

**ESIS TC24 Seminar October 2012**

# ***Inspection of Axles on Moving Vehicles***

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Technology  
Engineering



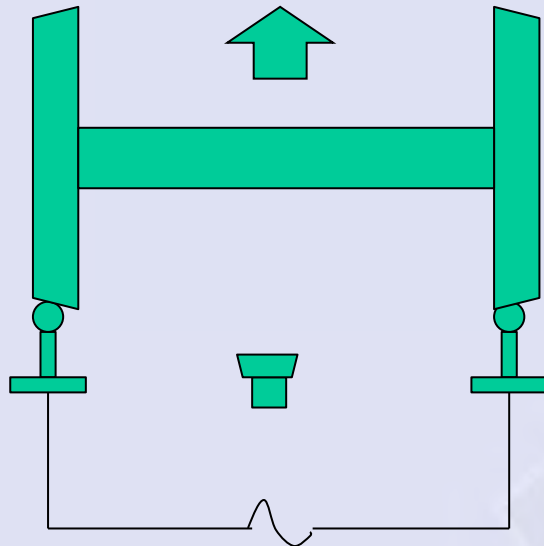
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# ***Background***

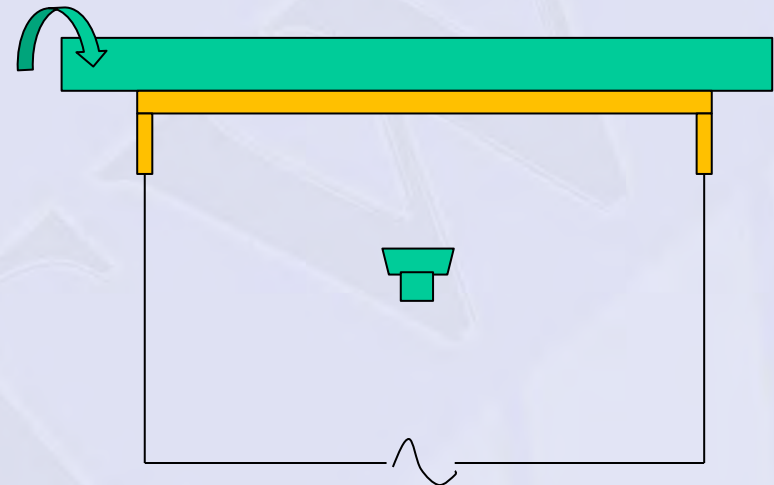
- **Mistake in Euraxles proposal!**
- **Potential for efficient inspection in minimum time**
- **Exposed areas only**

# AC Thermography Crack Detection

- Direct (track mounted)



- Induction (in workshop)





Technology  
Engineering



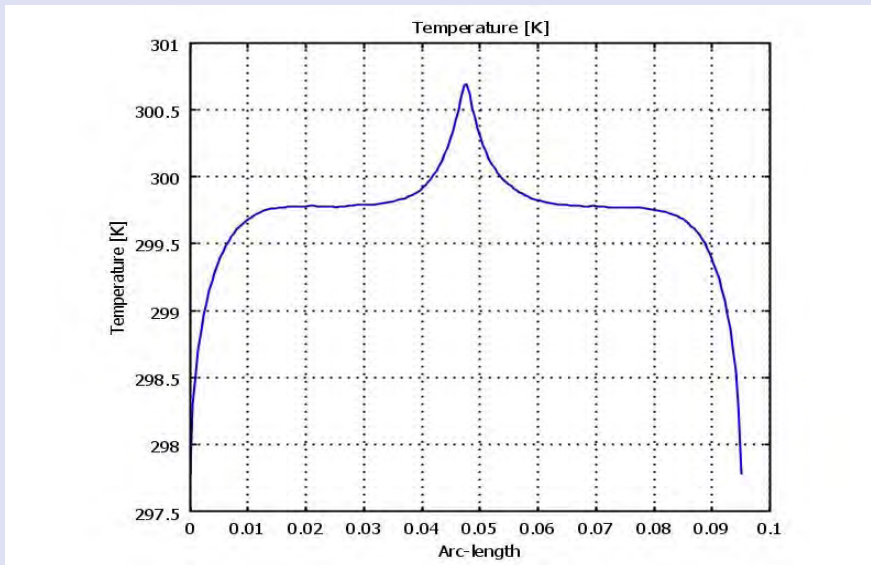
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# *General Approach*

