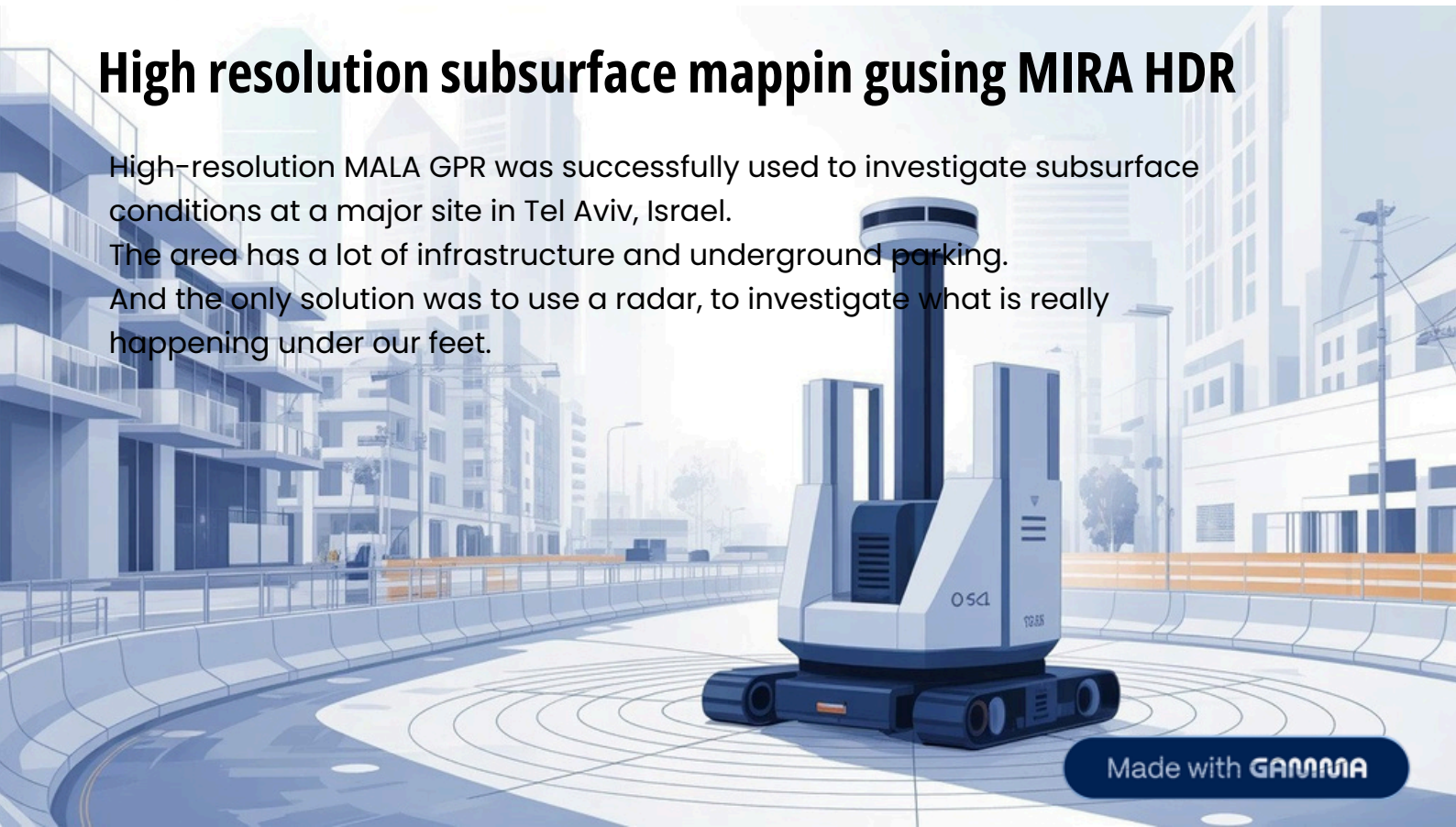


## High resolution subsurface mapping using MIRA HDR

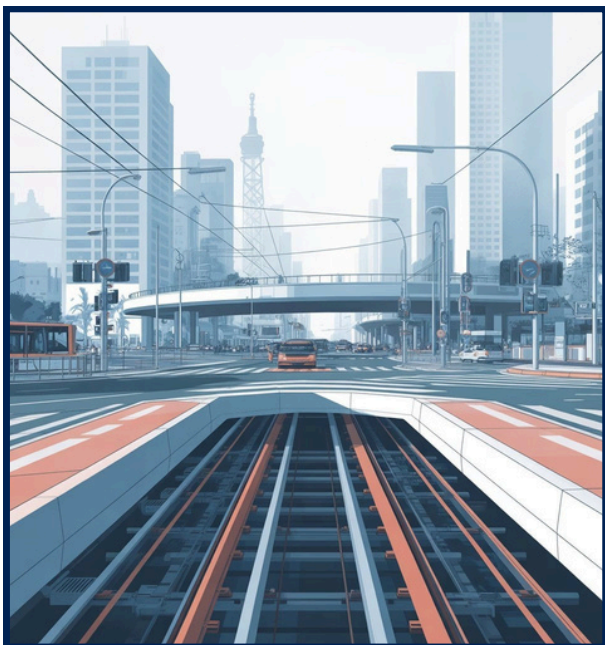
High-resolution MALA GPR was successfully used to investigate subsurface conditions at a major site in Tel Aviv, Israel. The area has a lot of infrastructure and underground parking. And the only solution was to use a radar, to investigate what is really happening under our feet.



