



KEOLIS amey

Metrolink

PREVENTATIVE MAINTENANCE ON METROLINK

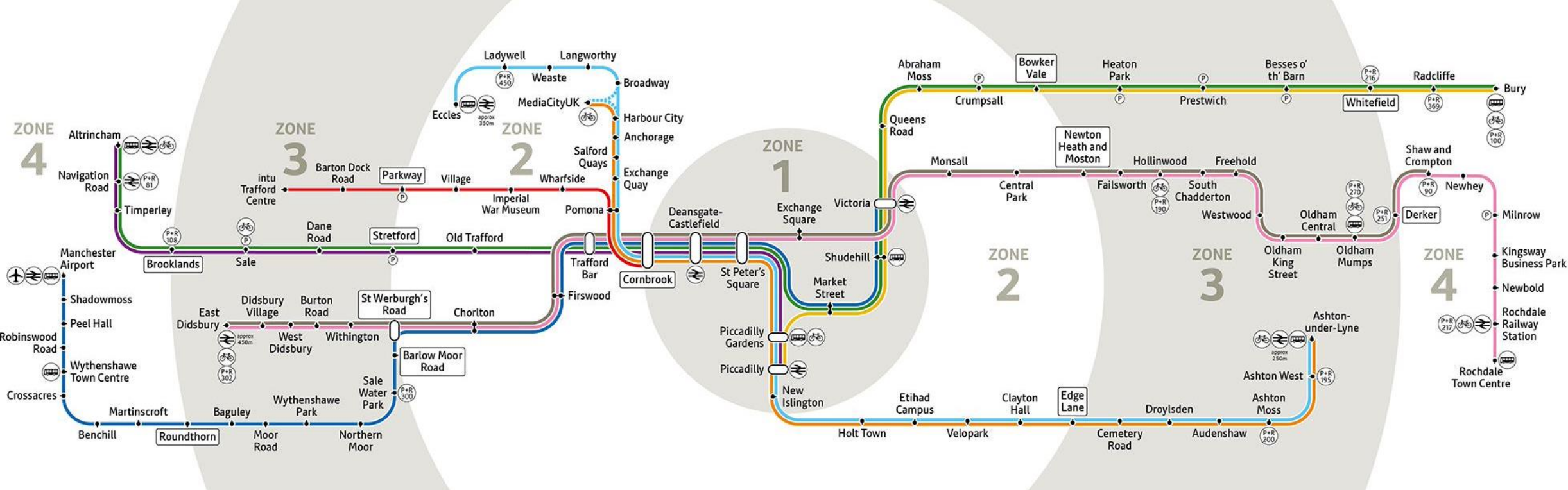
Dr Martyn Chymera

Head of Engineering and Asset Management

Agenda

- Manchester Metrolink
- Condition Monitoring
- Predicting Failures
- Preventative Maintenance

