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1. Demo Job Information



2025/06/24, Tuesday



Pangyo Station, Shinbundang Line



2 Pax (from South Survey)
3 Pax (from local dealer)



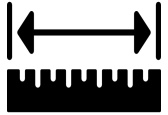
Tunnel Type: NATM
(New Austrian Tunnelling Method)



2. Demo Job Settings



Tunnel Access: 12:30pm – 2am
Job Duration: 1:00am – 1:40am



Mission Mileage: 14K400 – 14K300
(100m downlink and uplink each)



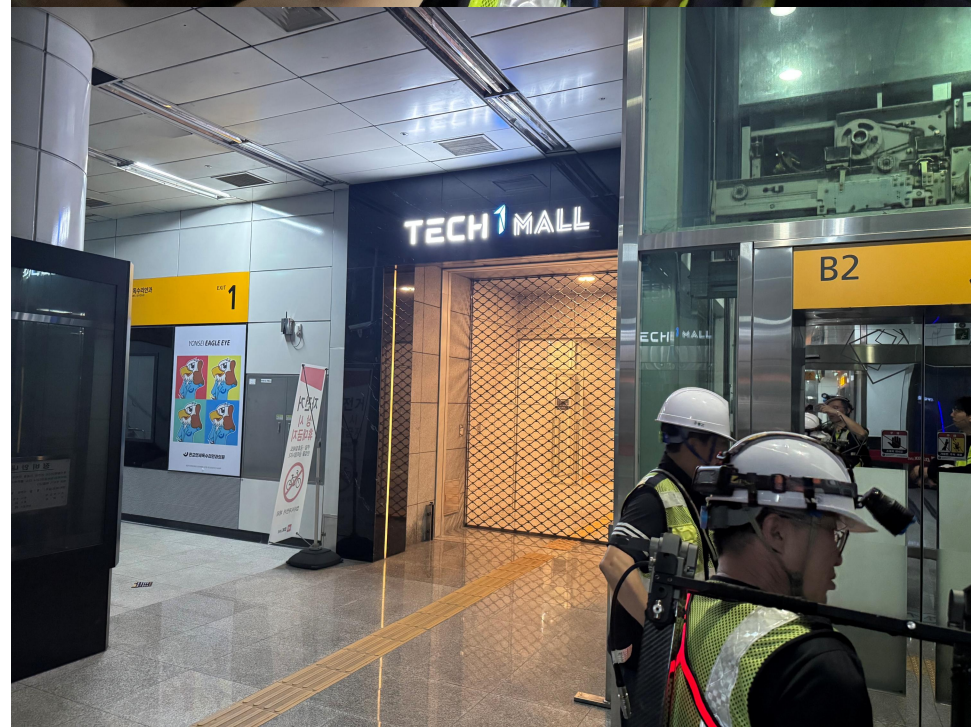
Trolley Speed: 0.8KMH uplink
0.8KMH downlink



Capture Mode: Scanning + Imaging







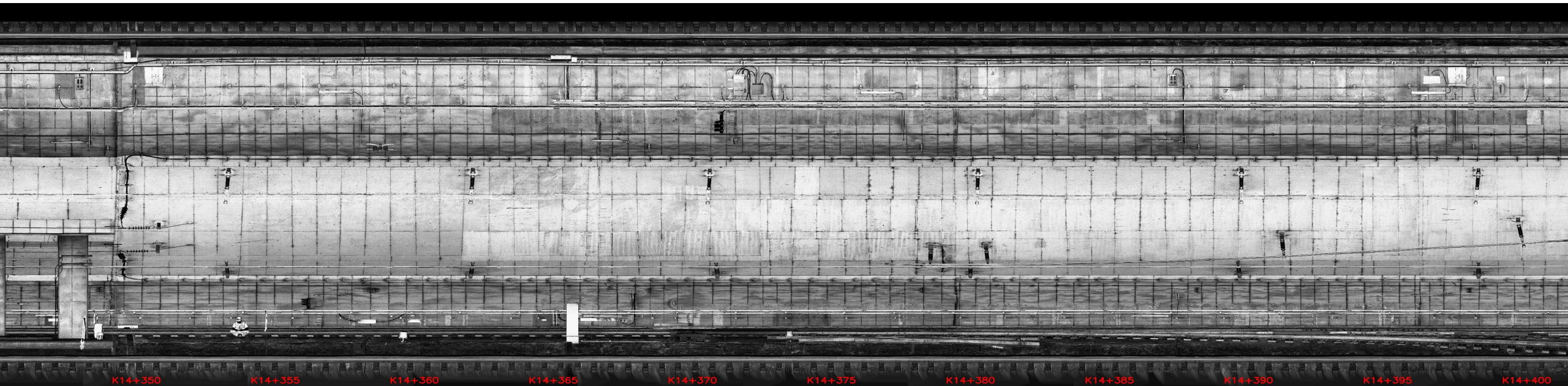
3. Outputs Overview

Inspected Category	Inspected Contents	Method	Intended to Find	Remarks
Tunnel Structure	Profile	Scanning	✓	
	Ovality		×	Non-shield Tunnel
	Tunnel Limit		×	No local data provided
	Tunnel Clearance		✓	
	Tunnel Convergence		×	
	Segment Stagger		×	Non-shield Tunnel
Inwall Defect	Lining Crack	Imaging	✓	
	Leakage		✓	
	Moist		✓	
	Concrete Peeling-off		✓	
	Concrete Falling-block		✓	
	Patch		✓	

4. Outputs Display ① - Overall Stats

Range	Mileage: 14284.0376-14402.4307m; Ring No. 1-24 (24 rings)	
Profile/Ring	Profile/Ring	Num of Profile: 47; Num of Ring: 24
	Max. Clearance	V. Clearance: 5.3686m (Ring No. 13) 850mm: 8.8287m (Ring No. 15); 3200mm: 8.8206m (Ring No. 24)
	Min. Clearance	V. Clearance: 4.7791m (Ring No. 3) 850mm: 3.9836m (Ring No. 14); 3200mm: 4.0950m (Ring No. 10)
	Ring Diameter	Unknown
	Zenith Elevation	Range: 4.7791-5.3686m; Average: 5.32908m
	Long Semi-axis	Unknown
	Short Semi-axis	Unknown
	Ovality Distribution	Unknown
	Ovality Max. Value	Unknown
	Ovality Min. Value	Unknown
Segment Stagger	Inter-segment	<u>Num</u> of Stagger: 0
	Inner-segment	<u>Num</u> of Stagger: 0
Tunnel Limit	Train Limit	Out of Tolerance: 0
	Facilities Limit	Out of Tolerance: 0
	Building Limit	Out of Tolerance: 0
Inwall Defects	Crack	Num: 0
	Breakage	Num: 0
	Leakage	Num: 0
	Total	Num: 0

