Long-term Commercial FOT of Automated Buses in Kashiwa-no-ha

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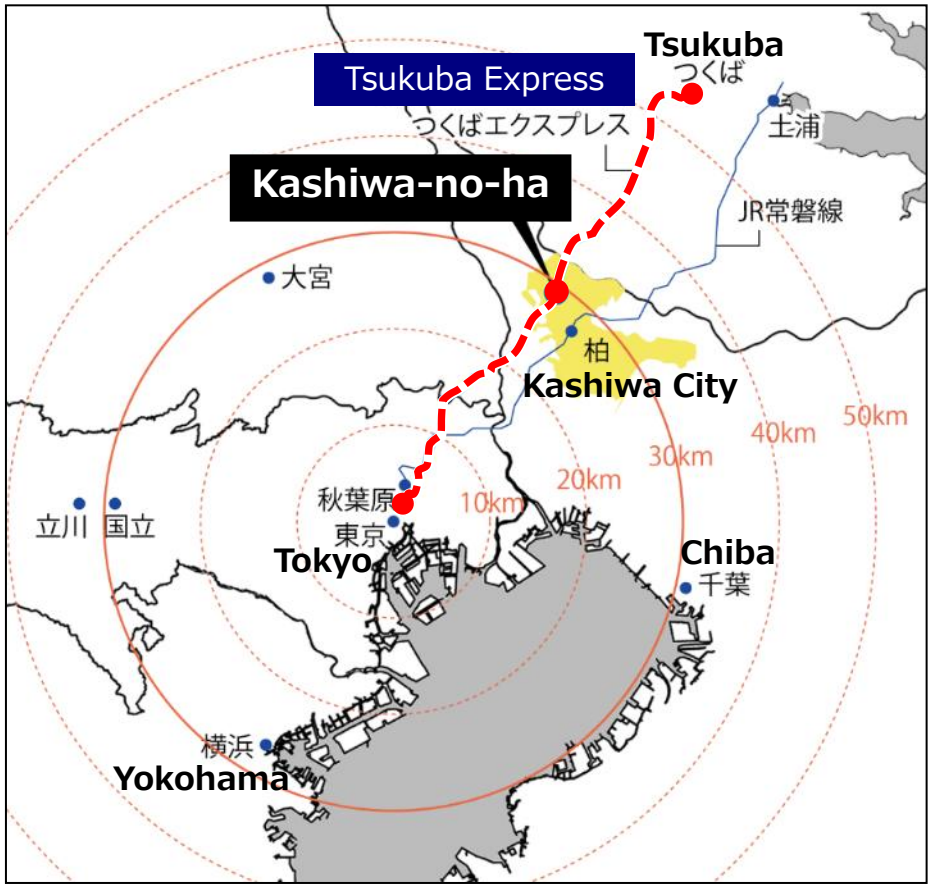
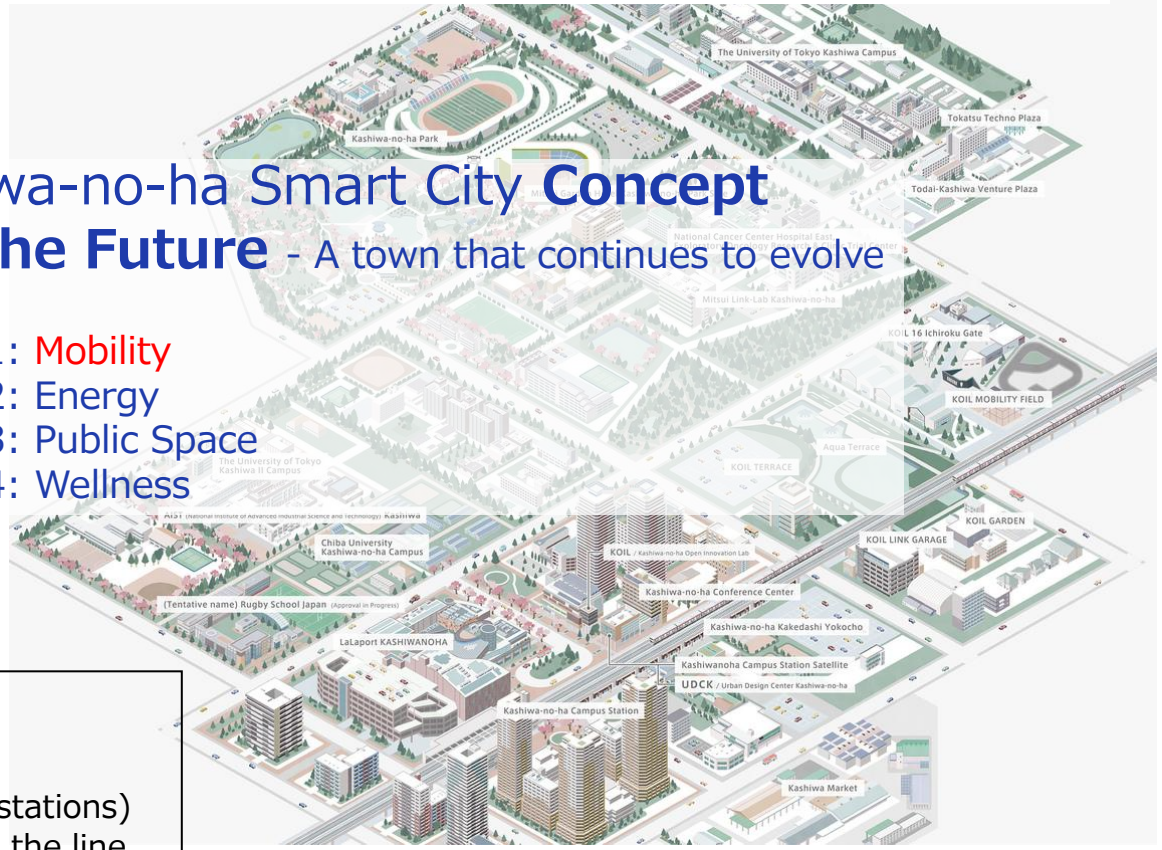
Joint Workshop with UWA and Japanese Universities, Feb. 6th, 2026

Kashiwa-no-ha Area Overview



- 30 km from central Tokyo Core
- Tsukuba Express train service opened in 2005, and a new urban development project was started.
- Kashiwa-no-ha Smart City is being built.



