, the small laser installed near the headlamp was turned on, and the position of the laser and the coordinate of the laser beam projected on a screen were measured by a three-dimensional measurement instrument.
- (6) In each loading condition, an inclination of motorcycle posture was calculated from the readings on the above coordinate, and the amount of posture variation was determined in comparison with the control posture of the motorcycle carrying a rider and no additional load.
- (7) After completion of the above routine consisting of a single preliminary run and posture measurement, the same routine was repeated two more times for a total of three times for each loading condition.



(Rider only)

(Rider + Load equivalent to passenger)

Fig. 2 Loading conditions

### 3. Results

As the vertical inclination of the passing beam headlamp is required to remain between -0.5% and -2.5% in the ECE No.53 (Installation of light for motorcycle), the initial vertical aiming in this study is -0.86 degree (corresponding to -1.5%, the median value of the range).

The average value of the two measurements in each loading condition was adopted as a representative data. Figure 3 shows the variations of headlamp cutoff line under the two loading conditions, where the headlamp was adjusted to the normal aiming (i.e. the cutoff line of the headlamp passing beam located 0.86 degree below the horizontal) when the test motorcycle is carrying one rider and no additional load.

The results indicated that each of the four motorcycle categories had its cutoff line below the horizontal when the back seat load was 75 kg. Accordingly, it is not necessary to have a leveling system activated to adjust the headlamp's cutoff line position to below the horizontal, if the motorcycle is under a load equal to a passenger (75kg) on the back seat.

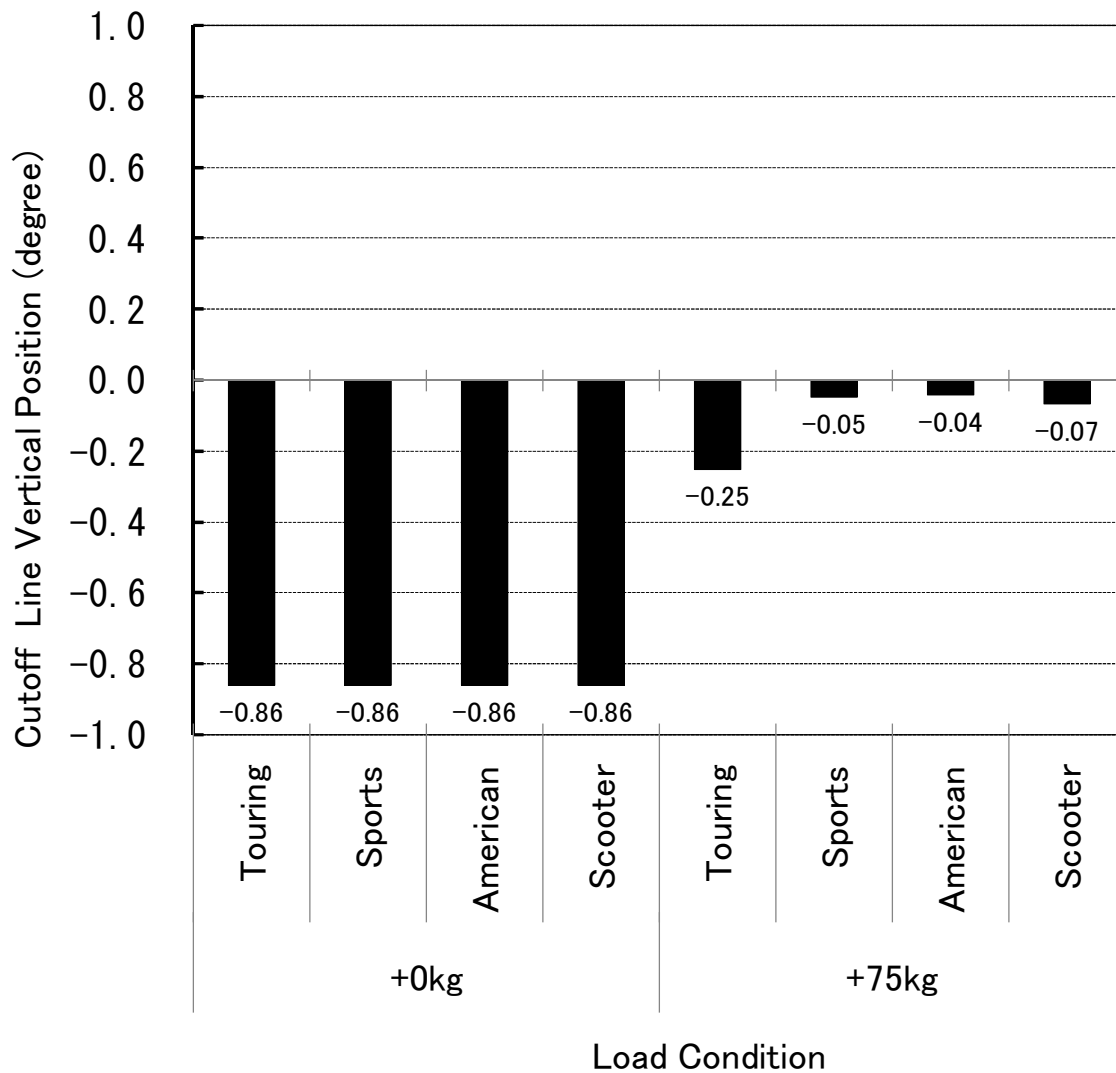


Fig. 3 Passing beam cutoff line vertical position vs load condition