4. Outputs Display ② - Circular Orthophoto (some portions only)



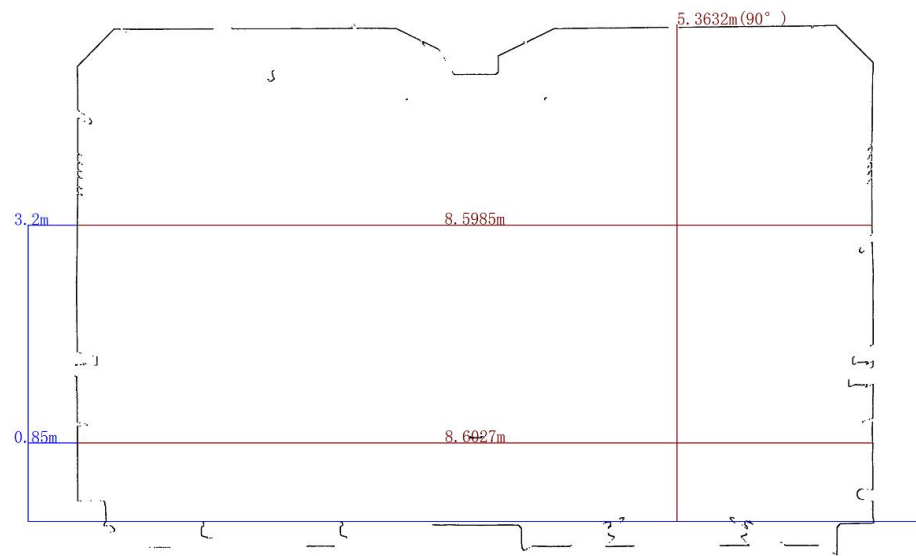
4. Outputs Display ③ - Tunnel Clearance (some portions only)

Ring No.	Mileage (m)	Segment Diameter (m)	Zenith Elevation (m)	H. Clearance		
				V. Clearance	850mm	3200mm
-	K14+309.038	-	5.3517	5.3517	8.6199	8.6212
-	K14+311.538	-	5.3505	5.3505	8.6115	8.6112
-	K14+314.038	-	5.3412	5.3412	8.6389	8.6254
-	K14+316.538	-	5.3349	5.3349	4.1109	4.1096
-	K14+319.038	-	5.3406	5.3406	4.107	4.1
-	K14+321.538	-	5.3592	5.3592	8.6212	8.6128
-	K14+324.038	-	5.3599	5.3599	8.621	8.6128
-	K14+326.537	-	5.3461	5.3461	8.6146	8.62
-	K14+329.038	-	5.3497	5.3497	8.4608	8.623
-	K14+331.538	-	5.3474	5.3474	4.1008	4.095
-	K14+334.038	-	5.3512	5.3512	5.6815	4.0977
-	K14+336.538	-	5.3579	5.3579	4.1087	4.1039
-	K14+339.038	-	5.3545	5.3545	8.6012	8.6017
-	K14+341.538	-	5.3532	5.3532	8.6064	8.6082
-	K14+344.038	-	5.3526	5.3526	4.0962	8.6023
-	K14+346.538	-	5.3686	5.3686	8.6026	8.5946
-	K14+349.038	-	5.3519	5.3519	3.9836	4.1179
-	K14+351.538	-	5.3545	5.3545	8.644	8.8201
-	K14+354.038	-	5.326	5.326	8.8287	8.8109

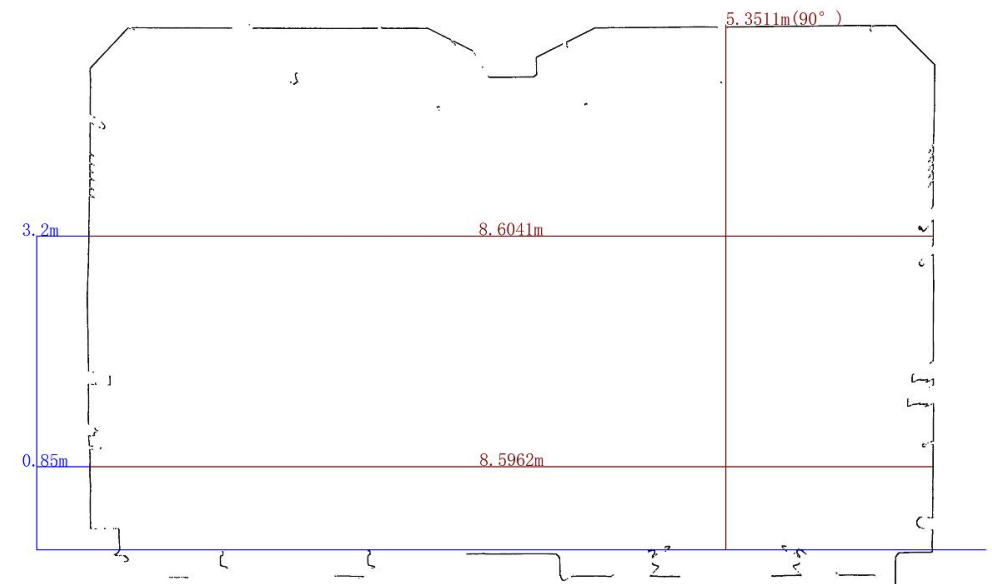
4. Outputs Display ④ - Detected Defects in HD Image

No.	Area (m ²)	Length (m)	Width (mm)	Defect	Reference
1-1-crack-0	0.0000	0.2125	0.5400	Crack	
1-1-crack-1	0.0000	0.3802	0.5500	Crack	
1-1-crack-2	0.0000	0.4728	0.6500	Crack	
1-1-crack-3	0.0000	0.2150	0.4600	Crack	

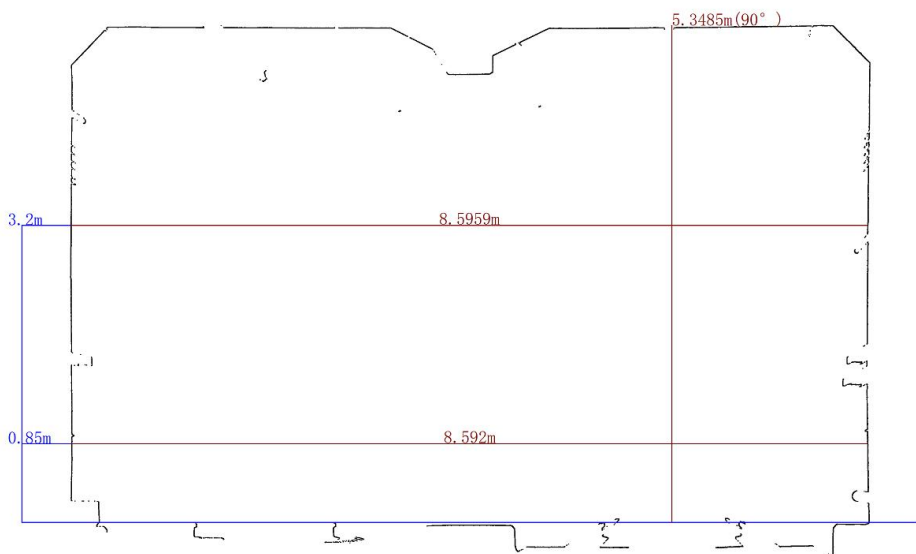
4. Outputs Display ⑤ - Profiles (some portions only)