Kashiwa-no-ha Smart City **Concept**

TRY the Future - A town that continues to evolve

Theme 1: Mobility
Theme 2: Energy
Theme 3: Public Space
Theme 4: Wellness

Tsukuba Express

Opened in August 2005
Akihabara station (Tokyo) - Tsukuba station 58.3 km (20 stations)
New urban areas of 3,200 ha in total are developed along the line.

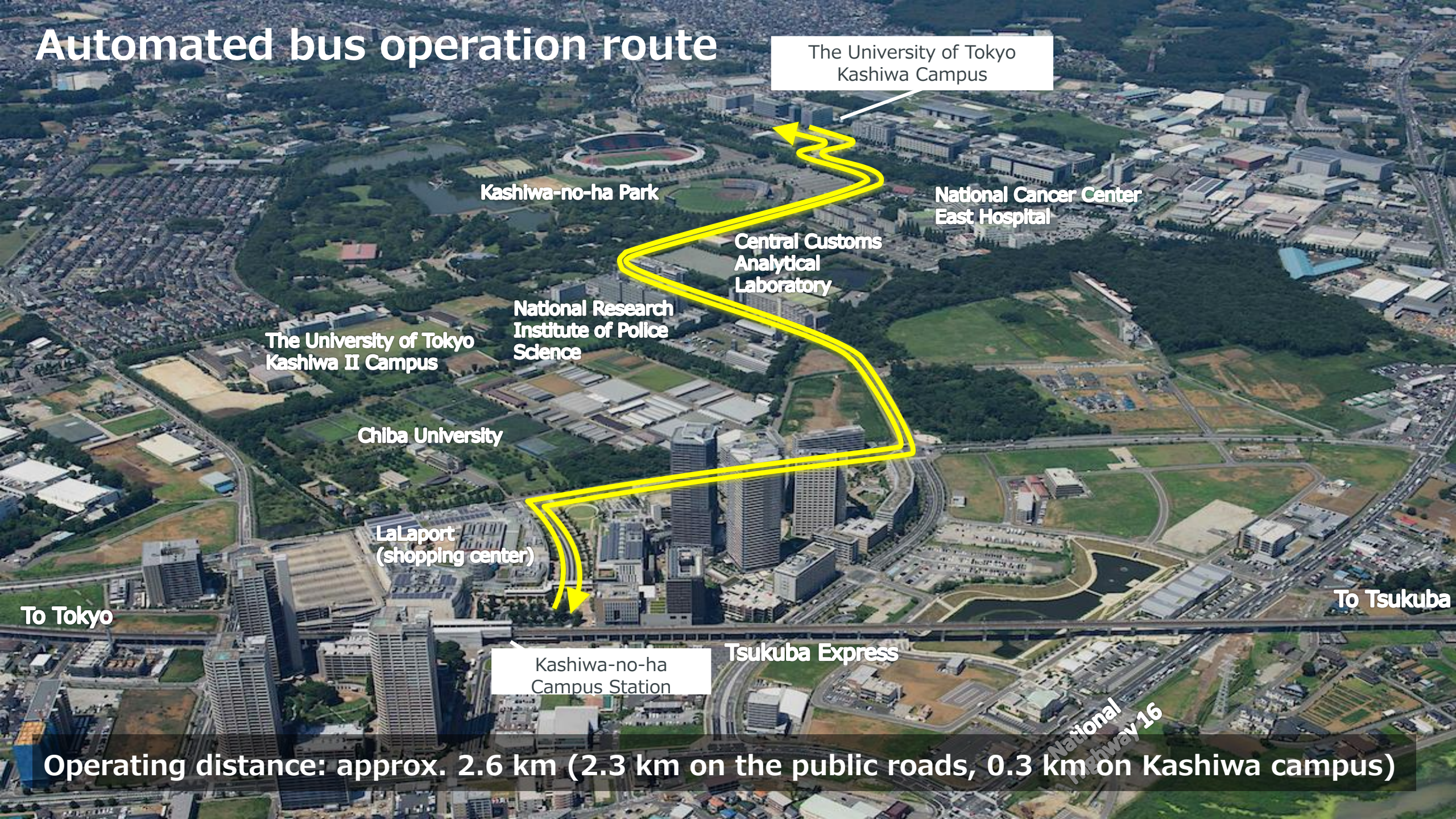
Kashiwa-no-ha Long-term Commercial FOT

- **Long-term commercial FOT of automated buses has been conducted since 2019 by the Kashiwa ITS Promotion Council.**
- **A hands-off Level 2 automated bus was operated in the initial phase.**
- **The University of Tokyo leads and coordinates the council.**
- **A Level 4 automated bus is now being developed under the CooL4 project within RoAD to the L4.**