Manchester Metrolink



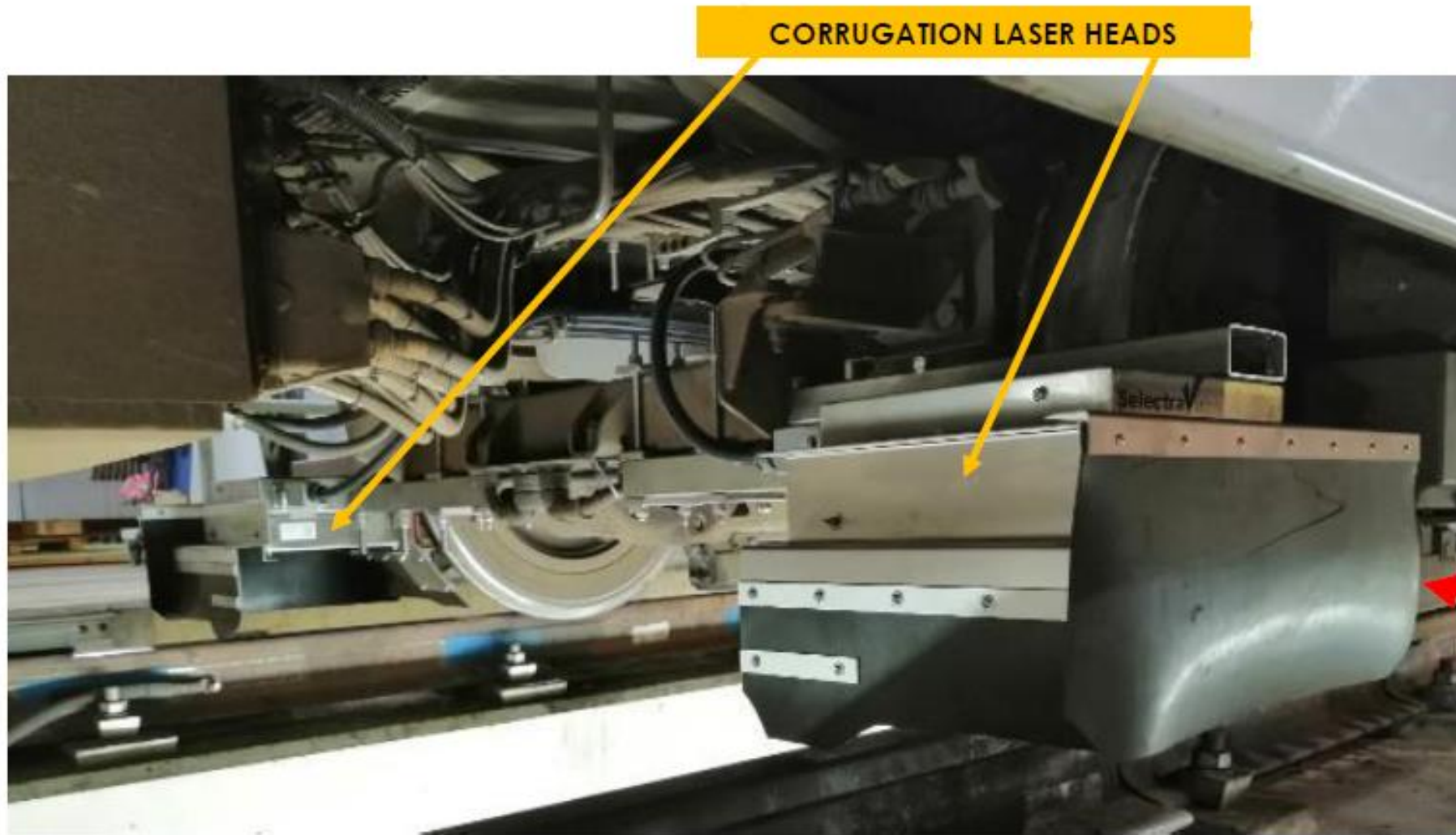
Condition Monitoring

- Track
- Overhead Line
- Pantographs
- Wheel Profiles

Before Condition Monitoring



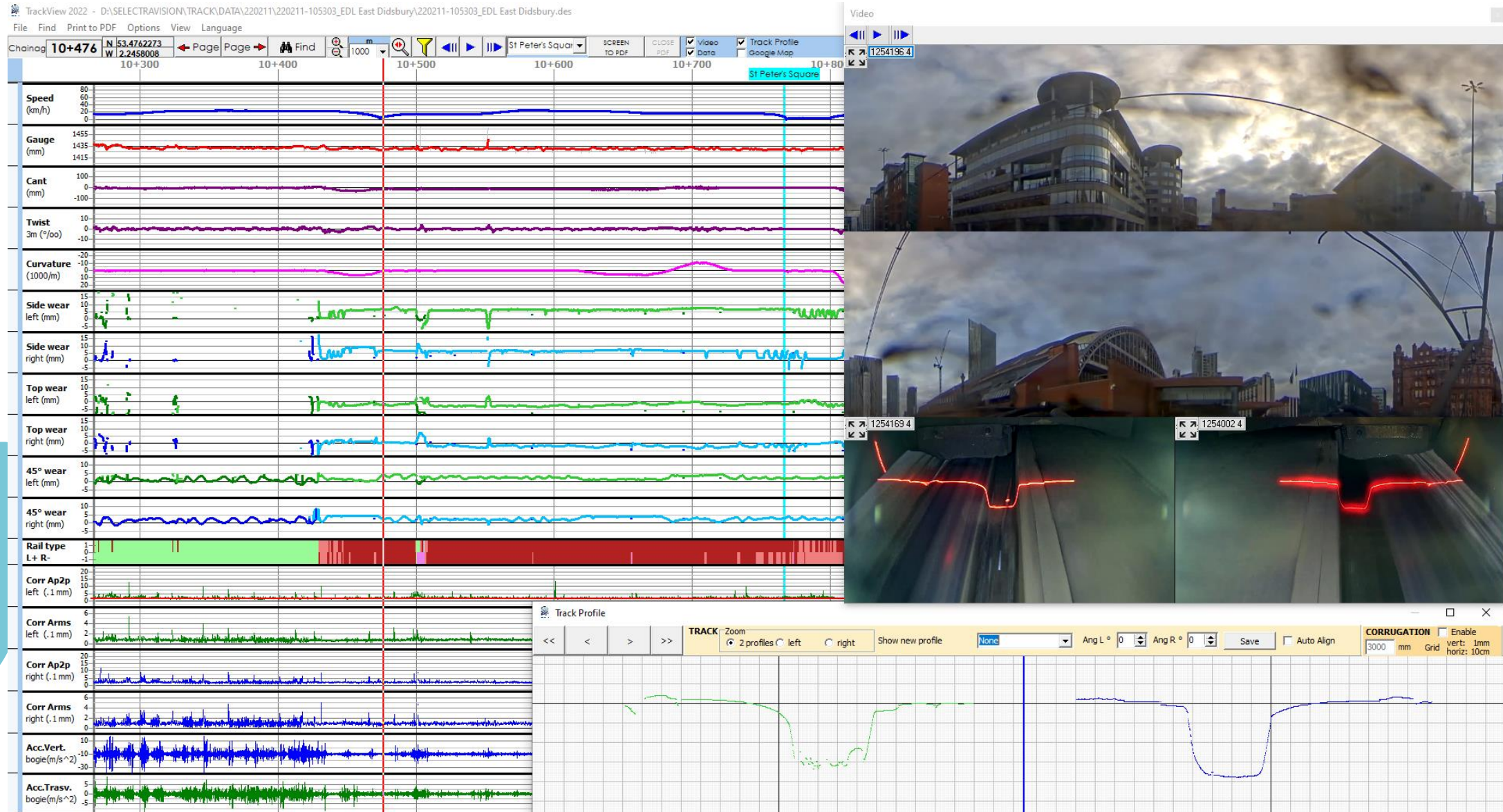
Remote Condition Monitoring – Track and Rail



