



PANDAS-V® OVERVIEW

BACKGROUND

When train pantographs or rail overhead line infrastructure experience faults, the consequences can vary from minor inconveniences to severe disruptions. In worst-case scenarios, these faults can result in de-wirement, leading to substantial delays for rail operators and costly repairs, sometimes exceeding £1.5 million. Employing remote, automatic, and state-of-the-art technology to monitor pantographs and overhead line infrastructure can prevent catastrophic damage and minimise the time needed to locate and address consequential issues.

Currently, maintenance teams and drivers often rely on visually inspecting pantographs from the side of the carriage, a method that has proven to be unreliable. While manual inspections are performed during scheduled maintenance intervals, typically weekly, it's crucial to note that pantograph damage can occur at any time during operation, underscoring the importance of continuous monitoring.

PANTOGRAPH COLLISION ASSESSMENT SYSTEM

PANDAS-V® is a remote condition monitoring system designed to swiftly and efficiently identify pantograph and overhead line defects. By accurately pinpointing problematic areas, maintenance personnel can promptly address issues with the pantograph head and/or overhead line before they escalate into more serious problems.

PANDAS-V® integrates cutting-edge technology, featuring pantograph-mounted wireless accelerometer and roof-mounted camera gateway. The combination provides critical data including impact (g), GPS location, and high-definition video footage. In addition, by leveraging advanced image processing algorithms, artificial intelligence, and machine learning, the system autonomously interprets data and can detect:

- OHL wire stagger;
- Pantograph height;
- Pantograph flip;
- Carriage sway/ride quality;
- Arcing



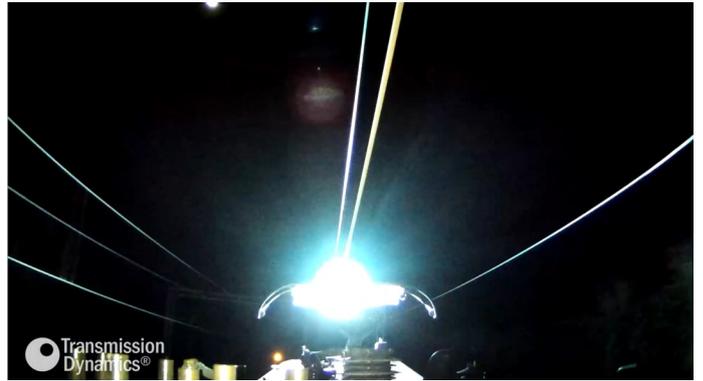
PANDAS-V® camera installed on a train roof