Kashiwa ITS promotion council members

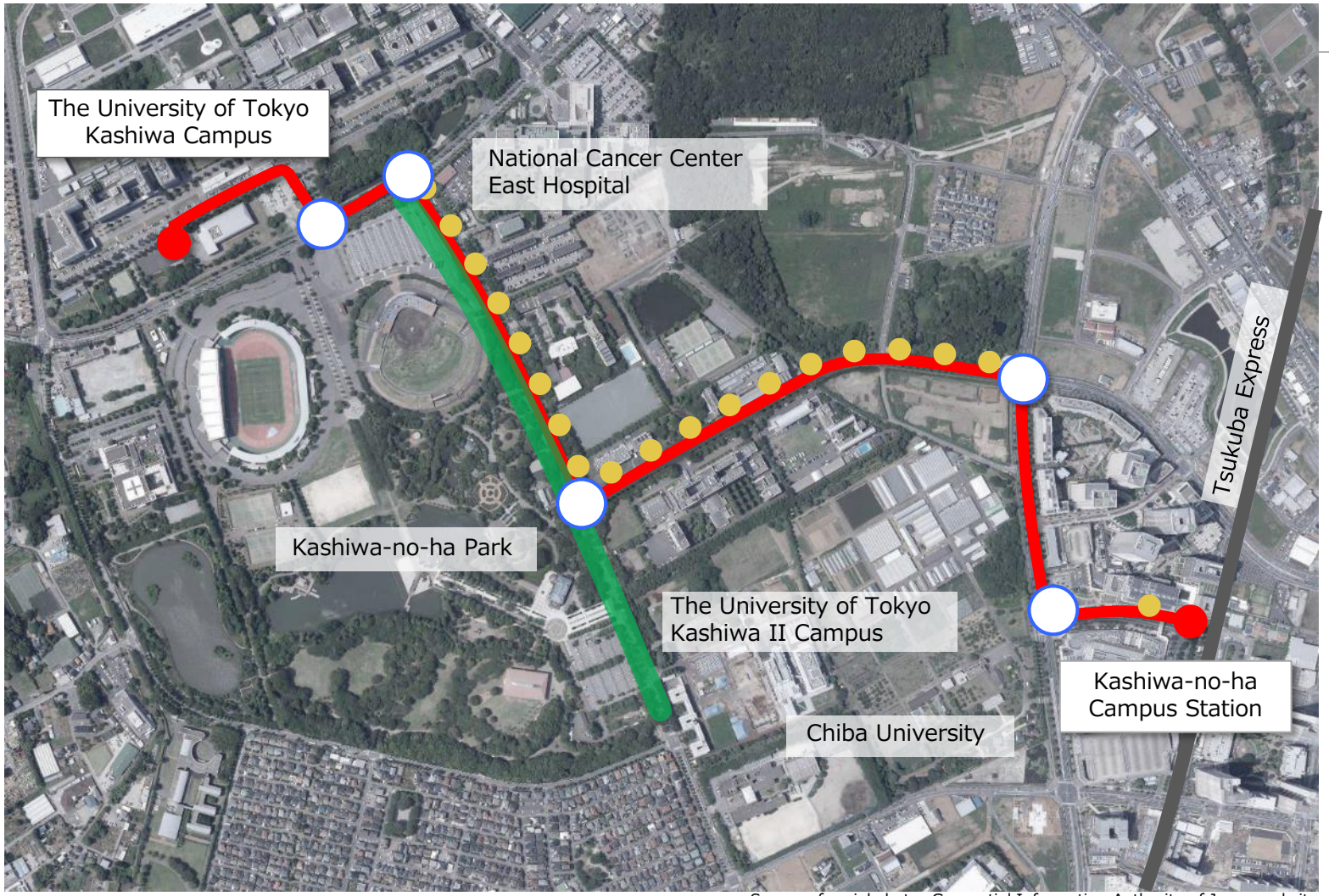
- The University of Tokyo
- Kashiwa City (Local municipality of Kashiwa-no-ha)
- Advanced Smart Mobility Co.
- Tobu Bus Central Co.
- Mitsui Fudosan Co.
- BOLDLY Inc.
- Sompo Japan Insurance Inc.
- Mitsubishi Auto Leasing Corporation
- Aichi Steel Corporation
- IHI Corporation
- Koito Electric Industries, Ltd.
- Pacific Consultants Co.
- Nippon Signal Co.
- Urban Design Center Kashiwa-no-ha (UDCK)

Automated bus operation route



Operating distance: approx. 2.6 km (2.3 km on the public roads, 0.3 km on Kashiwa campus)

Challenges of Automated Level 4 Implementation



Source of aerial photo: Geospatial Information Authority of Japan website

Operational Route

Intersections with traffic lights

Tree Tunnel

Magnetic Marker Installation Section

Challenges of Automated Level 4 Implementation

On-street parking of vehicles

Pedestrian crossing without a traffic light

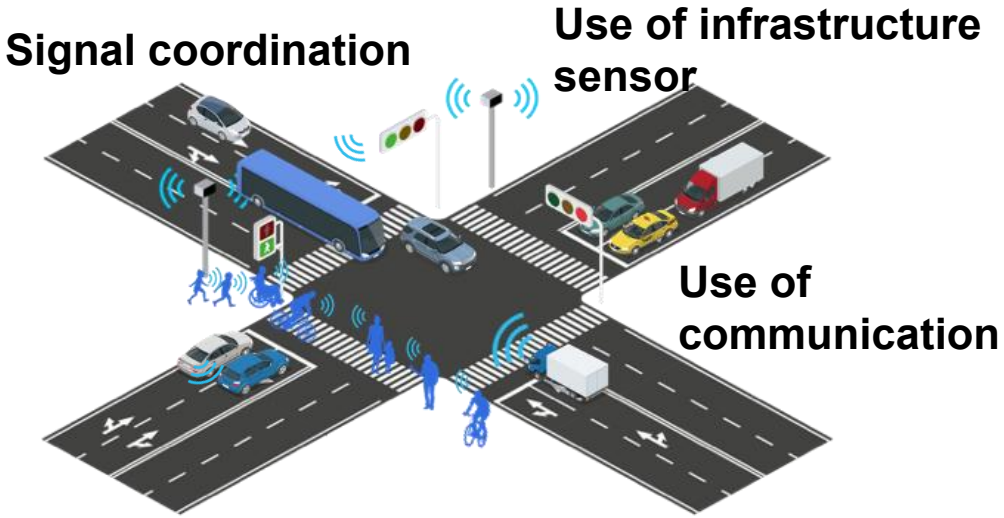
Side streets with poor visibility

Merging from the bus bay to the travel lane

Aims of CooL4 project within RoAD to the L4

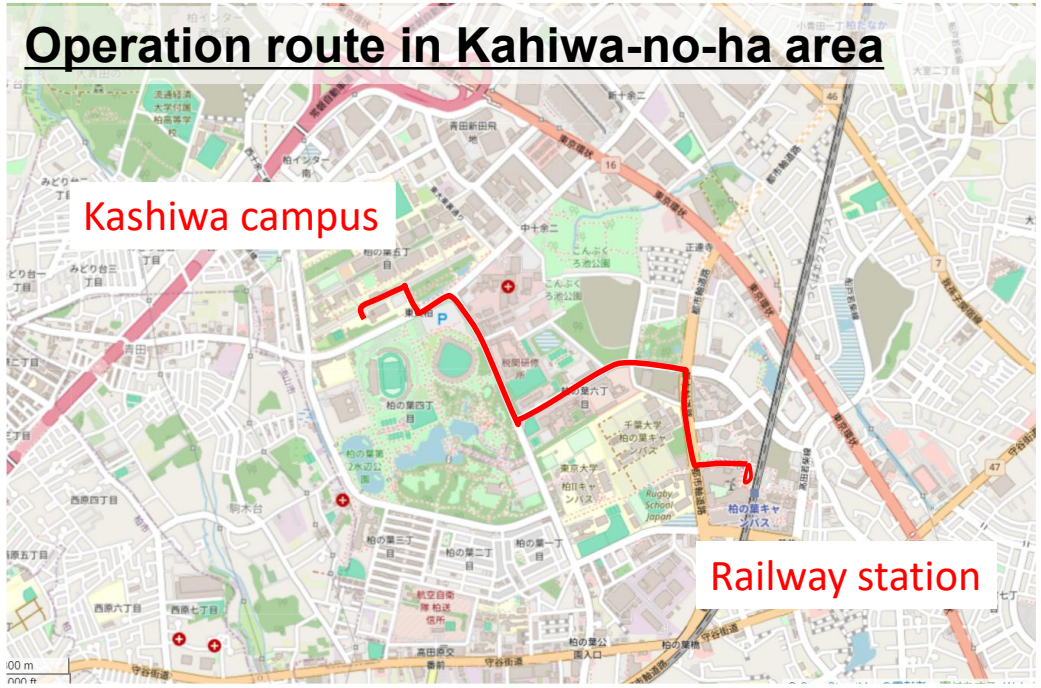
Goal

1. Achieve cooperative Level 4 automated driving in a mixed space in the Kashiwa-no-ha area.
2. Develop goals and requirements for a cooperative system deployable in mixed spaces nationwide.