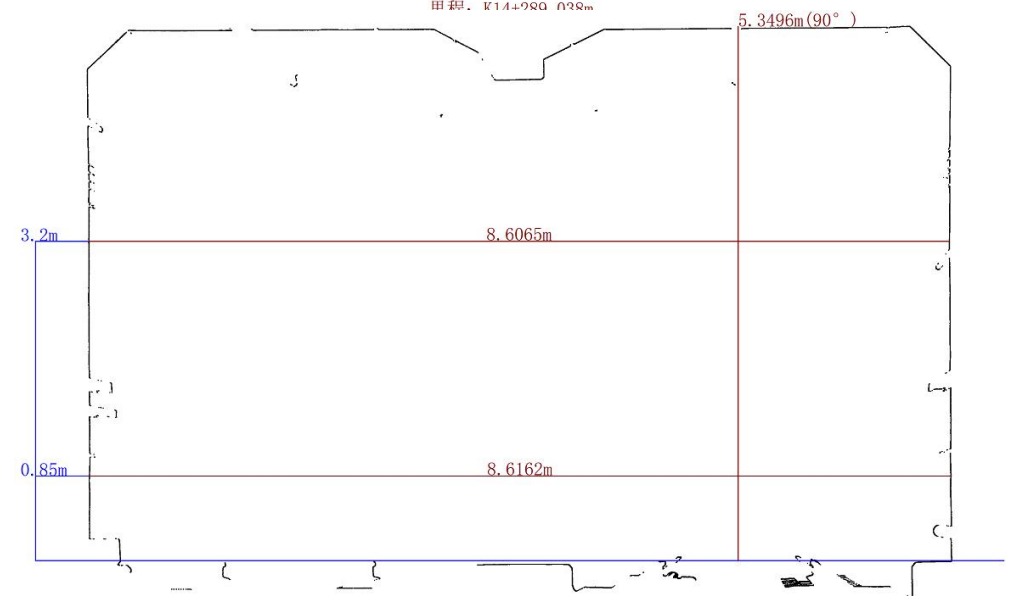
里程: K14+286.538m



里程: K14+290.038m

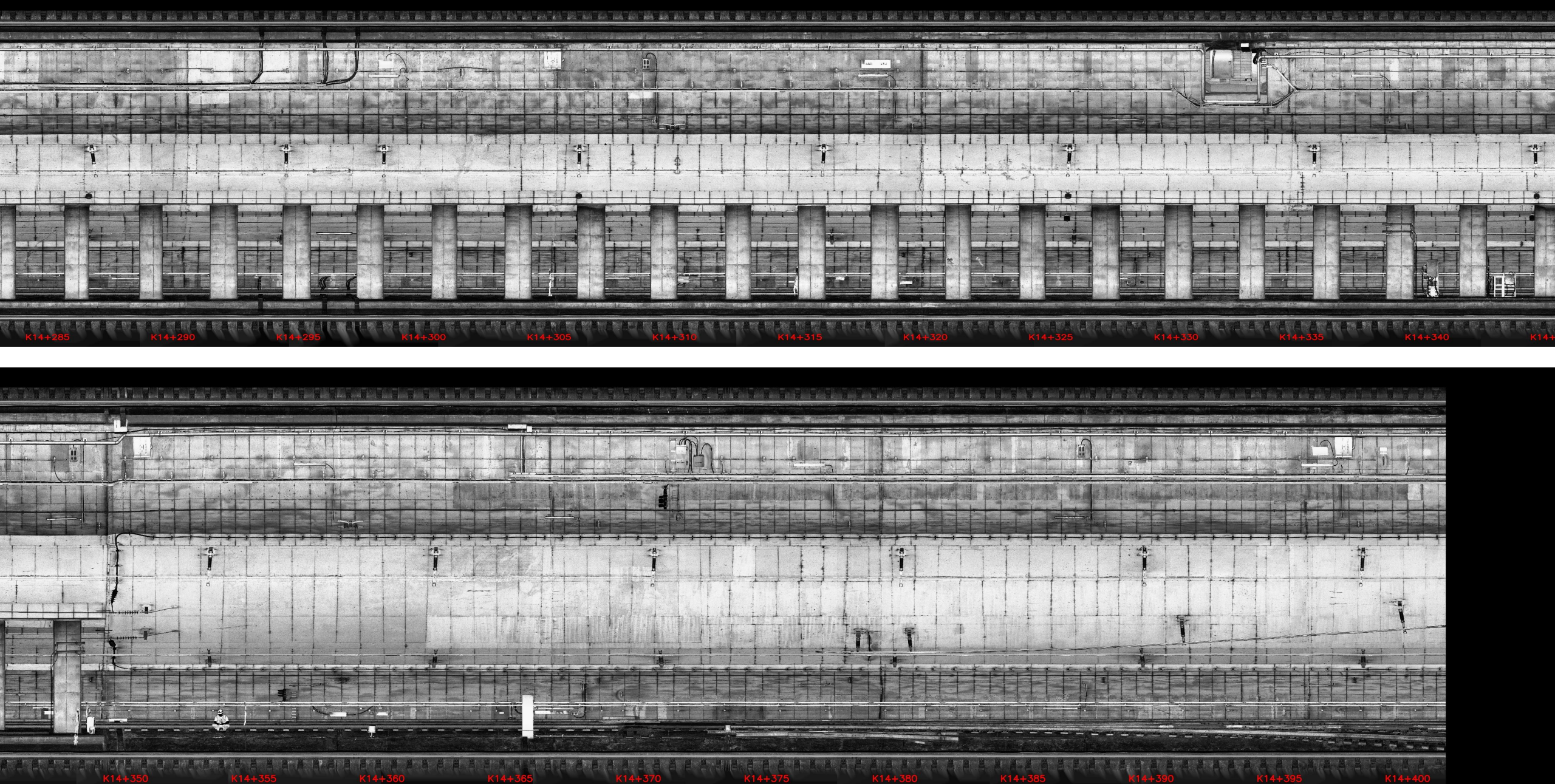


里程: K14+291.538m

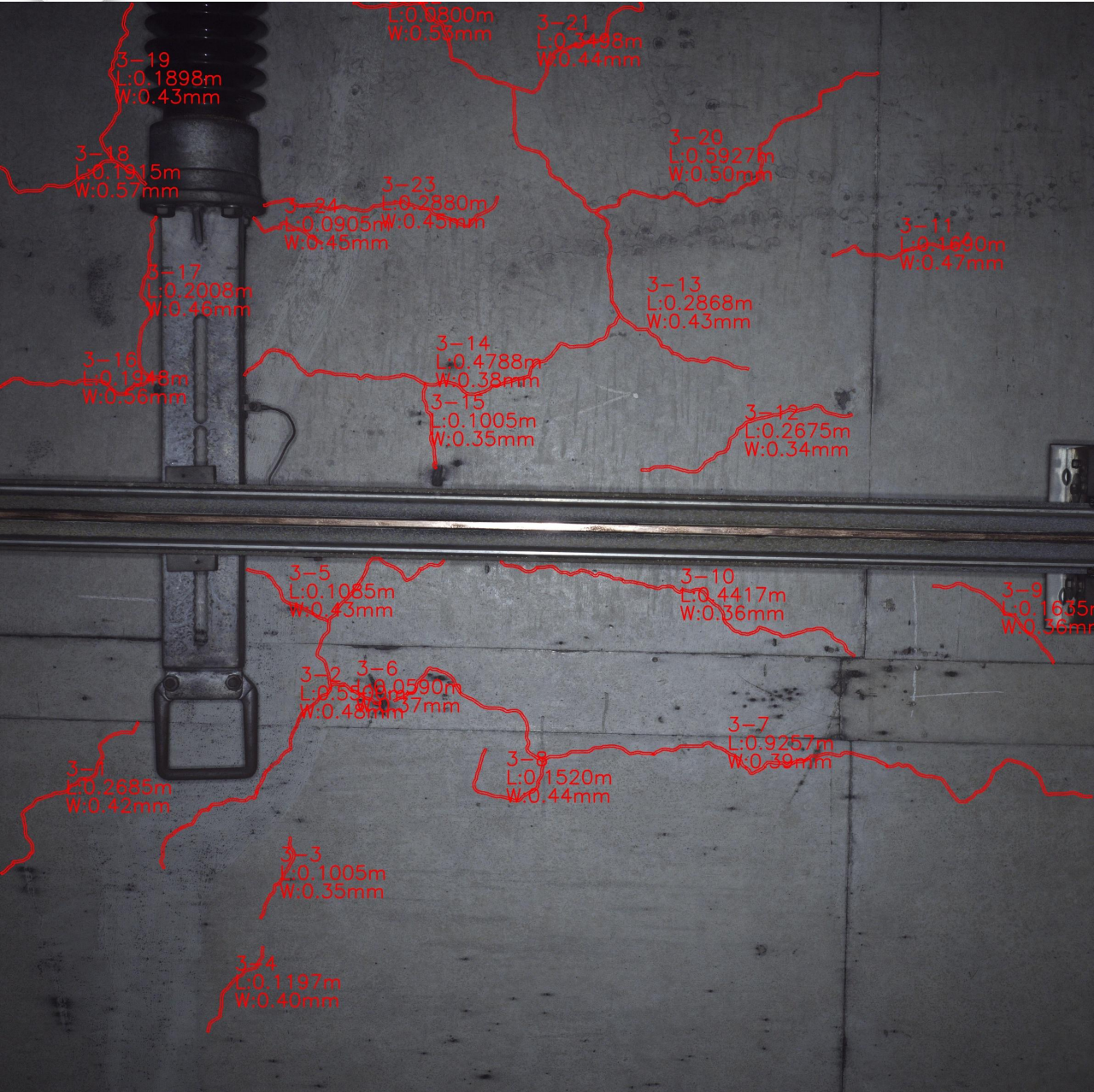


里程: K14+304.038m

4. Outputs Display ⑥ - Detected Defects in Circular Orthophoto



4. Outputs Display ⑦ - Detected Crack in HD Image



l:crack

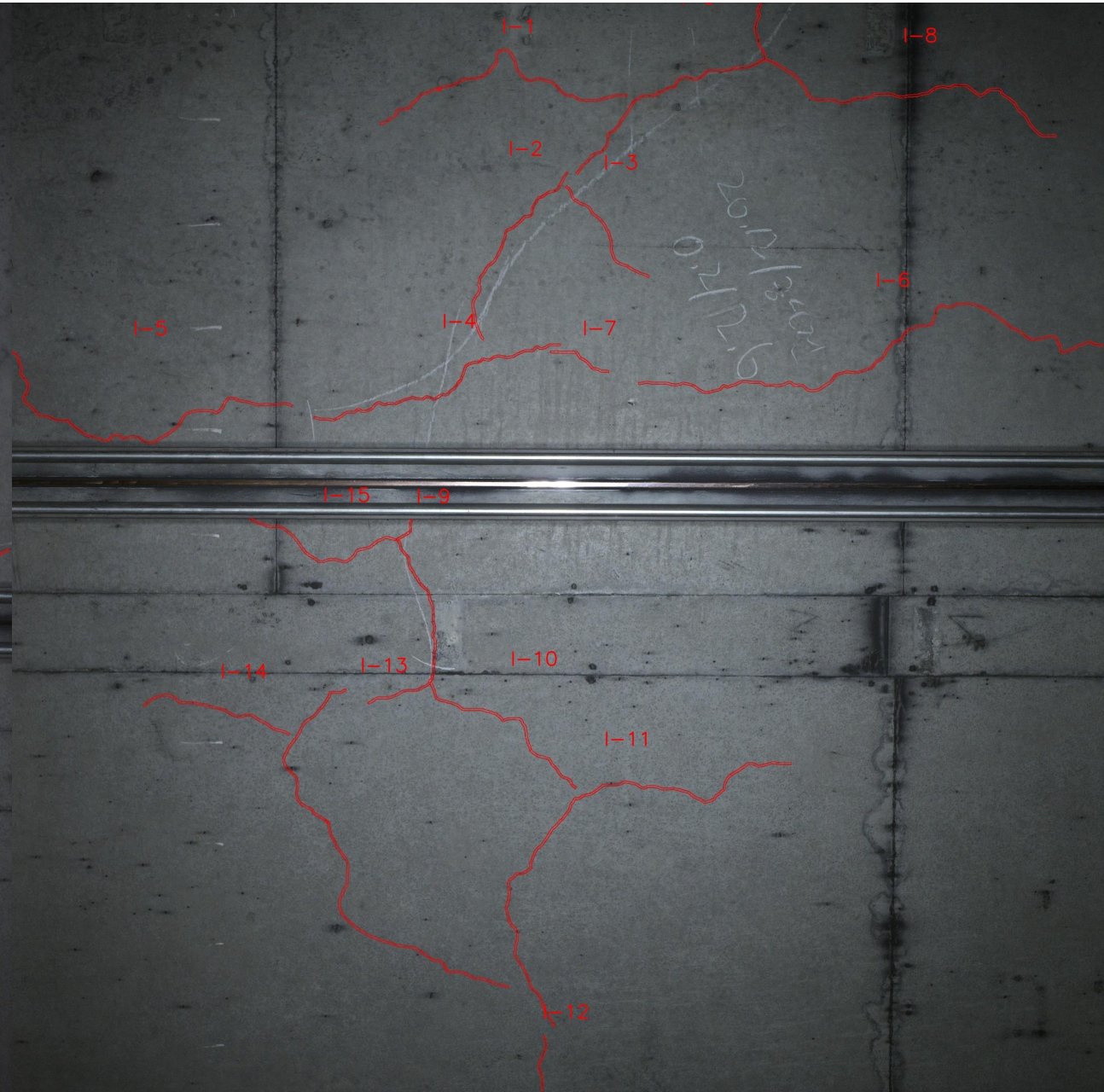


l:crack

4. Outputs Display ⑦ - Detected Crack in HD Image



l:crack



l:crack

4. Outputs Display ⑦ - Detected Crack in HD Image



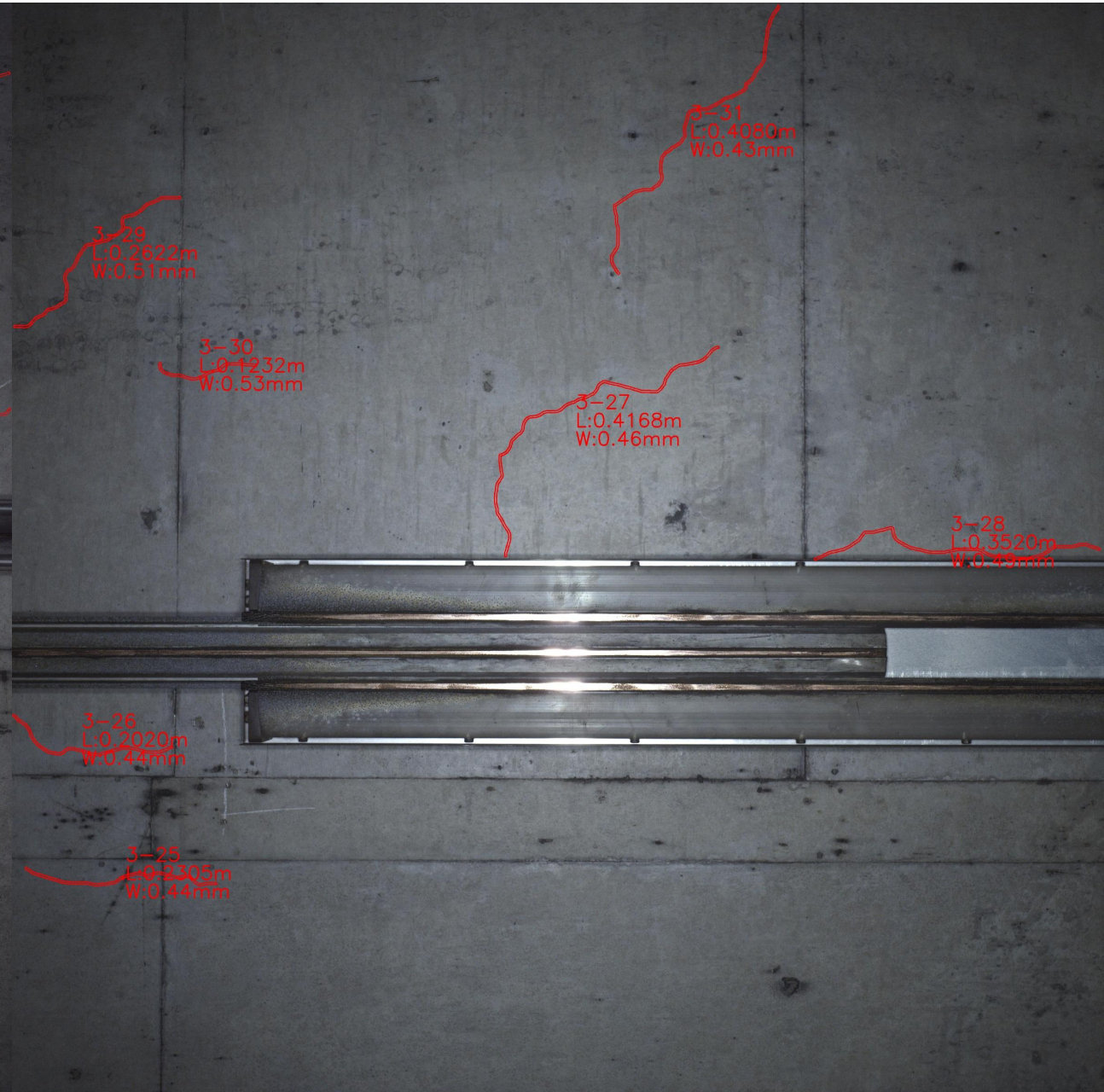
l:crack

l:crack