### Client

NTA - Urban Transport Routes Ltd. is a government company, which is entrusted with the planning and implementation of the light rail in Tel Aviv and the subway in Tel Aviv. The company is subordinate to the Ministry of Transportation.

### Challenge



The work site is intended to be a metro station as part of the reforms of the Ministry of Transport. The site itself is a central place in the heart of Tel Aviv which has many infrastructures and different types of underground buildings. As part of the metro station planning process, we were required to locate an external wall of an underground structure.

### Project Requirements

#### Wall Structure Infrastructure Mapping

The wall itself should be supported by stilts during The planner required us to locate both the wall structure construction of the future station. and the infrastructure in the area.

## Solution

Since detailed subsurface mapping of the whole area was needed, MALÅ MIRA HDR was used. The MALÅ MIRA HDR is a GPR array solution, i.e. a multichannel system with very dense channel spacing (6.5 cm). The solution uses real-time sampling HDR technology, measures 22 parallel GPR lines simultaneously and delivers high resolution data of the subsurface. The area of interest was covered with flat asphalt and the MIRA HDR could easily scan throughout the entire project. In total, high resolution GPR data was collected across 500 square meters. The entire data acquisition took approximately 1 hour. For positioning, a base-over GNSS set up was used. The GNSS antenna was fitted on top of the MIRA HDR.

## Data Collection Process

### Field Measurements

Measurements were carried out during afternoon hours when traffic had settled. The MIRAsoft HDR software was used to navigate and help placement of each swath. was also used for additional navigational help.

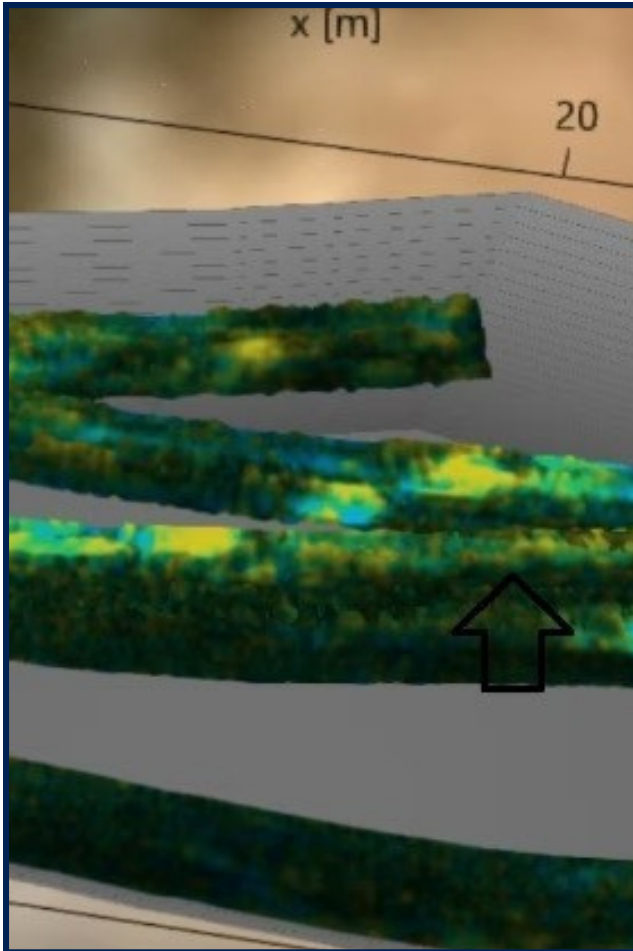
### Data Processing

Processing of data was made with rSlicer, a postprocessing software developed for MIRA and MIRA HDR data. rSlicer is a very efficient software for handling of MIRA GPR data, positions, and interpretations. Time/depth slices were created, and interpretations delivered in DXF format.

## Results & Conclusion

The MALÅ MIRA HDR solution delivered high detailed data across the entire site, revealing and verifying both known and unknown buried utilities and structures. Even in areas with multiple buildings and multiple infrastructures, the MALÅ, together with a built-in GPS, knew how to overcome the obstacles and show us both the infrastructures and the underground structures we were looking for. The client of the work received a depth and location of the structure and the various infrastructures.