Project members

- **The University of Tokyo** (Secretariate)
- Nagoya University
- National Institute of Advanced Industrial Science and Technology
- Mitsubishi Research Institute, Inc.
- Japan Automobile Research Institute
- Advanced Smart Mobility Co., Ltd.



Overall Roadmap towards Level 4 Mobility in Kashiwa-no-ha

FY2021 – 2022	FY2023	FY2024	FY2025

Prior Pilot Test (Level 2 operation)

- Using a Level 2 automated bus with a driver
- University staff, students and visitors can ride freely.
- Installation of co-operative roadside equipment on public roads
- Development of elemental technologies for cooperative systems

Public road test (Level 2 operation)

- Development of the bus capable of L4 automated operation.
- Development and installation of RSU for cooperated L4 service.
- Data acquisition for L4 operation

Pilot test (Level 4)

Application for Specified Automated Operation (SAO)

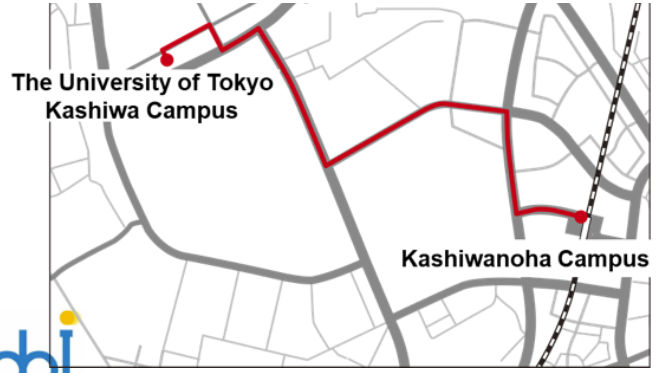
- Operation at L4 after the permit is obtained
- Pilot test of operation as L4 mobility service