Broken Dropper Wire



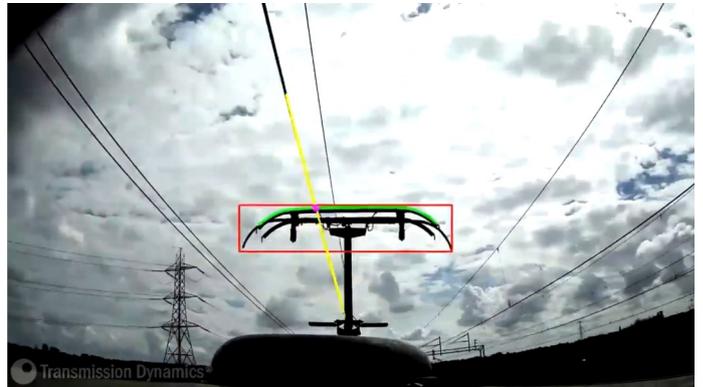
Bird Strike



Arcing Event



Foliage Detection



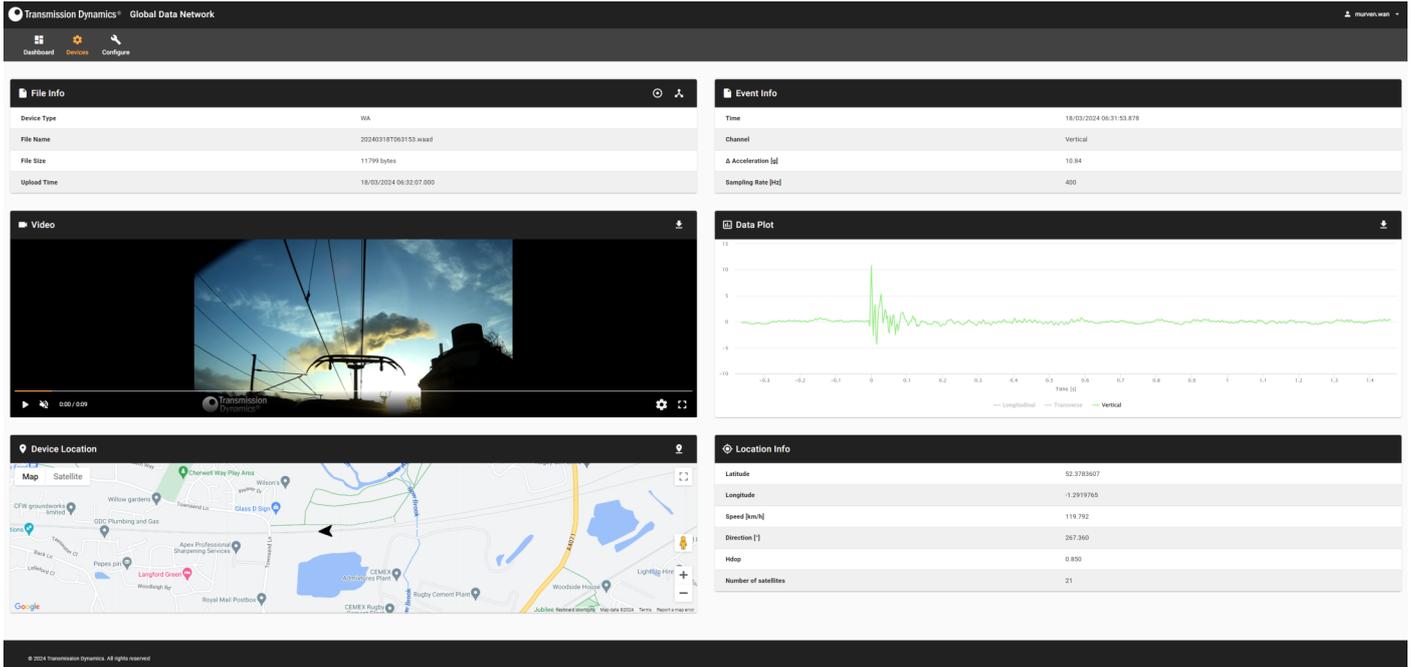
Pantograph Height



Vandalism Event



Carbon Chip Detection



Global Data Network (GDN®) portal used to view, analyse and export events

GENERAL SPECIFICATION

Type	Camera Gateway
Part Number	JRD-1131-MK3
Approx. Dimensions	242 mm (L) x 192 mm (W) x 120 mm (H)
Weight	4.5 kg (inc. mounting plate)
Power Requirements	24 Vdc; 2 A max (1 A typical)
Communication	Bluetooth license-free frequency range of 2.4 GHz
Radio Frequencies	Mobile (3G, 4G & 5G), Bluetooth (2.4 GHz), WiFi (2.4 GHz), GNSS (L1 +L2)
Operating Temp. Range	-40 °C to 85 °C
Ingress Protection	IP69K

DATA TRANSMISSION

Comms. Protocol	BT
Compression	H.264
Video Frame Rate	Max. 120 FPS
Video Resolution	1080p
Internal Memory	Up to 256 GB
Data Output	Binary and .csv

SENSOR

Type	CMOS
Shutter	Rolling Shutter
Resolution	5 MP
Lens	S-Mount
Aperture	F1.8
Focal Length	3.6 mm (other available)
Format	1/2.5"
Pixel Size	2.2 µm x 2.2 µm
Pixel Bit Depth	8, 12 Bit
Colour	Mono/Colour
Synchronisation	Free-run, software trigger

STANDARDS COMPLIANCE

Shock & Vibration	EN61373:2010
Conducted Emissions	EN55016-2-1:2014
Radiated Emissions	EN55016-2-3:2010
Electrostatic Discharge	EN61000-4-2:2009
Radiated Susceptibility	EN61000-4-3:2006
Fast Transient Burst Susceptibility	EN61000-4-4:2012
Surge Immunity	EN61000-4-5:2014
Conducted Immunity	EN61000-4-6:2014