## Detail 1: Underground Parking Wall Detection



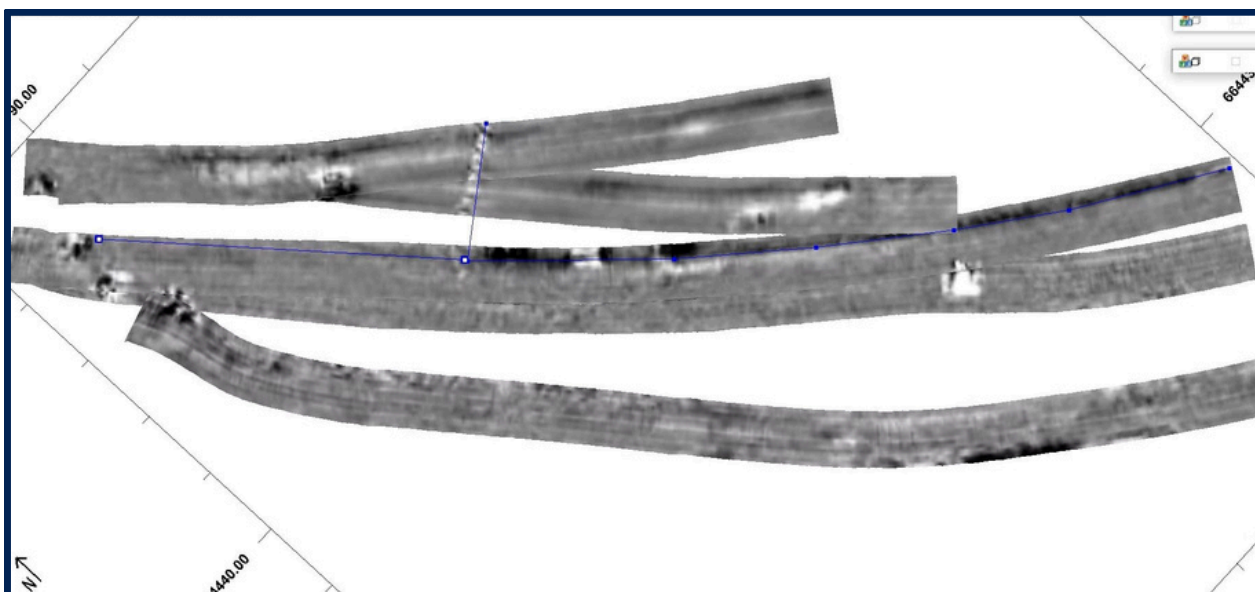
In the pictures below we can see the marking of the outer wall of the underground parking lot in MALA's decoding software.

You can also see the scan we received in the RSLICER software.

In addition, during the decoding we saw an internal retaining wall which contributed to the continuation of the planning.

The programs also show the depth of the wall, in this case the wall begins to appear from a depth of **1 meter to 6 meters**.

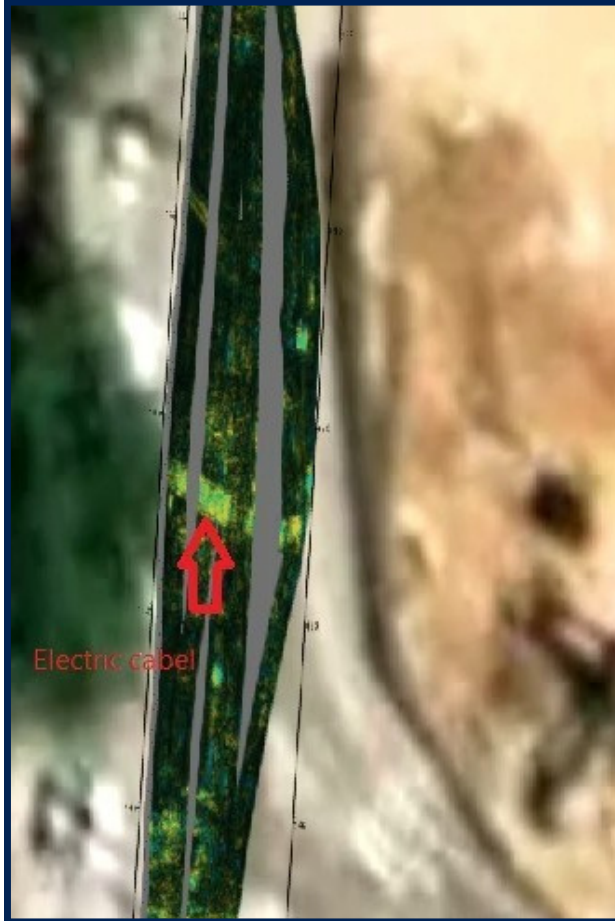
## Infrastructure Detection Results



In this picture we can see various infrastructures that cross the test area and are quickly and efficiently identified by the decoding software.

In this case it is electrical cables

## Comprehensive Site Analysis



**500**

Square Meters

**1**

Hour

**22**

Parallel Lines

Total area covered with high resolution GPR data

Complete data acquisition time

Simultaneous GPR measurements