Launch Ceremony on Jan. 13th, 2026

Commer-cialization

Expansion to other regions

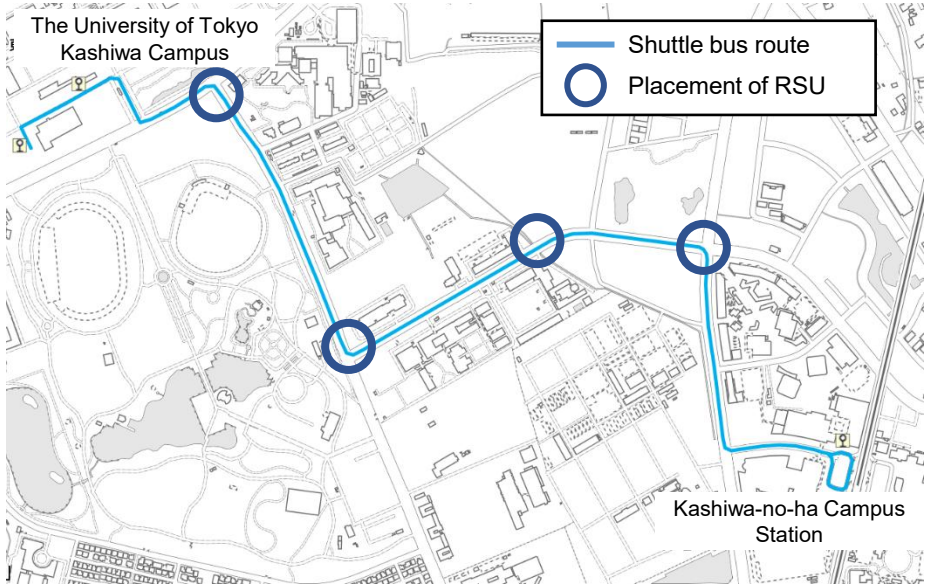
Operation route in Kashiwa-no-ha area



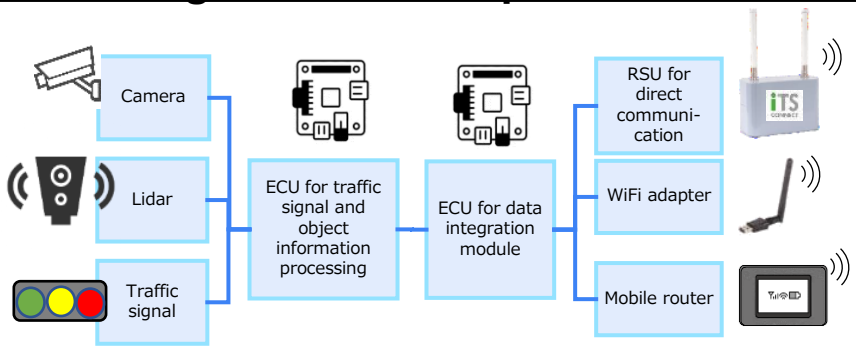
Launch Ceremony on Jan. 13th, 2026

System for Level 4 Operation

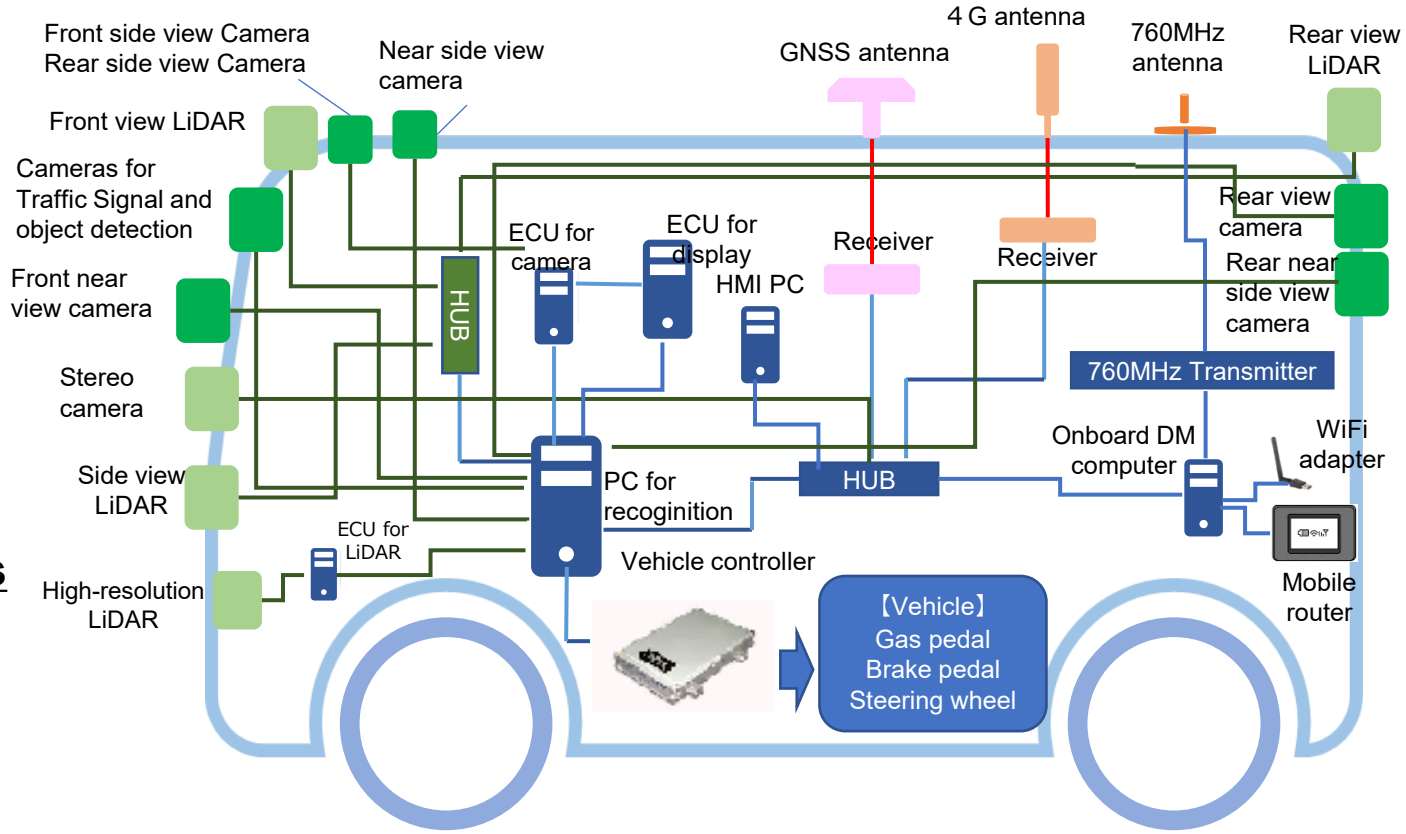
Locations of roadside units of the cooperated system



Basic configuration of cooperative roadside units



Basic configuration of a cooperative automated vehicle



Cooperated automated driving bus

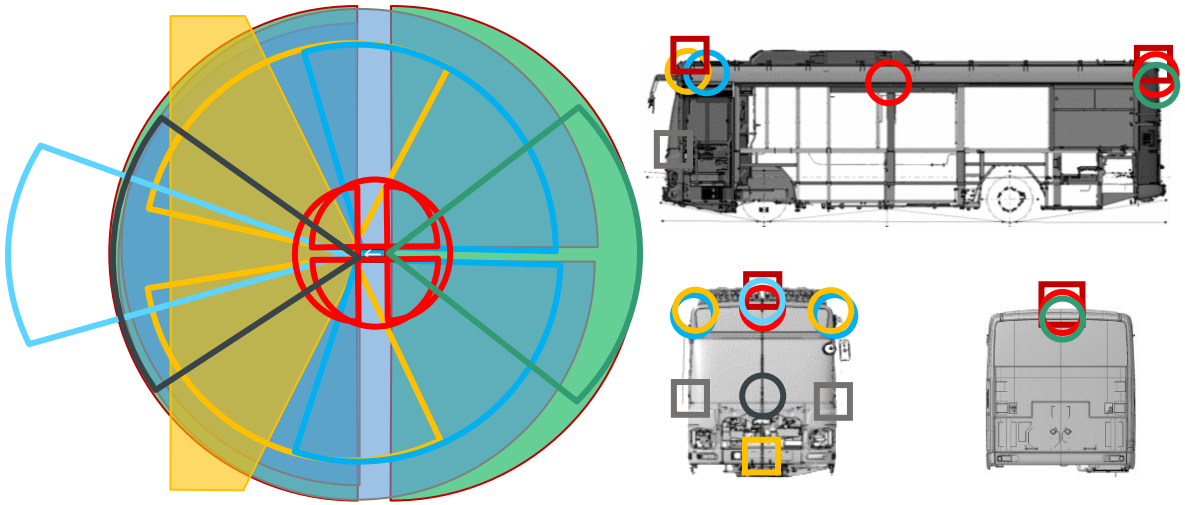
1. Develop automated driving methods for each separated section and define the necessary sensing functions according to the risk scenario on target route.
2. Implement an interface to transmit traffic signals received from cooperative roadside equipment to the vehicle controller.

