



## Train Inspection Monorail CERN Proprietary

TIM is like a small metro but instead of transporting passengers, it has a lot of sensors for autonomously monitoring the 27-km long Large Hadron Collider tunnel during machine shut-downs.

### What does it do?

During machine shut-downs in the Large Hadron Collider, TIM allows unmanned, real-time operations in the tunnel like measuring, monitoring and immediate interventions when necessary.

### How does it work?

The train operates on a monorail that is installed on the ceiling all around a tunnel. Packed with different sensors and instruments, the train can be programmed to perform real-time operations. Due to the modular design a customized train aligned to specific needs is possible. For example robotic arms can be added operated by a human from a safe distance via 4G or WiFi.

### Is there an analogy or metaphor you can use to help describe this simply?

Nowadays robots are already used to inspect the sewer system. Those robots are attached to cables for power supply and data transfer and need to be operated manually.

### Unique characteristics

Fully autonomous operation. No expert operator is necessary.  
Modular extendable architecture.

### Limitations or constraints

Needs a rail.  
The communication over 4G/WiFi could be a limitation for low lying tunnels.

### Originally designed to be used for:

Inspection, monitoring and repairs at the Large Hadron Collider.  
Two TIM units are currently running in the LHC tunnel.

### Questions related to this technology

How can be the design changed to use the train in sewer systems without rails?  
Is 4G strong enough for communication in sewer systems?

### Source

CERN. Autonomous monorail for monitoring of underground water pipelines. CERN. Retrieved from: <https://kt.cern/success-stories/autonomous-monorail-monitoring-underground-water-pipelines>

### References

CERN. Train Inspection Monorail (TIM). Retrieved November 18, 2018, from <https://kt.cern/technologies/train-inspection-monorail-tim>

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