4. Outputs Display ⑦ - Detected Crack in HD Image

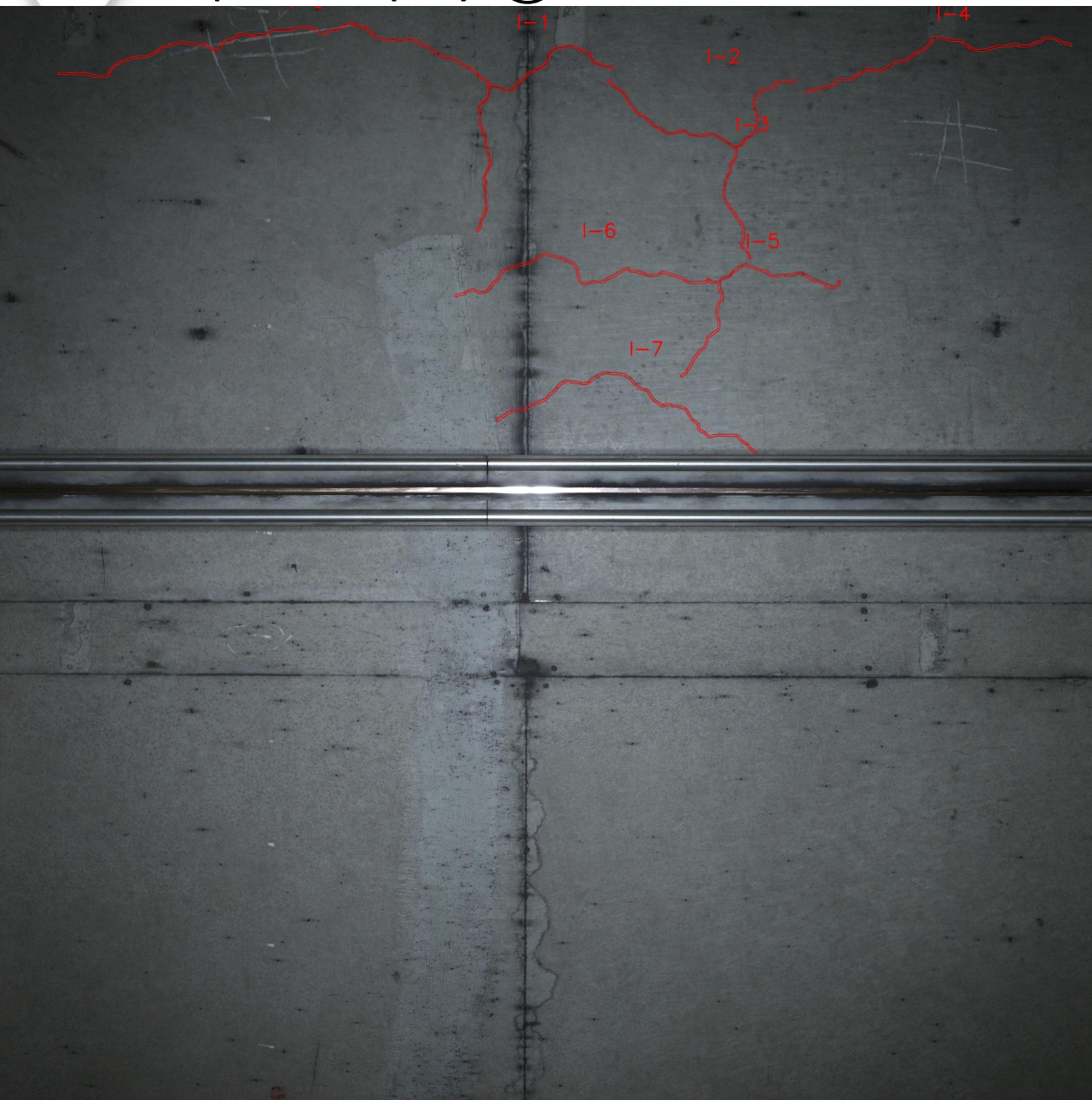


I:crack

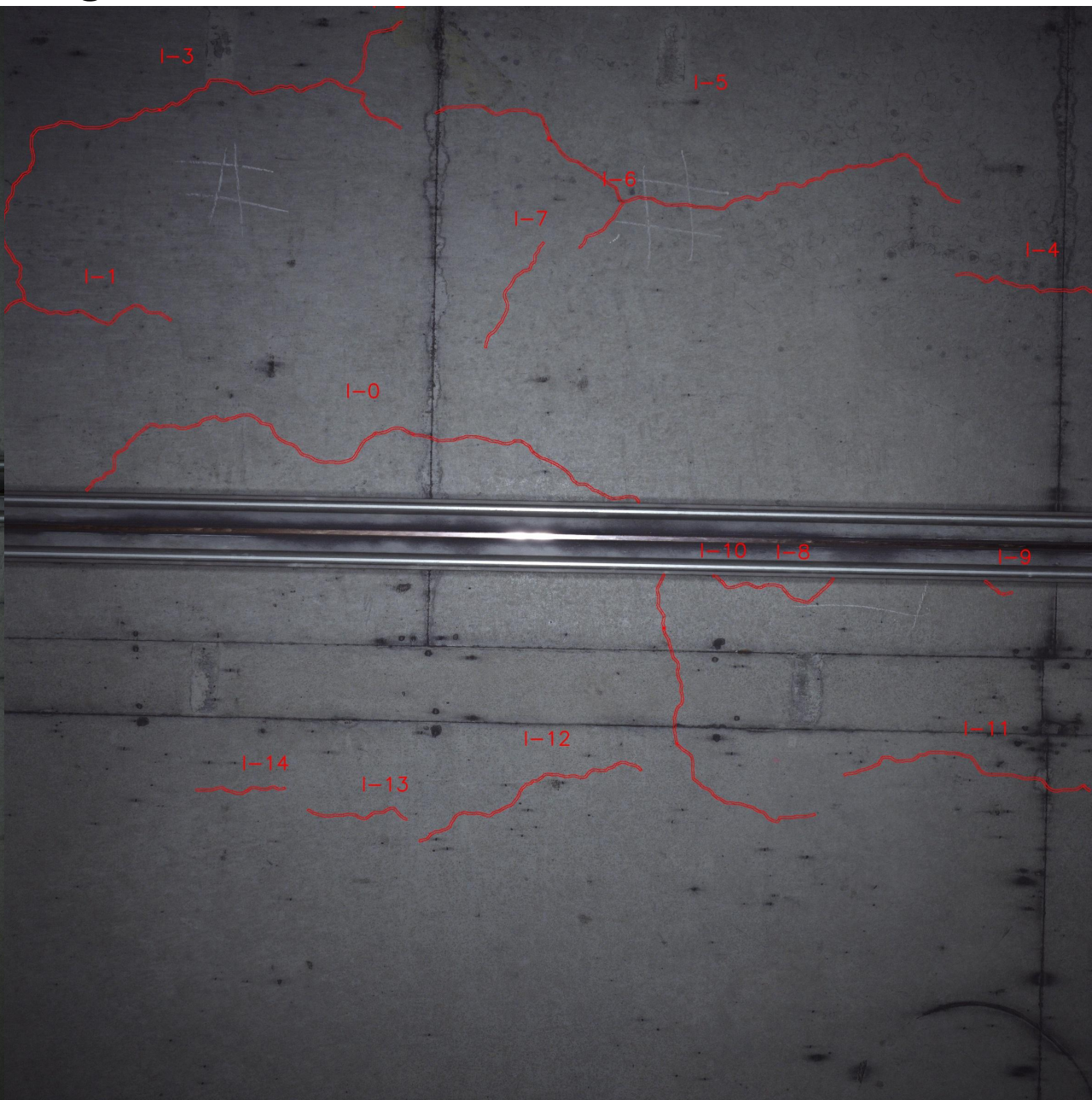


I:crack

4. Outputs Display ⑦ - Detected Crack in HD Image

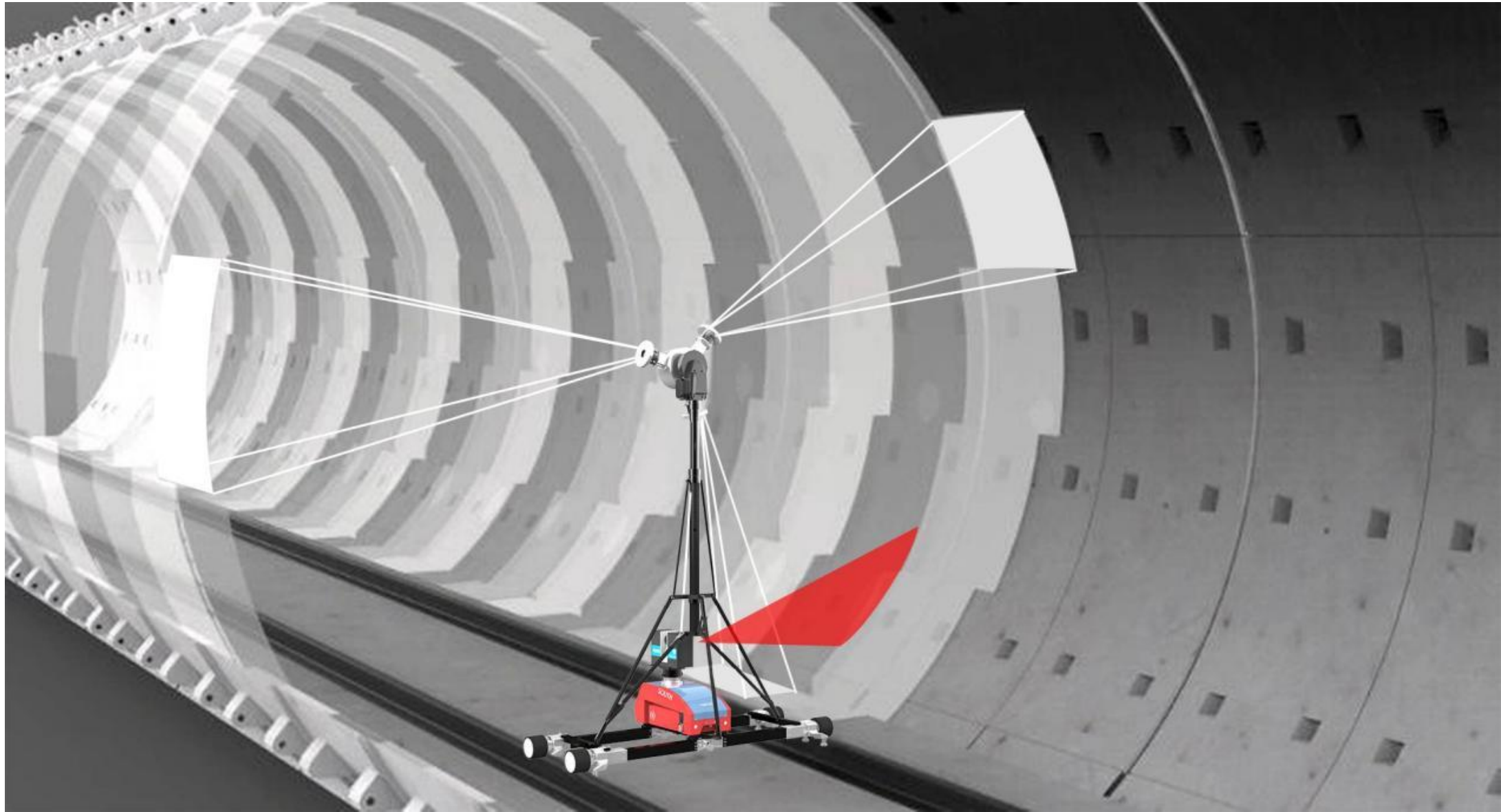


l:crack



l:crack

5. Demo Job Conclusion



7th Gen (since 2023)



8th Gen (since 2025)



The 2 generations differ slightly in the TrolleyAuto Base Stand, but primarily in the integrated camera system.

The table below talks about the key differences between 7th and 8th generations only.

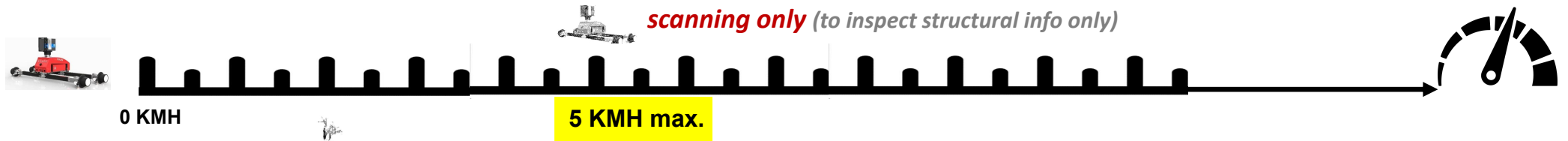