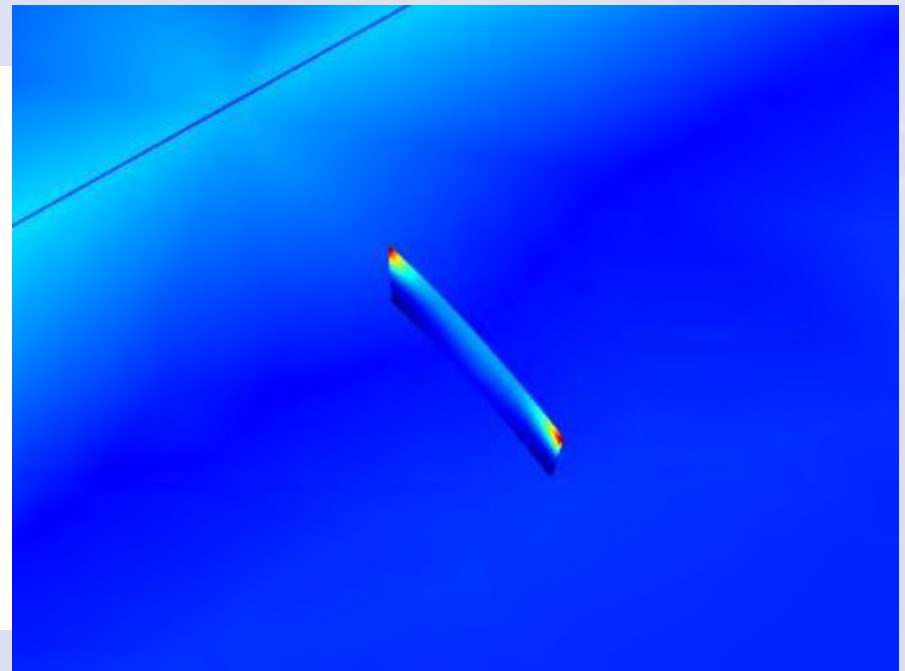
- **Modelling**
- **Small Scale Tests**
- **Laboratory Tests**
  - **Induction and Direct Application**
- **Field Trials**

