

## Implementation of Local 5G Verification Aimed at Improvement of Construction Work Efficiency and Safety in Tunnels

MIRAIT ONE Corporation (head office: Koto-ku, Tokyo; President and CEO: Toshiki Nakayama; “MIRAIT ONE”) and HAZAMA ANDO CORPORATION (head office: Minato-ku, Tokyo; Representative Director and President: Masato Fukutomi) jointly implemented verification of quality of local 5G and verification of acceleration of video processing using a low-latency camera developed for the purpose of reducing personnel and ensuring safety in tunnel work in the Shiribeshi Tunnel (Tenjin) and other work<sup>(Note 1)</sup> for the Hokkaido Shinkansen ordered by the Hokkaido Shinkansen Construction Bureau of the Japan Railway Construction, Transport and Technology Agency, and effectiveness was confirmed in both verifications.

Through the verification, the two companies are engaged in DX of tunnel work utilizing the latest ICT, realization of efficient and safe solutions, and development of technologies that can also be applied to other work in closed spaces, and aim to practically implement these in 2025.

### 1. Background

As a measure to address the shortage of personnel brought about by the decrease in the working population associated with the decline in birthrate and aging of society, the construction industry seeks to reduce personnel required and automate tasks. It is necessary to proceed with full automation using digital data to improve efficiency and ensure safety in tunnel work, and this requires high-speed communication in closed spaces and acceleration of video processing, etc.

### 2. About the Trial

#### ① Trial objective

Confirmation of the radio propagation characteristics of local 5G under special conditions in a tunnel, and the impact on transmission of high-definition video with low latency

#### ② Trial period

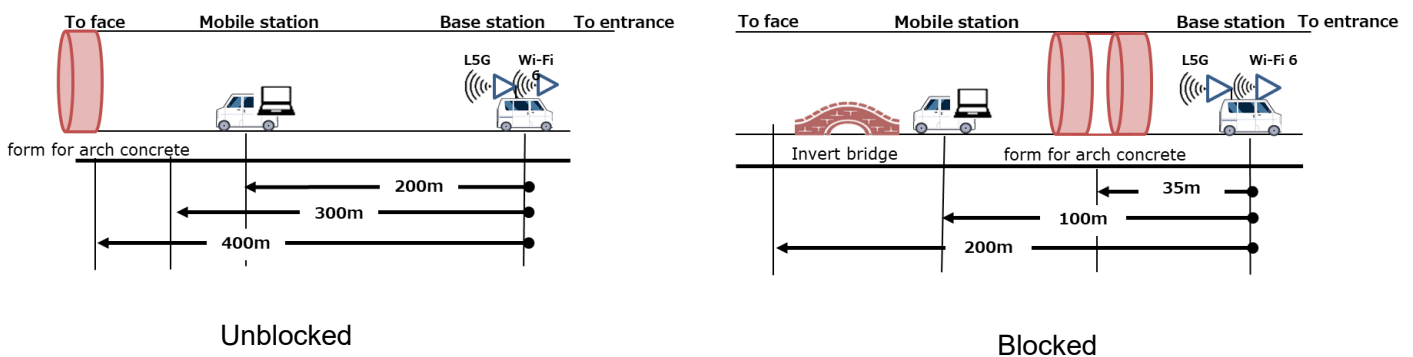
November 19 and 20, 2022 (2 days)

③ Roles of the companies

MIRAIT ONE	<ul style="list-style-type: none"> <li>- Creation of local 5G and Wi-Fi 6 wireless areas within the tunnel</li> <li>- Confirmation of throughput(Note 2) in the tunnel through verification of characteristics and measurement of propagation of the signals</li> </ul>
HAZAMA ANDO	<ul style="list-style-type: none"> <li>- Provision of trial field</li> <li>- Consideration of base station implementation methods and safety when applying the technology to closed spaces such as a tunnel site</li> </ul>

④ Trial environment and overview

- Comparative verification of throughput and other aspects of local 5G and Wi-Fi 6
- Broadly categorized the environment in the tunnel as blocked or unblocked, separated the mobile station from the base station and measured signal propagation at each point, implementing confirmation of transmission of high-definition video with low latency
- Measured latency of video transmission using configurations of a low-latency camera developed by Konica Minolta, Inc. and each wireless format, and verified the shortening of transmission time of high-definition video



3. Trial Results

① Local 5G quality verification

As a result of measuring signal strength, throughput and latency in 100-meter intervals of 200m⇒300m⇒400m between the local 5G mobile station and base station, it was confirmed that signal input was not significantly degraded, and that the values for throughput and latency were also good.



Base station (local 5G, Wi-Fi 6)

Signal measurement

② Results of confirmation of 4K video quality and confirmation of low latency

A low-latency camera developed by Konica Minolta was connected to the local 5G environment established within the tunnel to verify the transmission of high-definition video. As a result, it was confirmed that latency from shooting with the camera to displaying on the display was kept to 100 milliseconds or less and that high-definition 4K video could be transmitted even when the camera and the display receiving and displaying the video are 400 meters apart.

(Note 1) Construction work overview

Project: Hokkaido Shinkansen, Shiribeshi Tunnel (Tenjin) and others

Project owner: Hokkaido Shinkansen Construction Bureau of the Japan Railway Construction, Transport and Technology Agency

Executor of construction work: Joint venture of Hazama Ando, Ito, Horiguchi, Taishin Special Construction Consortium for Hokkaido Shinkansen, Shiribeshi Tunnel (Tenjin) and others

Construction period: November 1, 2019 - June 30, 2025

Construction overview: Tunnel length of 4,460m, width of approximately 10m and height of approximately 8m

(Note 2) Throughput

Processing capacity or data transfer volume per unit of time

(Note 3) Overview of Konica Minolta's low-latency camera

When receiving video on a terminal in a remote location from a camera, latency (time lag) occurs in the video due to the transmission time, and it is said that people feel a sense of discomfort if the latency exceeds 100 milliseconds. Due to the latency of a general network camera being from several hundred milliseconds to several seconds, remote operation in real time is currently difficult. The low-latency camera used in this trial supports 5G and is also capable of transmitting high-definition video up to 4K, while keeping video transmission latency to 50-70 milliseconds.



Konica Minolta's low-latency camera