Gen		7 th	8 th
System Performance	Carrier Platform	standard base stand, with wheelbase 400mm	standard base stand + mobile vehicle + railway trailer
	Suited Scenes	rail tunnels φ 5±1 m	rail tunnels φ 6.5±1.5 m
	Memory Size	2TB (2km max. as default); 4TB (4km max. as option)	10TB (55m max. JPG format)
	Function	to capture HD RGB images (JPG/PNG/BMP and raw formats) that present the surface conditions of rail tunnels	
Camera	Number of Lens	3 RGB lens, max. frame @14fps	8 RGB lens, max. frame @14fps
	Focusing Method	manual (default); auto (option)	auto (default)
	Image Resolution	0.26mm @5.4m, tiny cracks detected up to 0.2mm	
	Depth of Focus	approx. 1m	
	Imaging Method	Spiral Imaging	Fixed Imaging
	Imaging Direction	rotates 15° clockwise (8 triggers per round)	non-rotatable, each lens facing one direction to cover 45°
	Inspecting Coverage	360° (= 15° x 8 x 3)	360° (= 45° x 8)
	Power Consumption	< 240W (fill-in light < 30W for the 3 lenses each)	< 600W (fill-in light < 50W for the 8 lenses each)
	Gross Weight	9kg	16kg
Job Efficiency	Structure Only (scanning only)	5km/h	5.5km/h