Remote Condition Monitoring – Track and Rail

- Gauge, cant, twist
- Horizontal alignment
- Rail type identification
- Rail wear (L/R) (head/side/45)
- Rail corrugation
- Vibration
- Rail head and panoramic video

Remote Condition Monitoring – Track and Rail



Remote Condition Monitoring – Overhead Line Measurements

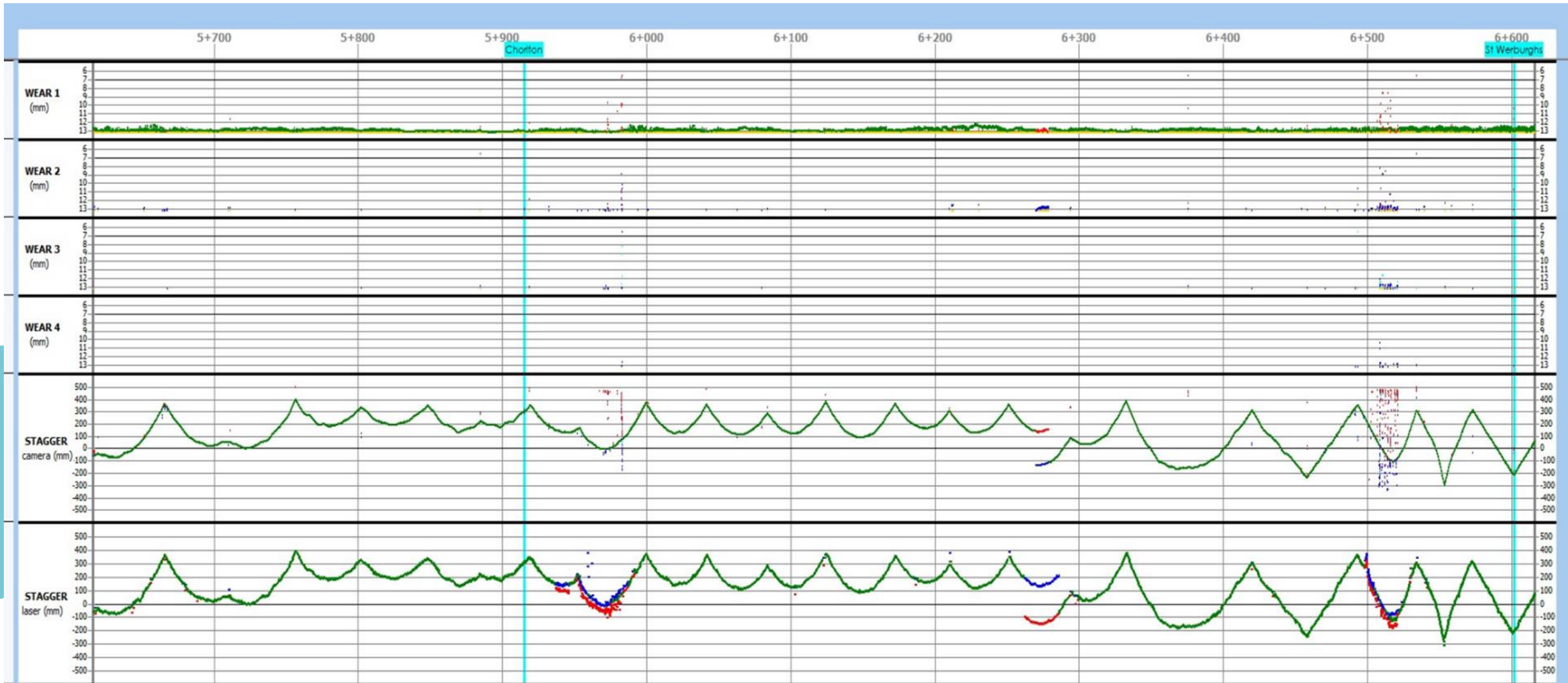


- Rotating Laser (lateral and vertical position)
- Light reflection (lateral position and wear)
- Video – pantograph and side view
- Thermal camera

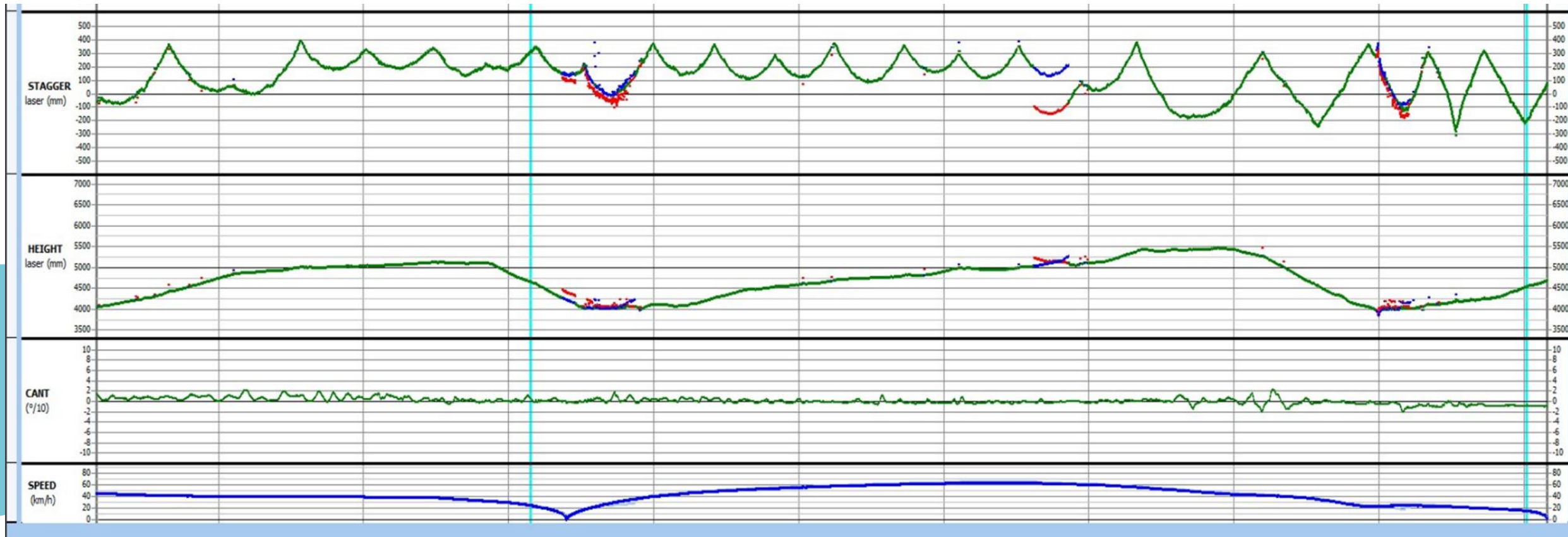
Remote Condition Monitoring – Overhead Line Measurements

