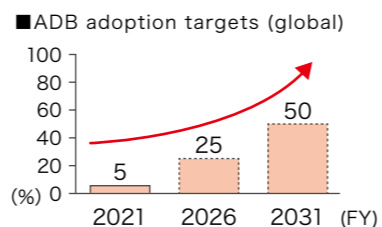


Special Feature:
The KOITO Group's Activities to Resolve Social Issues 

Improving Safety with the World's First BladeScan™ ADB System which “Manipulates Light”

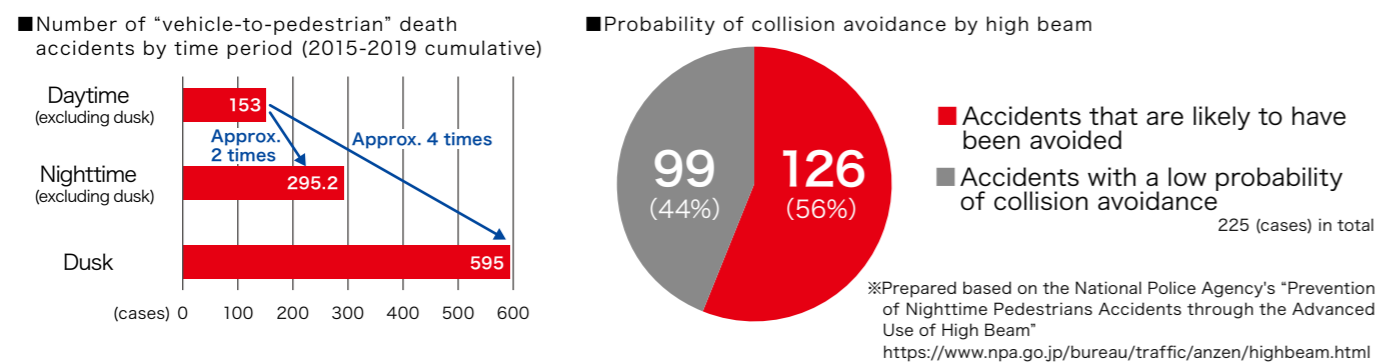
The KOITO Group is committed to materialize a safe and secured automobile society by developing products that contribute to reduce traffic accidents. As part of this effort, we are promoting development and adoption of ADB (Adaptive Driving Beam) systems.



High Beam Contributes to Reduce Accident Mortality

The number of traffic accident deaths in Japan is about 3,000 per year. Among them, fatal accidents at dusk (17-19 o'clock range) account for the largest proportion. “Vehicle-to-pedestrian” accidents occur most frequently from the dusk to nighttime, which is two to four times larger than daytime accidents. It can be inferred that deterioration of drivers' visibility can be one of the causes for traffic accidents with pedestrians. In addition, an analysis of “vehicle-to-pedestrian” fatal accidents occurrence shows that a considerable number of accidents were likely to have been avoided if the driver had utilized high beam.

High beam, which allows drivers to detect pedestrians from a greater distance, is effective in preventing traffic accidents in dark driving conditions.



Improving Drivers' Visibility by ADB System

Driving with high beam on offers much better visibility. However, as it causes glare for other drivers, drivers need to switch high beam into low beam manually when they encounter with other vehicles. This troublesome manipulation and the situation where high beam can only be used in limited conditions in Japan, where traffic volume is high and the road range is relatively narrow, has avoided drivers to drive with high beam all the time. As a solution to these problems, KOITO has developed an ADB system in 2012. The system uses an in-vehicle camera to identify and dim preceding vehicles. This allows drivers to drive with high beam all the time and significantly improved their visibility. The most popular ADB system is an “Array™” ADB, which controls shaded area by alternating the illumination of LEDs arranged laterally, and can prevent preceding and oncoming vehicles from glare. However, KOITO has confronted with a new challenge. As lighting segments were proportioned to the number of LEDs, if we were to improve the performance of Array™ ADB system, we had to increase the number of LEDs as well. As an increase in the number of LEDs also leads to an increase in the unit size, we could not enhance ADB performance without increasing costs. How can we achieve precise light distribution without increasing the number of LEDs? Through a lot of trial and error, KOITO has developed the world's first “BladeScan™ ADB,” developed based on completely different and innovative ideas than the conventional system. The new system has contributed to improve safety significantly by enabling drivers to identify pedestrians from a distance.



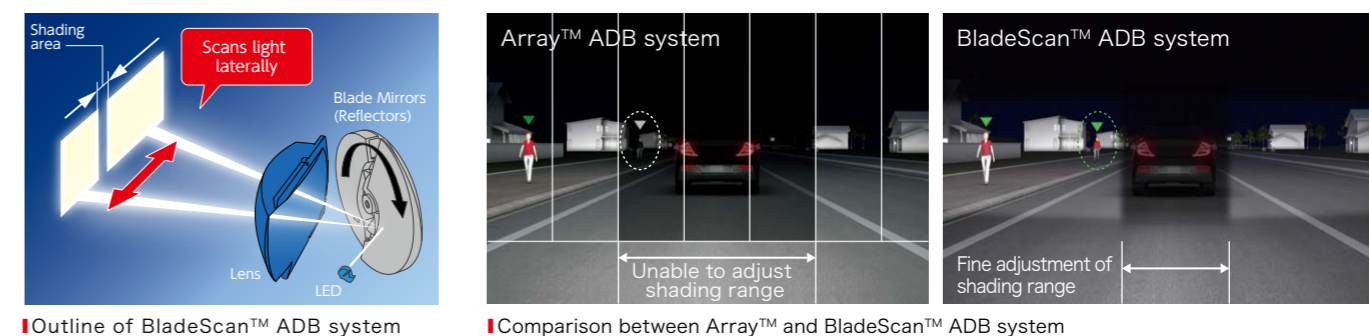
Developing and Commercializing BladeScan™ ADB

BladeScan™ ADB adopts innovational “scanning method,” instead of conventional “Array™.” It utilizes LED lights reflected on a fast-rotating mirror and allows the LEDs to cast their light laterally to create an illumination surface with an afterimage of the light. The system turns off the light while it passes through the area to be shaded and alternates the illumination of the LEDs, and delivers more precise control over the shading effect than the conventional ADB system.