	Structure + Defects (scanning + imaging)	2.5km/h	5.5km/h (running by TrolleyAuto, standard base stand); 10km/h (running by railway trailer or mobile vehicle)

Note:

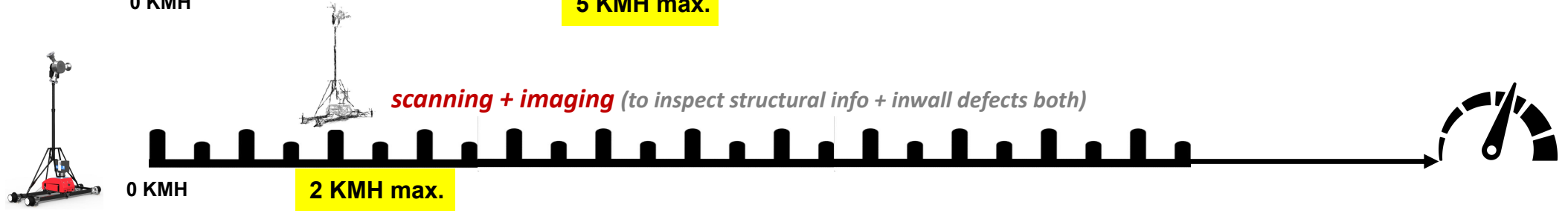
- 1) *high running speed of TrolleyAuto on the railway is actually not friendly to the operator, because human beings can't move like 4-5 km/h along the railway tracks, but max. 3.6 km/h in reality ;*
- 2) *Ultrahigh running speed of TrolleyAuto is not good for camera triggering and rotating. To increase the job efficiency, it's suggested to change with another mobile carrier platform.*