- Contact wire height and stagger
- Contact wire wear
- Thermal, pantograph and panoramic video

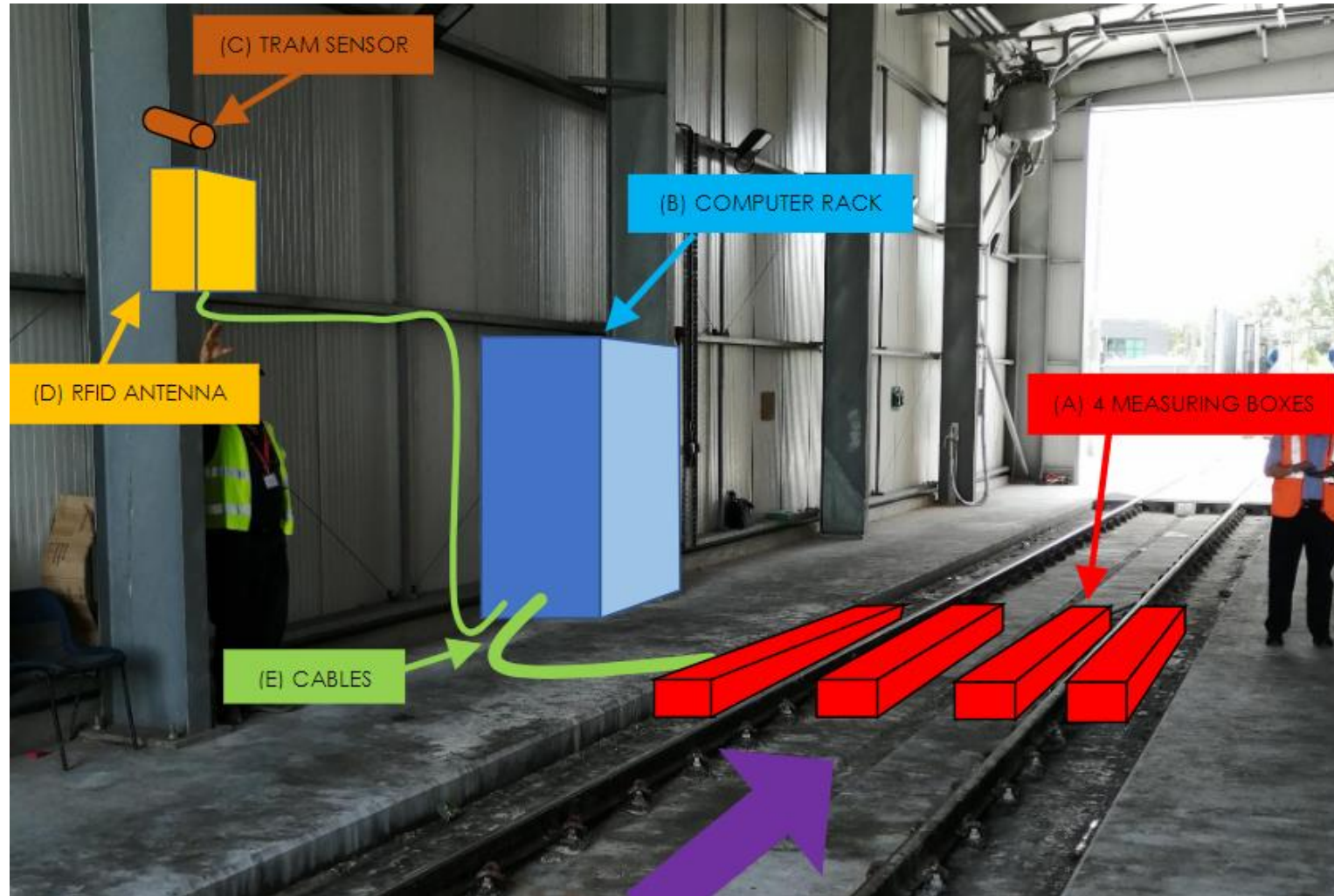
Remote Condition Monitoring – Overhead Line Measurements