Developed bus for L4 drive

Front & rear side view camera

High-resolution LiDAR
to detect small objects or lying people on the road ahead

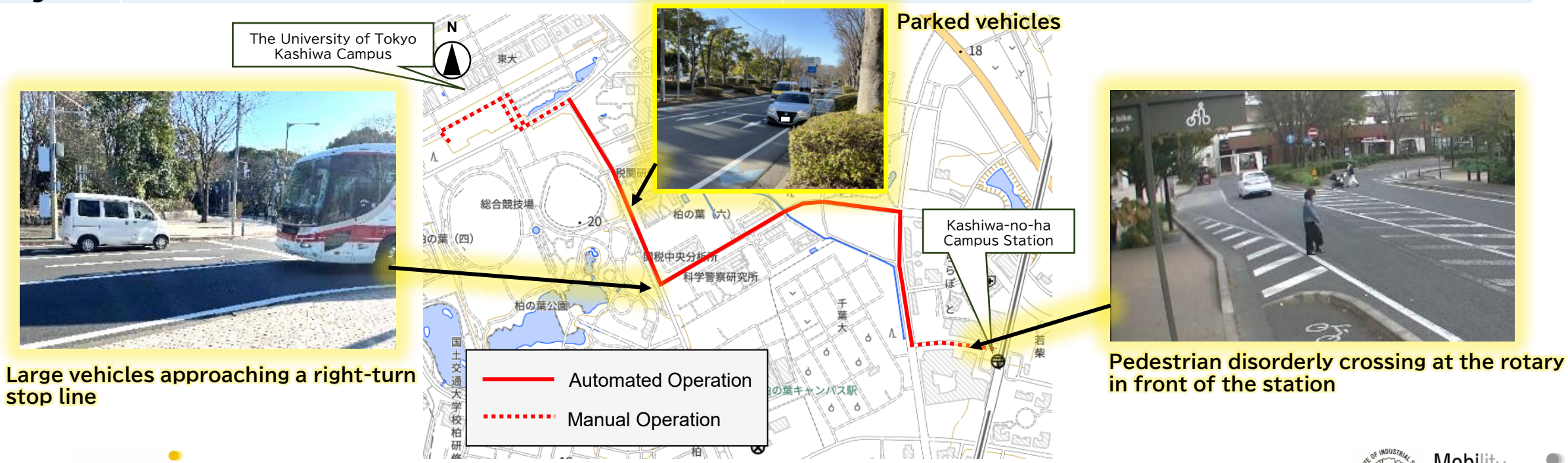
Recognition system configuration (camera/LiDAR)



Camera：Long-range front x 1○, Middle-range surrounding x 4○○,
Short-range surrounding x 4○, Middle-range rear x 1○,
Front stereo camera x 1○
LiDAR: Long-range front and rear x 2□, Left and right near x 2□,
High resolution front x 1 □

Experiment on Improving Physical Road Infrastructure for Automated Buses

Impact of the road traffic environment on automated driving		Details of Measures
Classification	**Situation**	
person-to-vehicles	• Pedestrians walk on the driving route • Pedestrians suddenly interrupt the travel route • Difficult to see pedestrians attempting to cross a crosswalk	• **Installation of digital signage** • **Examination of bulb-out structure(on the campus)**
vehicles mutual	• Danger of collisions with other vehicles at intersections • Sudden bicycle interruption/unable to safely overtake • Lots of on-street parking.	• **Installation of rubber poles** • **Stop line position setback** • **Median strip reduction for a right-turn lane** • **Installation of road markings**
vehicles single	• Unable to recognize self-position by GNSS	• **Installation of self-location estimation support equipment**

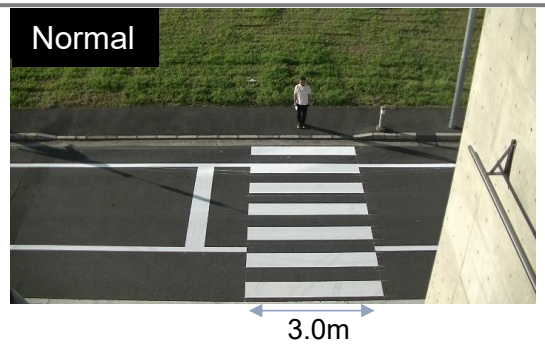


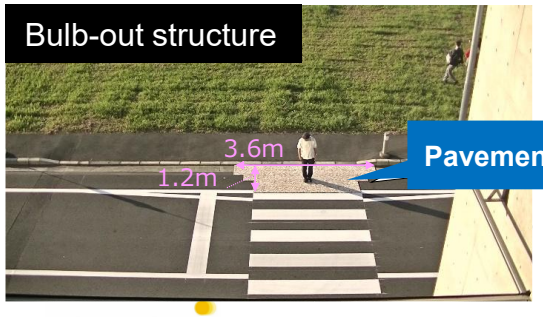
Experiment on Improving Physical Road Infrastructure for Automated Buses

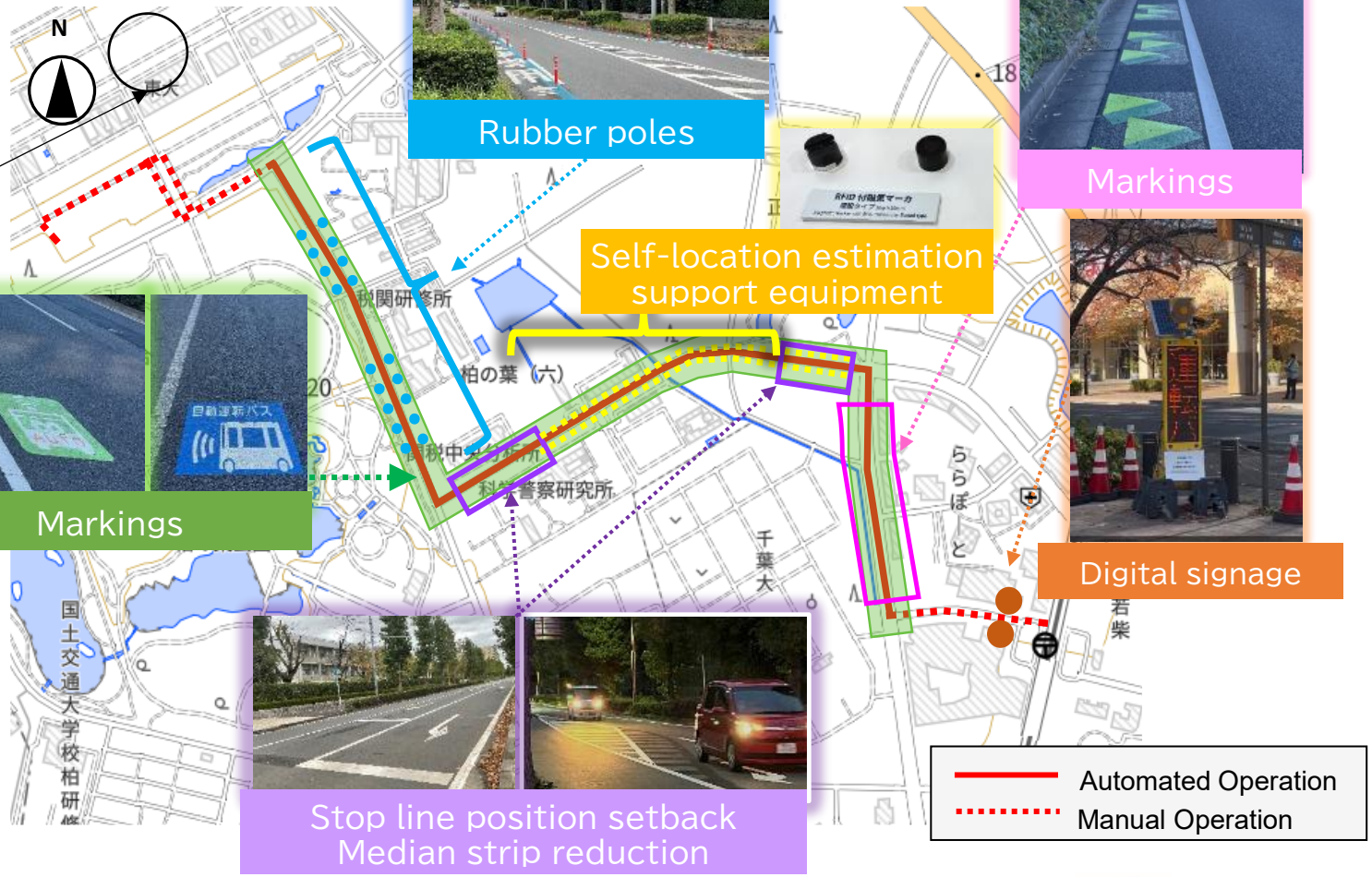
Condition	Experimental Period (in 2024) Number* of Bus Operations For Data Acquisition
Without	20 weekdays from September 9 to October 21 160 times
With	20 weekdays from November 25 to December 20 160 times