Metro Tunnel Inspection RoboCheck Job Efficiency At A Glance

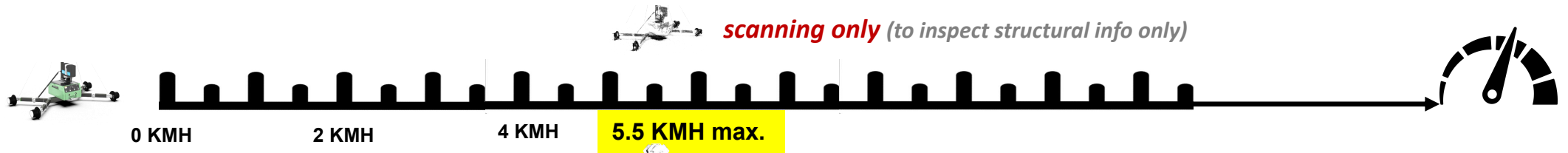
7th Gen
-TrolleyAuto



7th Gen
-TrolleyAuto



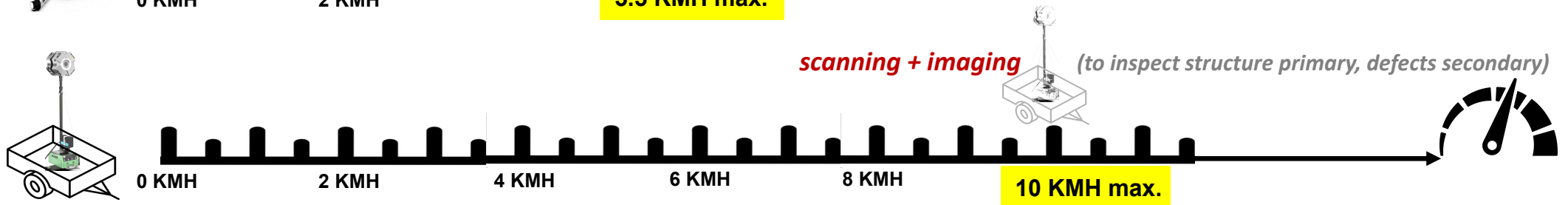
8th Gen
-TrolleyAuto



8th Gen
-TrolleyAuto



8th Gen –
installed on Trailer



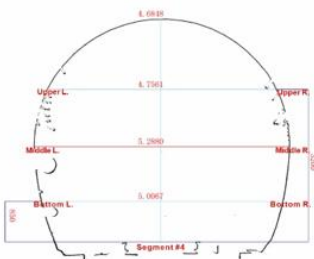
Note: it's possible for TrolleyAuto or Rail Trailer to run much faster, but it makes no sense in terms of comprehensive inspected data analysis. At 5km/h, the point spacing of the scanned point cloud is approx. 16mm, which is not friendly to compute satisfactory data of some structural info such as segment stagger.

Model		MS100	MS100 Pro
Component	TrolleyAuto	√	√
	Laser Scanner	√	√
	Software Tunnel Scan&Go	√	√
	Clover Camera System		√
Output	Grey-scale Image (derived from point cloud)	√	√
	Ultrahigh Resolution Image		√
	Inspection Report	√	√
	Tiny Crack Detected	Up to 2 mm	Up to 0.2 mm
Tunnel Structure	Ovality	√	√
	Tunnel Limit	√	√
	Tunnel Clearance	√	√
	Tunnel Convergence	√	√
	Segment Stagger	√	√
Inwall Defect	Lining Crack	√	√
	Leakage	√	√
	Moist	√	√
	Concrete Peeling-off	√	√
	Concrete Falling-block	√	√

Software	Tunnel Scan&Go	Tunnel Fulicle
type	software kit	software platform
supply	standard, must-have	optional
applicable for	contractors and rail authorities both	rail authorities mainly *
target	fieldwork, post process	big data management
---- functions included ----		
fieldwork setting	√	x
fieldwork control	√	x
realtime display	√	x
circular orthophoto generation	√	x
AI detection	√	x
structure info computation	√	x
single-task report export	√	x
full-life cycle management	x	√
traceable data records	x	√
overall/specific statistics	x	√
big data analysis	x	√
before & after comparison	x	√
deformation monitoring	x	√
out-of-tolerance warning	x	√
general report export	x	√

Note*: the software platform Fulicle for big data management is mainly designed for rail authorities which need to make full use of the captured data and run full-life-cycle management. But, in case that big contractors receive job services for long-term cooperation (eg. 3-5 years) with the local rail authority, it's also recommended to consider this MT-GIS to keep certain database against long-term management.

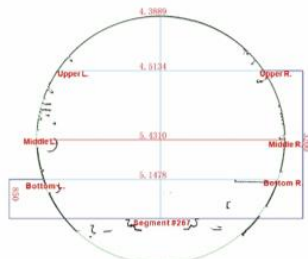
Tunnel Structural Deformation



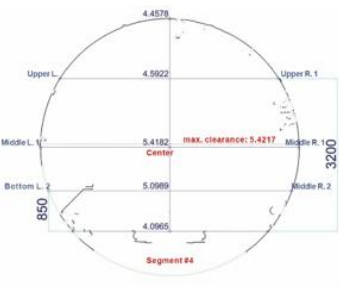
bored tunnel sectional data



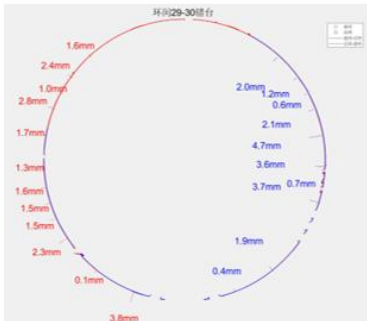
metro station sectional data



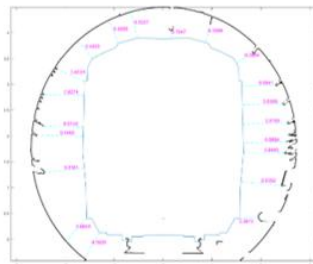
shield tunnel sectional data



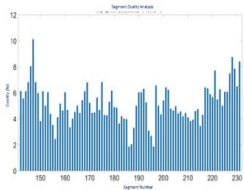
tunnel clearance



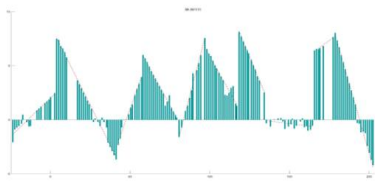
segment stagger



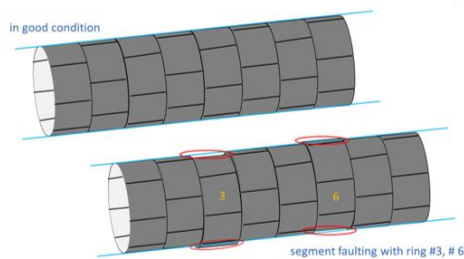
tunnel limit



segment ovality



segment stagger data extracted

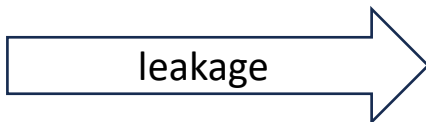


segment stagger

Tunnel Inwall Defects



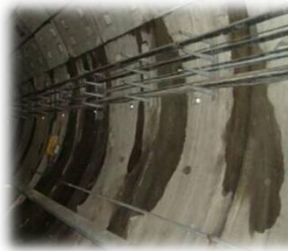
lining crack



leakage



moist



concrete falling-off



segment breakage