Remote Condition Monitoring – Overhead Line Measurements

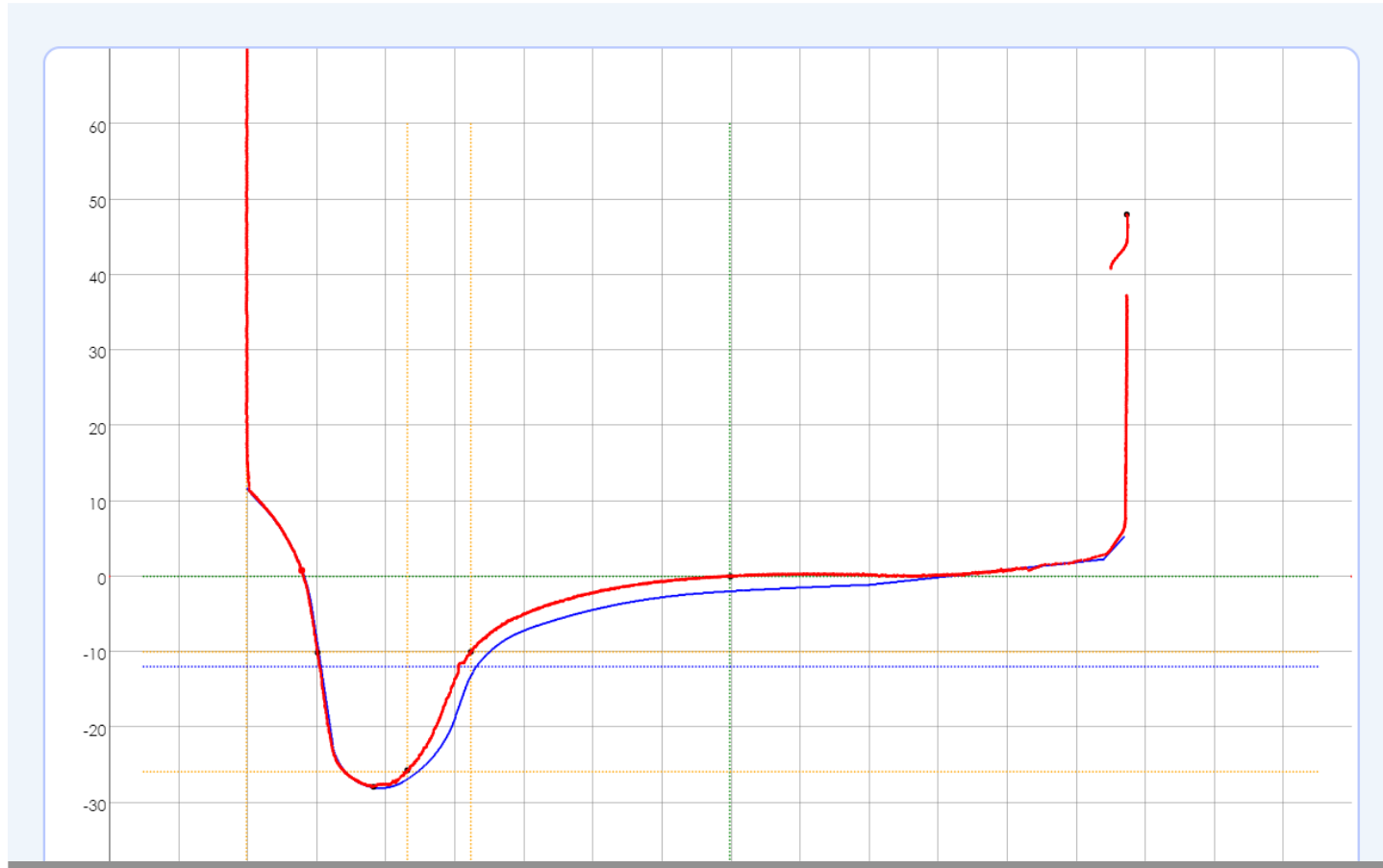


Wheel Profile Measurement



Wheel Profile Measurement

Vehicle Side	Width	Height	Quote q_r	Single Wheel	Axle difference
right	32.5	27.9	9.2	37.9	0.1



Wheel Profile Measurement

Transit Date and Time	Tram ID	Speed (km/h)	Axles No.	Wheels No.	Wheel Alarm	Transit Status
16.10.2020 - 01:10:22	V3025A	6.6	6	12		

TRAM OVERVIEW

** All measurements are in mm

tread depth	13.2	13.3	7.8	7.8	13.5	13.9			
Qr	8.9	8.7	9.1	9.1	9	8.9			
height	26.2	26.4	26.6	26.5	26.3	26.4			
flange width	32	33	32.5	32.6	32.6	33			
WHEEL ID	1	2	3	4	5	6			
RIGHT							RIGHT		
A	1357.2	1357.3	Back to back gauge	1357.6	1357.5	Back to back gauge	1357.2	1358.2	B
V3025	0.5	0.2	Tread Depth Difference	0.4	0.3	Tread Depth Difference	0.3	0.1	V3025
LEFT							LEFT		
WHEEL ID	12	11	10	9	8	7			
flange width	33.9	33.3	33.5	33.3	33.5	33.2			
height	26.7	26.8	27	26.9	26.7	26.7			
Qr	9.7	8.8	9.1	9.2	9.7	8.7			
tread depth	13.7	13.5	8.2	8.1	13.8	13.8			