*Number of Bus operations varies depending on the evaluation item

Examination of bulb-out structure on the campus



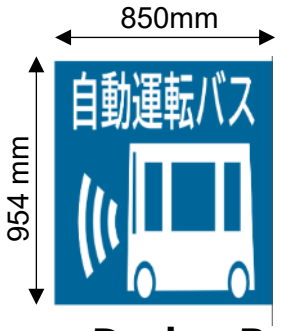




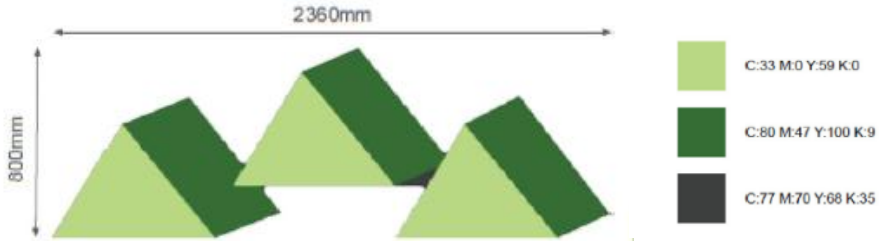
Rubber poles to prevent on-street parking and improve bike lane usage

Road Surface Markings for Automated Buses

Design A



Design B

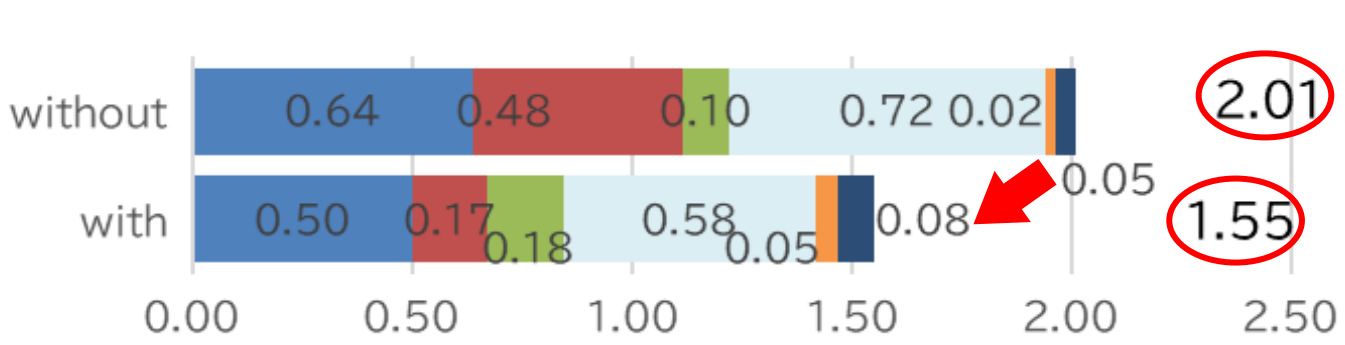


Design C (illusion-type road surface markings)

The design A and C were designed by DLX Design Lab of the University of Tokyo.

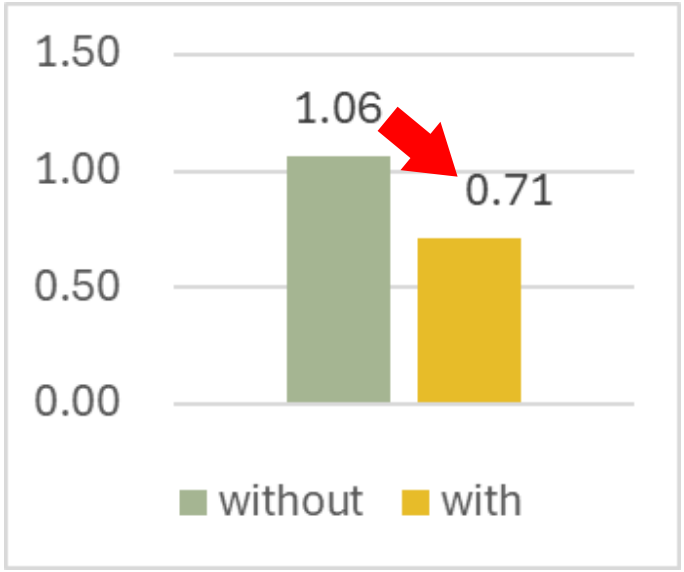
Reduction of Manual Interventions and Sudden Deceleration Occurrences

1) Number of manual intervention per bus operation



- Impact of on-street parking
- Impact of other automobile traffic
- Impact of bicycles and pedestrians
- Determined by driver's judgment
- Due to multiple factors
- Other than above

