

In order to efficiently get the condition of the tunnel lining surface, JR East Japan has been driving Tunnel Lining Scanning Car since 2000. By the aging of Shinkansen Super Express, JR East will update it to the new system which can capture high-precision data by high-speed driving.

### 1. What is TuLIS\*

JR East uses the drawing of the cracks and others on the tunnel lining surface for the tunnel inspection. JR East gets the detail such as crack on the tunnel lining surface, driving TuLIS on the rail.

\*TuLIS is Tunnel Lining Scanning Car

### 2. Feature of the new TuLIS

#### (1) Accurate data

The specific laser sensor is deployed on the new TuLIS, which can capture 2D image and 3D geometry by 1mm resolution. By shooting the reflection images of laser light irradiated with slit-shaped on the lining surface, the image and unevenness information on the tunnel lining surface can be captured with high accuracy.

#### (2) Driving speed

The improvement of the processing speed by the exchange of the measuring equipment makes it possible to obtain the high accurate data by driving at 20Km/h. It's a big advance in efficiency.

#### (3) Automation

Conventionally, humans manually interpret cracks and others on the tunnel lining surface from captured images. With the aim of improving the efficiency and automation in the future, an auxiliary function for crack extraction using information on the unevenness of the tunnel lining surface captured by the new TuLIS has been developed.

### 3. Plan

(1) For the Shinkansen tunnel, the measurement by the new TuLIS will be started sequentially from early February 2020.

(2) Utilizing the captured images of the tunnel lining surface, we aim to realize more efficient and sophisticated tunnel inspection.