Wheel Profile Measurement

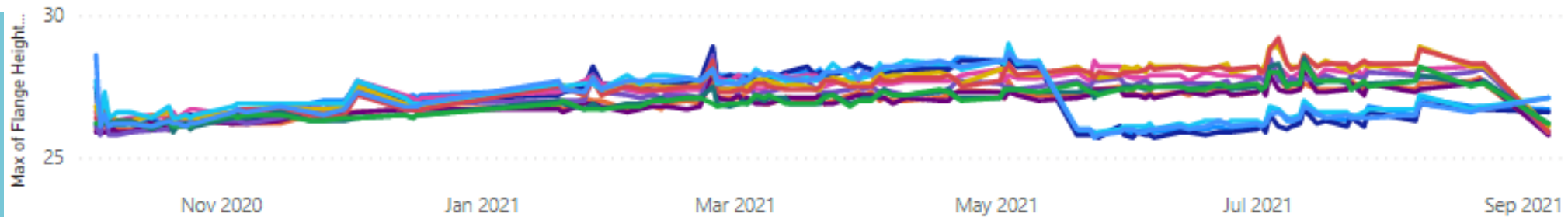
Max of Tread Depth (mm) by Transit Date and Wheel ID

Wheel ID ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8 ● 9 ● 10 ● 11 ● 12



Max of Flange Height (mm) by Transit Date and Wheel ID

Wheel ID ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8 ● 9 ● 10 ● 11 ● 12



Pantograph Monitoring

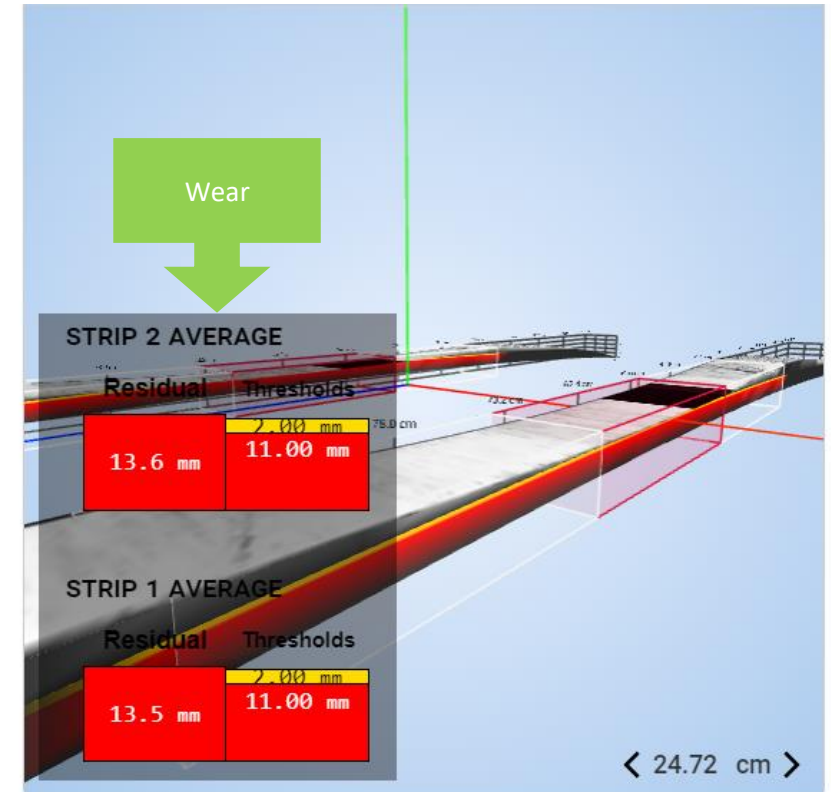
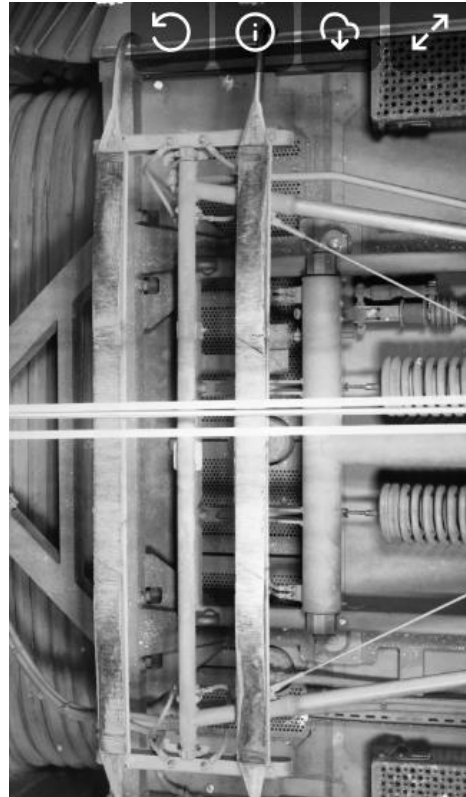