However, to illuminate the front with sufficient light intensity, we had to move large mirrors at high speed. As a result of repeating various trial and error, we have developed a mechanism which rotates disk-type mirrors. By rotating a blade mirror combined by multiple twisted-shaped mirrors, this mechanism allowed us to change light reflection direction.

BladeScan™ ADB, which “manipulates light,” achieved precise light distribution equivalent to 300 segments with 12 LEDs.

It was first adopted by Toyota Motor “Lexus RX” in 2019, and are expected to further adopted to a wide range of vehicles. The KOITO Group will continue contributing to reduce traffic accidents by utilizing light manipulation technologies.



Our Advanced Technology and Contribution to Safety Received High Evaluations

BladeScan™ ADB has won numerous awards, including “CES2020 Innovation Awards” by CES, one of the world's largest electronics trade shows sponsored by Consumer Technology Association (CTA), in recognition of its innovative lighting technologies and its contribution to safe driving.

| Winning Period | Sponsoring Organization | Awards |
|----------------|--|---|
| January 2020 | CTA (Consumer Technology Association) | CES2020 Innovation Awards |
| July 2020 | Society of Automotive Engineers of Japan, Inc. | 70th Society of Automotive Engineers of Japan Award “Technology Development Award” 2020 Super Manufacturing Parts Grand Prize “Nippon Brand Award” |
| October 2020 | MONODZUKURI Nippon Conference | 2020 The Japan Society of Mechanical Engineers Award (Technology) |
| March 2021 | The Japan Society of Mechanical Engineers | 2020 The Japan Society of Mechanical Engineers Award (Technology) |



Special Feature: The KOITO Group's Activities to Resolve Social Issues

Providing Optimal Lighting for Autonomous Driving Vehicles

Looking ahead future autonomous driving society, KOITO is working to develop and commercialize lighting and sensing technologies that materialize safety, peace of mind, and comfort. We are accelerating development efforts toward the early commercialization of next-generation products, such as conducting R&D with domestic and overseas startup companies and universities.

●Next-generation ADB - Supporting drivers -

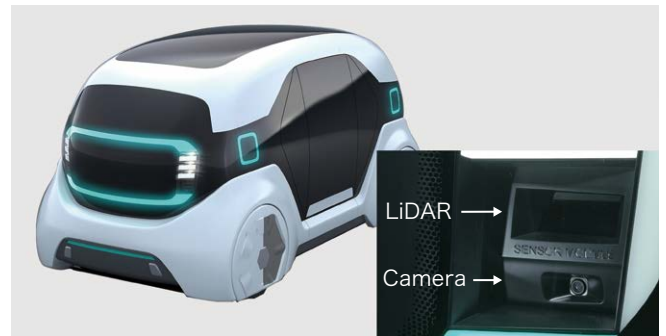
Next-generation ADB system delivers the optimal lighting by minimizing shaded areas and maximizing the driver's visibility during nighttime driving. It shades pedestrians to avoid glare and can also locally dim the light against objects such as traffic signs.



Next-generation ADB headlamp (concept model)

●Development of Sensing Technology - Supporting vehicles and pedestrians -

We are working to develop LiDAR that can accurately monitor the shape and distance of distant obstacles, as well as all-weather cameras that can accurately detect them even under bad weather conditions such as rain, fog and snow. By installing surrounding monitoring sensors into headlamps and rear combination lamps at four corners of the vehicle, these lamps protect sensors from dirt and keep them in optimal condition, achieving 360° monitoring of the surroundings.



Sensor lighting module (concept model)

●Communication Lamps - Supporting vehicles and pedestrians -

Utilizing its road projection and displaying functions, communication lamp conveys the movement of the vehicle to the surrounding vehicles and pedestrians instead of drivers. It contributes to safety of autonomous driving society by enabling vehicles-to-pedestrians communication.

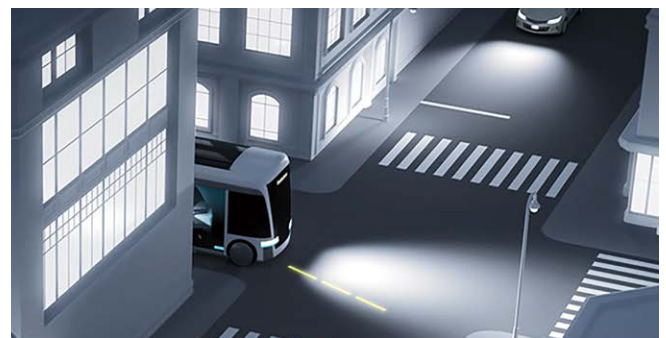


Image of road projection

●Smart Transportation Infrastructure - Supporting reliable transportation -

In the vicinity of intersections, street lights and traffic signals with LiDARs and cameras detect pedestrians and vehicles in a blind spot of the driver. By sharing these information with surrounding vehicles and drivers, smart transportation infrastructure can contribute to reduce traffic accidents and support smooth transportation.



Smart street light (concept model)