# Modelling Results

- 2D Result



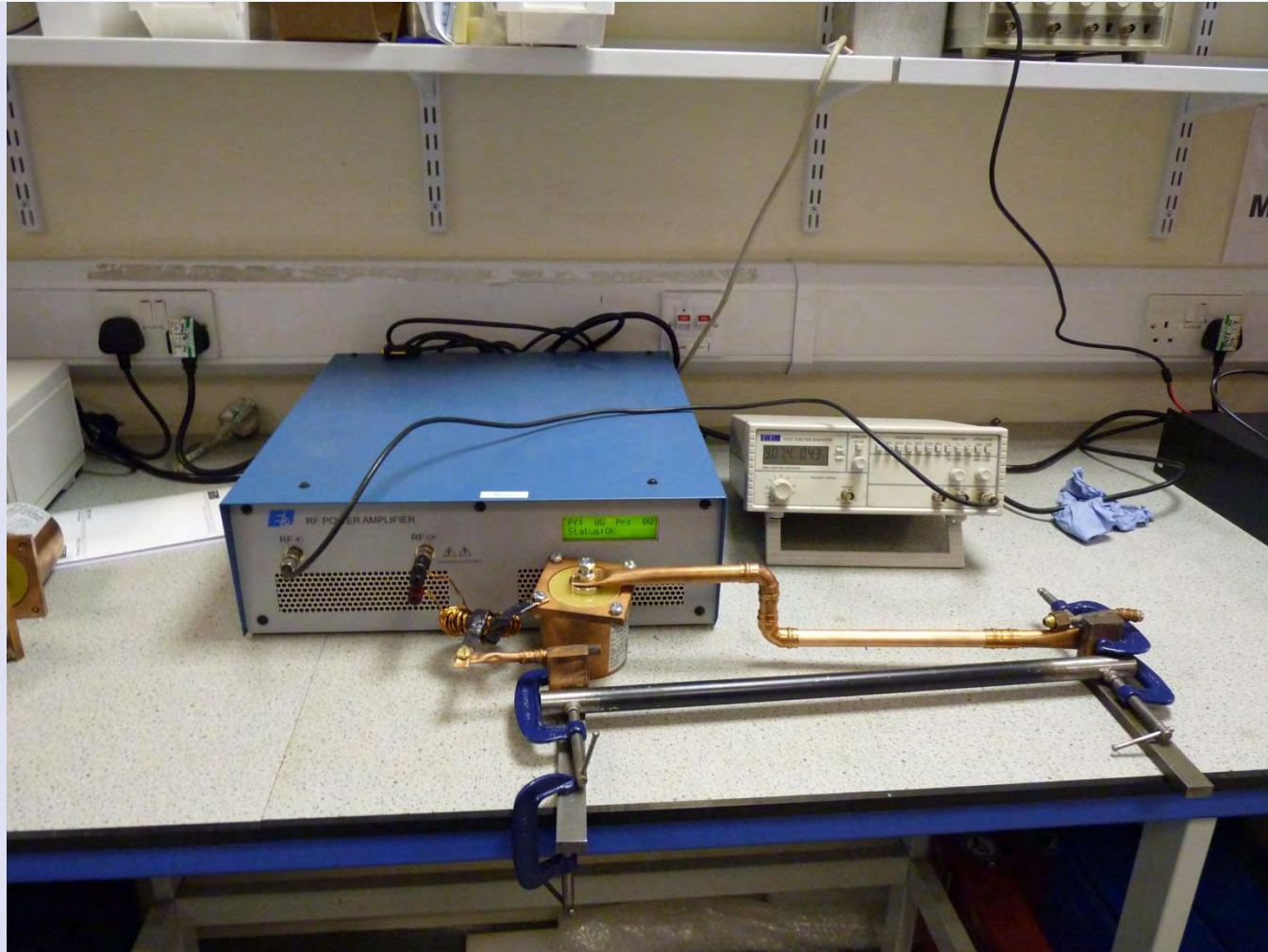
- 3D Result



# *Modelling Results*

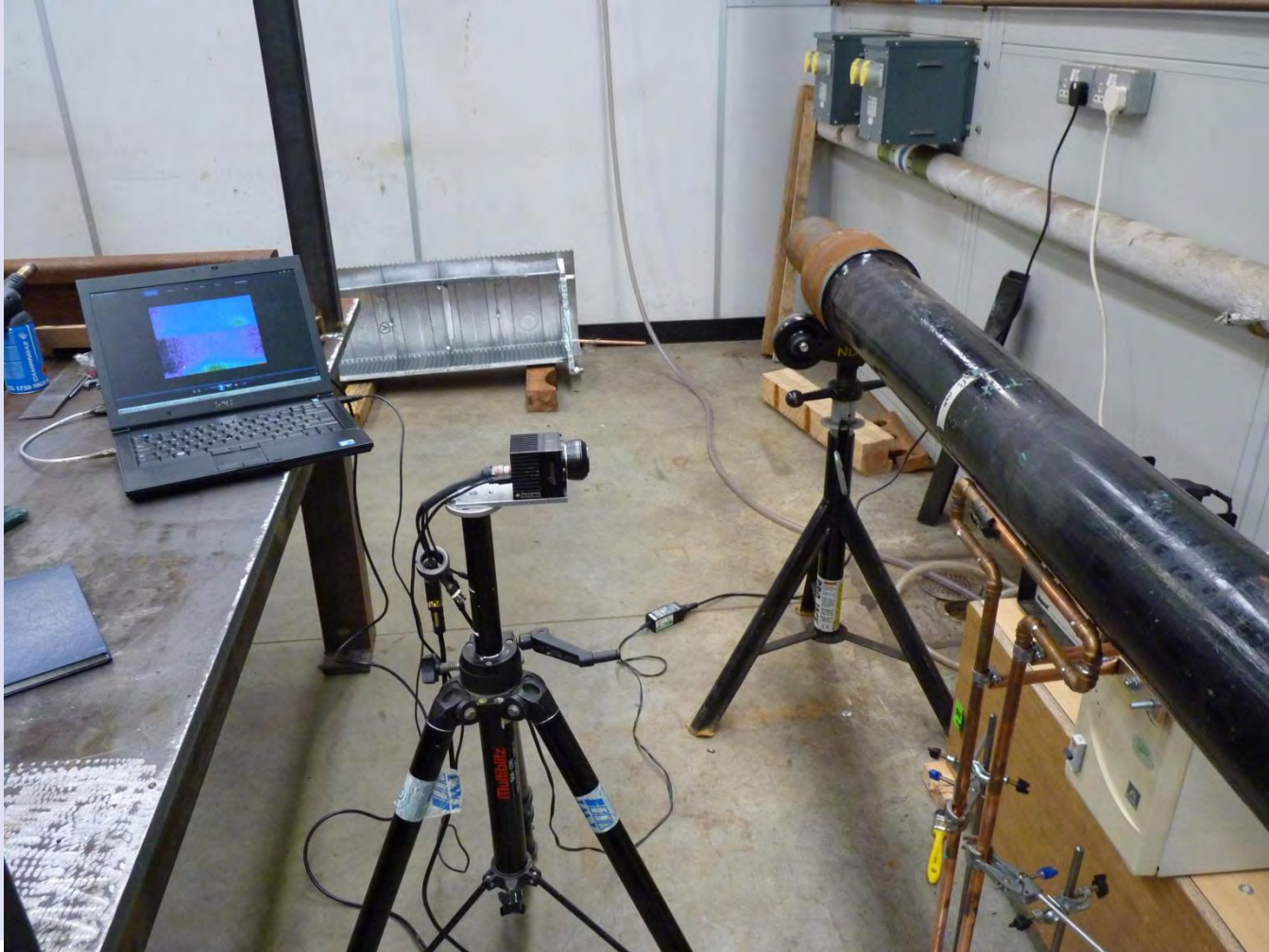
- **Sensitivity increases with current and frequency**
- **Main thermal response from crack ends**
- **Additional effect from crack centre**
- **Crack Sizing??**