Pantograph Monitoring

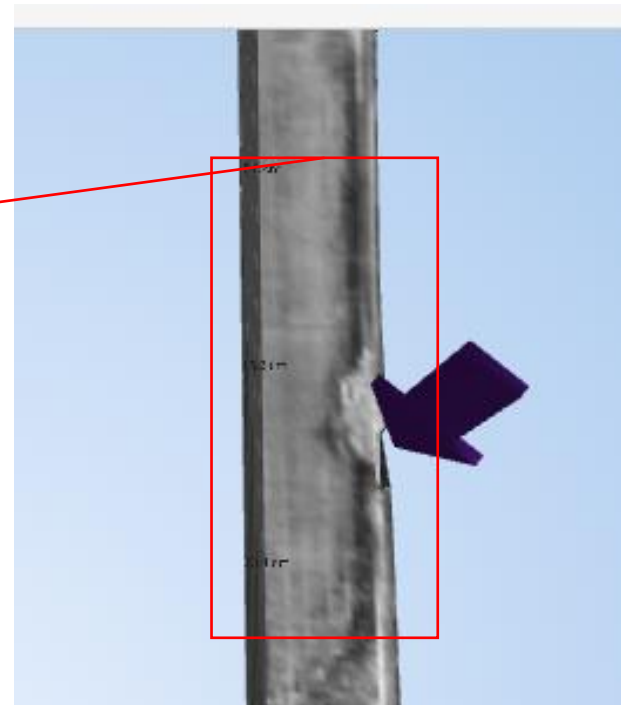
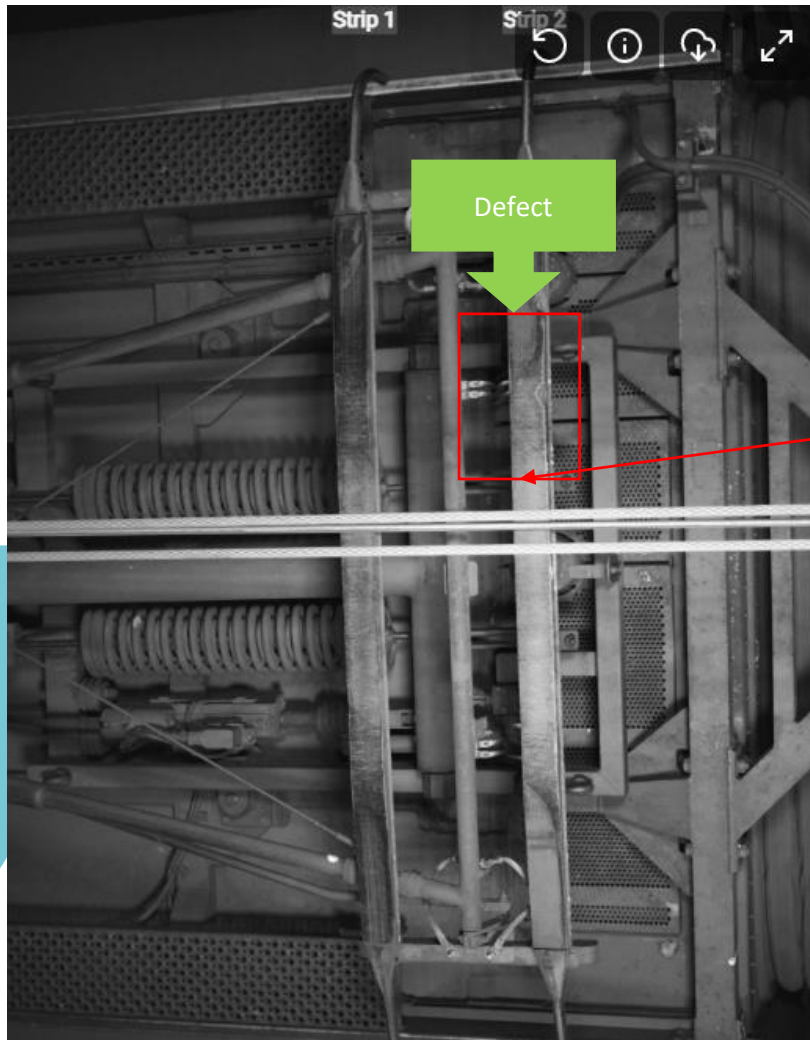