2) Number of sudden deceleration per bus operation

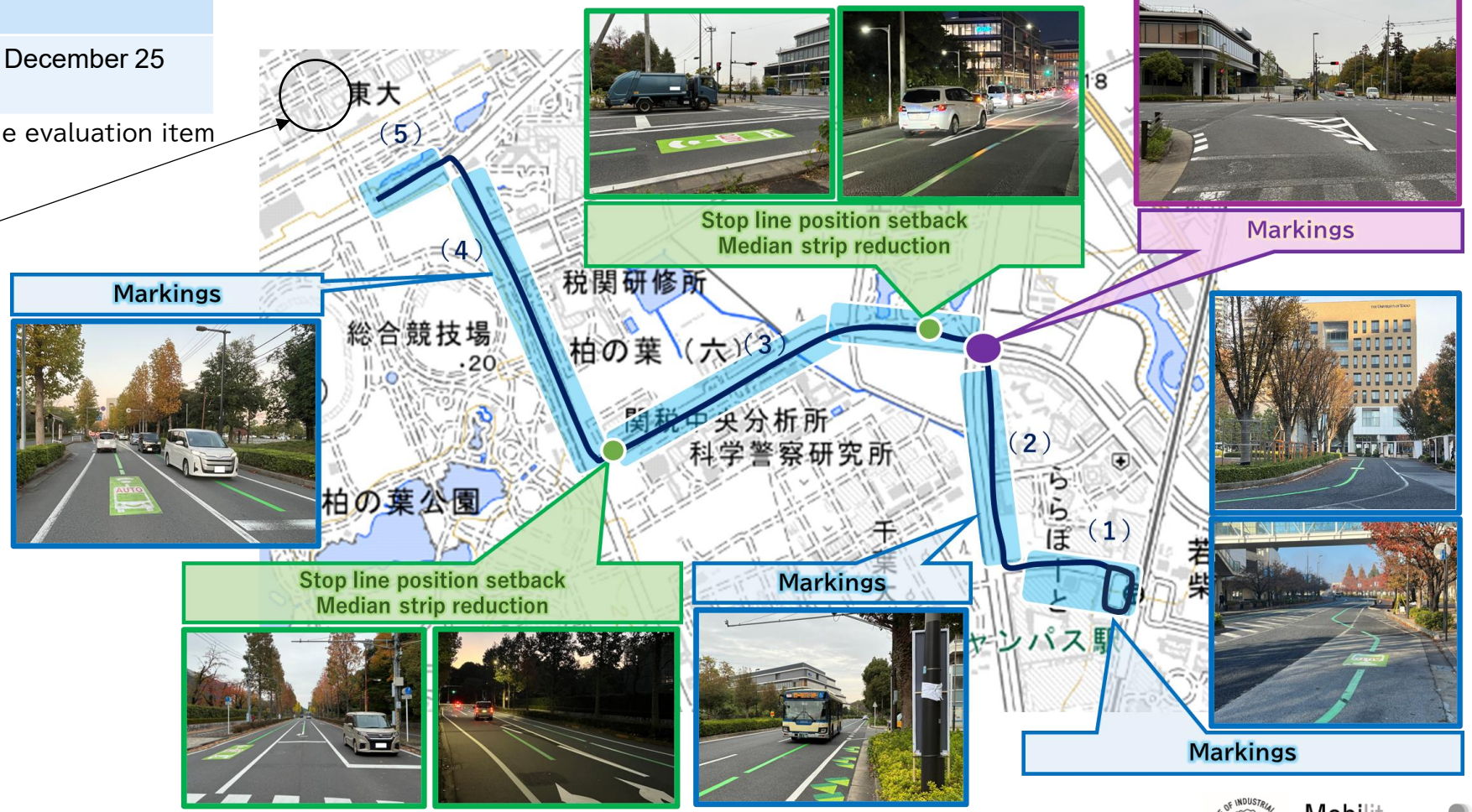


New Experiment on Improving Physical Road Infrastructure for Automated Buses

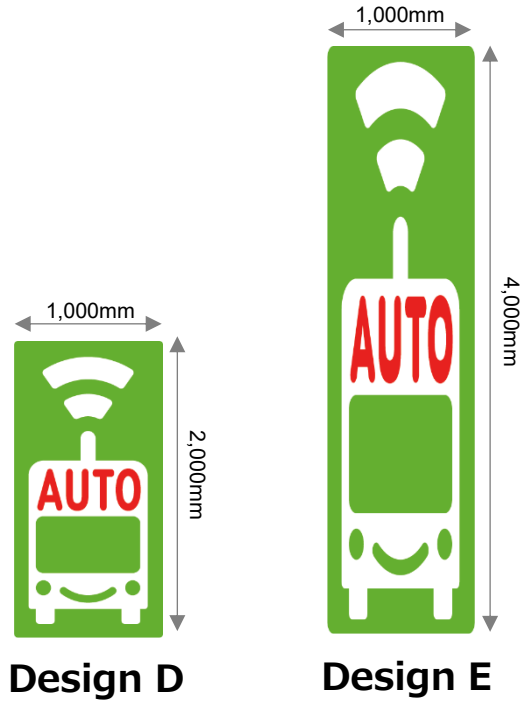
Condition	Experimental Period (in 2025) Number* of Bus Operations For Data Acquisition
Without	28 weekdays from August 18 to October 21 112 times
With	36 weekdays from November 4 to December 25 144 times

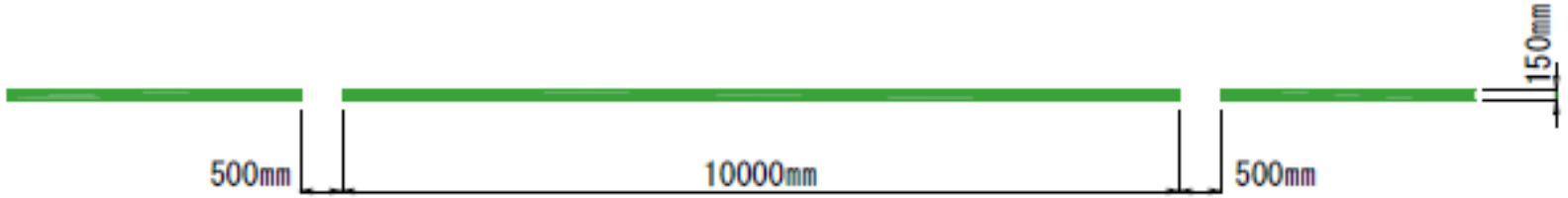
*Number of Bus operations varies depending on the evaluation item

Examination of the bus bay on the campus



New Road Surface Markings for Automated Buses





The design D and E were designed by DLX Design Lab of the University of Tokyo.

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