Pantograph Monitoring

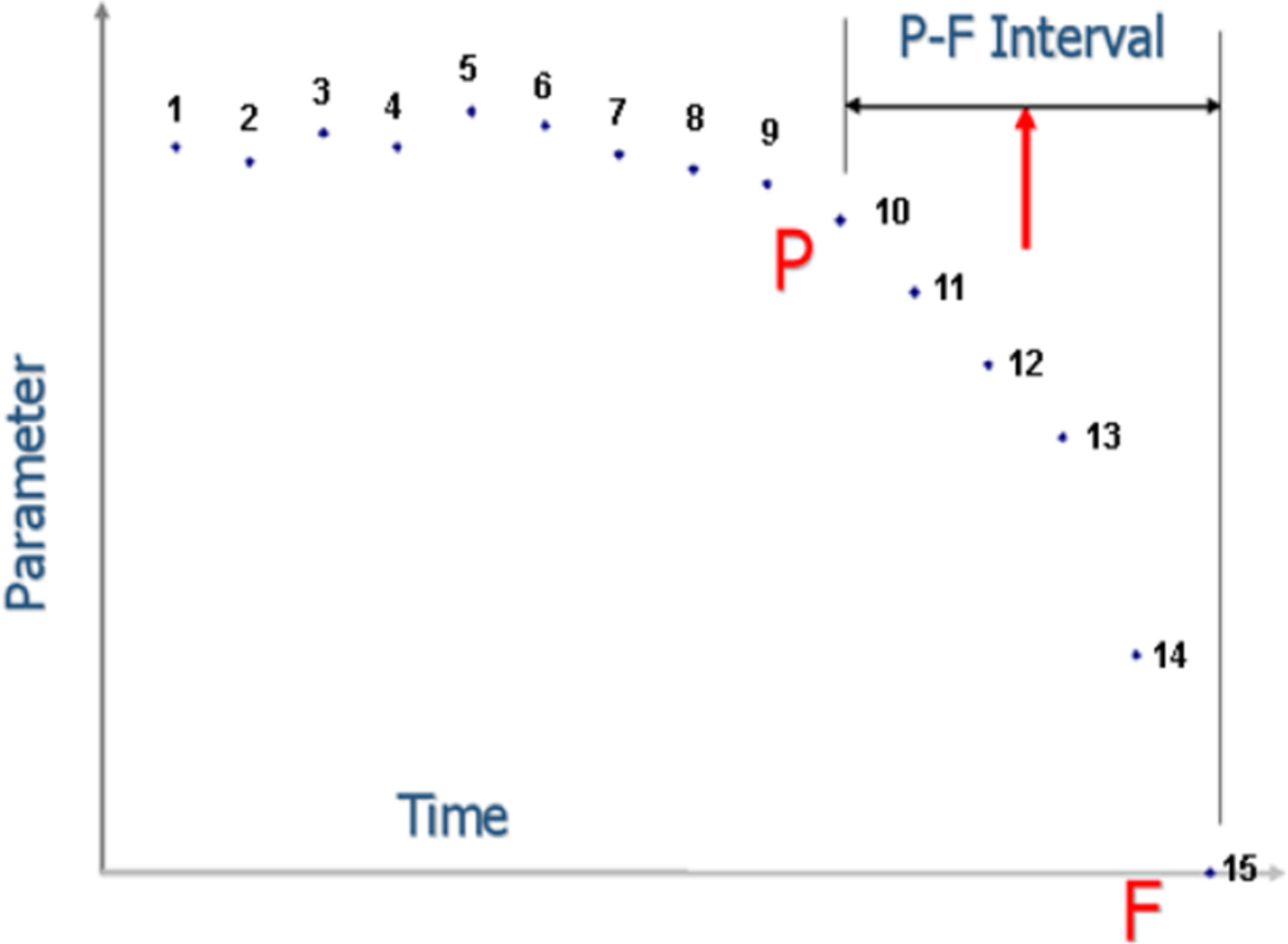
- Type and degree of carbon wear
- Carbon defects – chipping, holes, cracks
- Pantograph head position – orientation, pitch, yaw
- Arc horn positioning



Pantograph Monitoring



Predicting Failures



Priorities

- Determine the biggest issues
- Identify the indicators of these failures
- Consider data availability



Practical Implementation – Sensor Networks (Live Demo) ²⁴



Metrolink Sensor Network

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Profile ▾

Filter

Start Date
09/11/2022



Start Time
00:00



End Date
10/11/2022

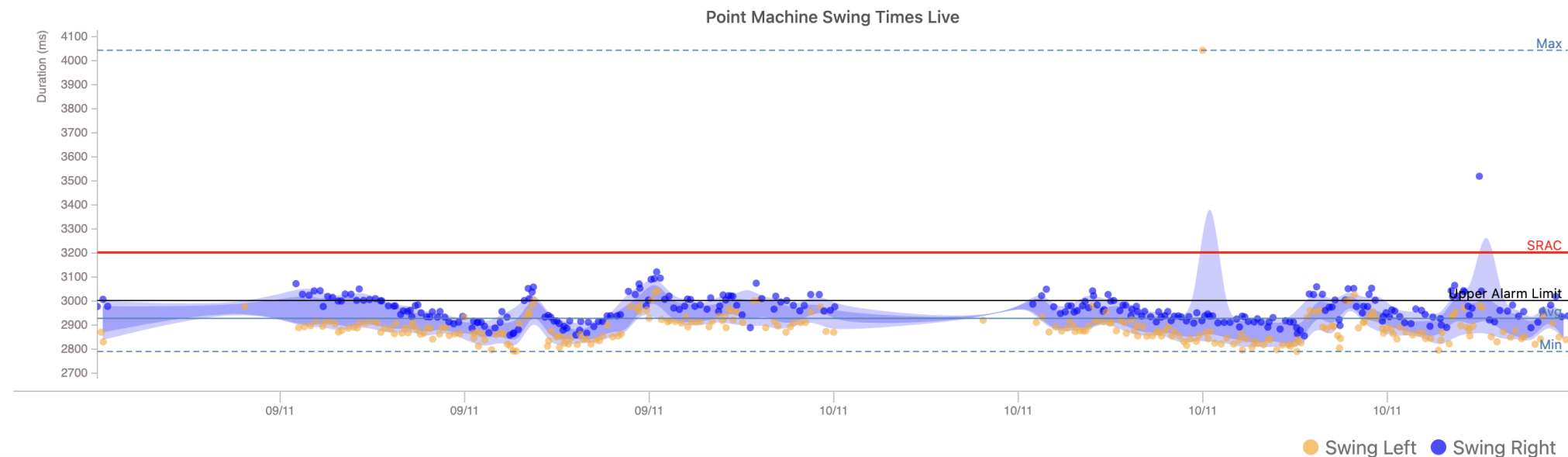


End Time
23:59



IRK02M

swing: - ms, time: -:--



Conclusions

- Condition Monitoring has reduced the need to put people on ballast
- Condition Monitoring has allowed us to prevent failures
- Condition Monitoring is helping to plan maintenance and renewals
- There are some quick wins to allow us to predict failures and prevent service disruption
- Preventative maintenance is more widely applicable, and we are only at the start of our journey.

Thank You
for Listening