# Small Scale Tests





# *Induction Method on full size axle*

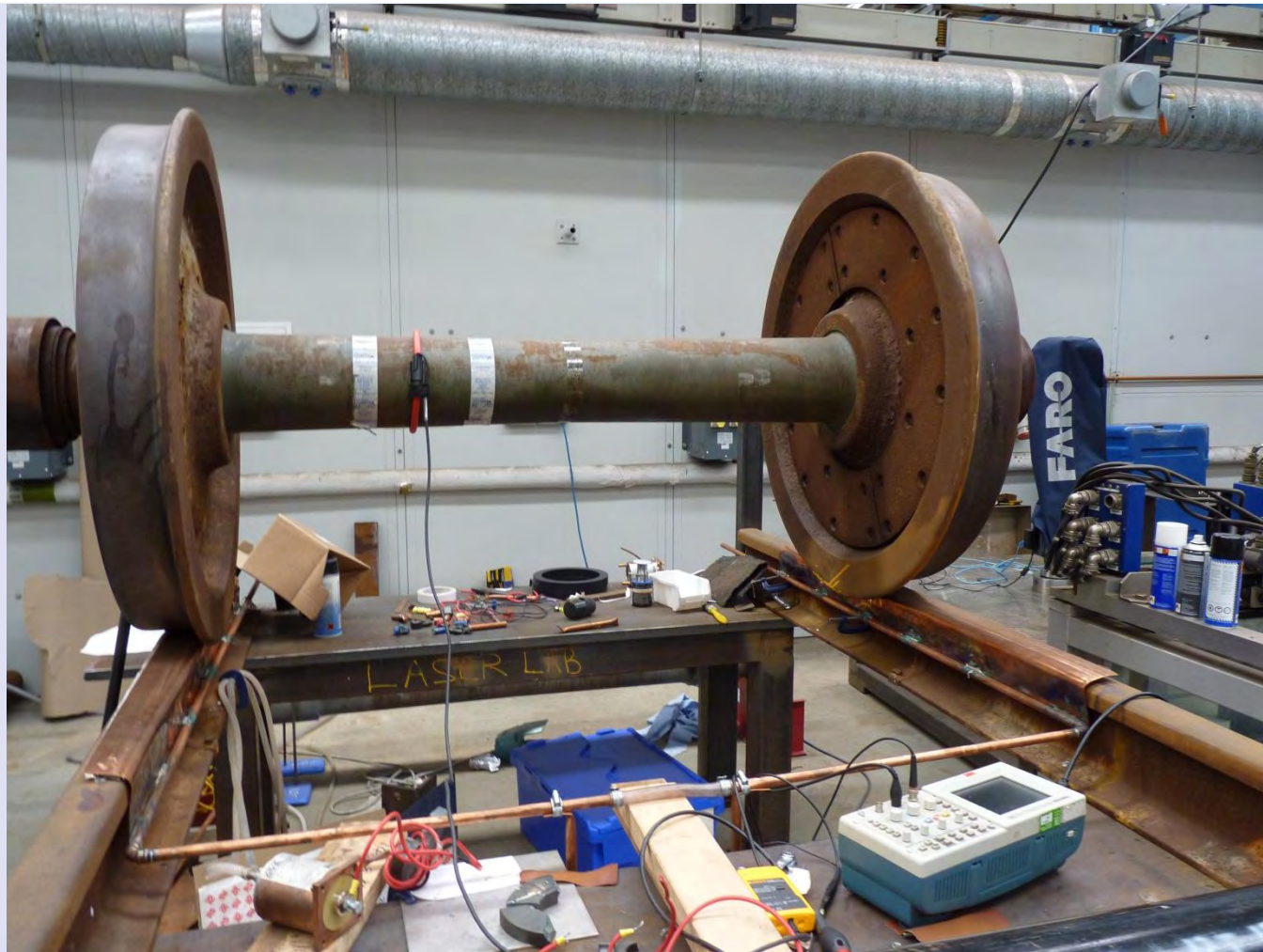


# Equipment

- 3kW for Induction
- 20kW for direct heating

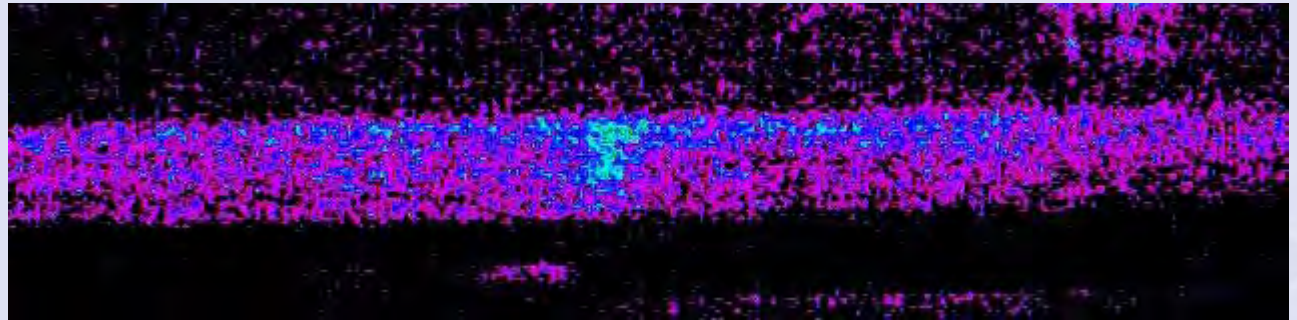


# *Direct AC Experiment on full scale axle*

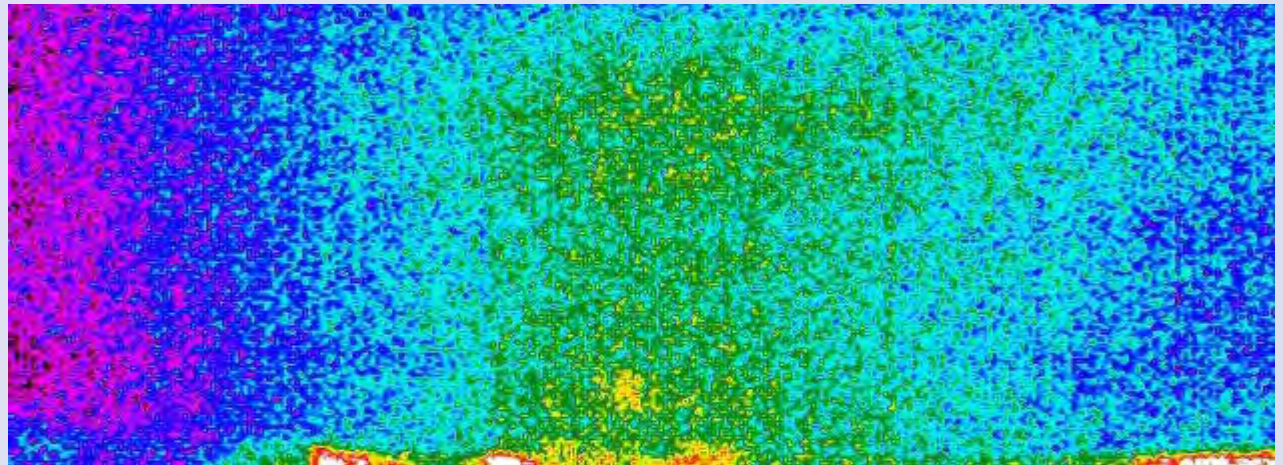


# Images

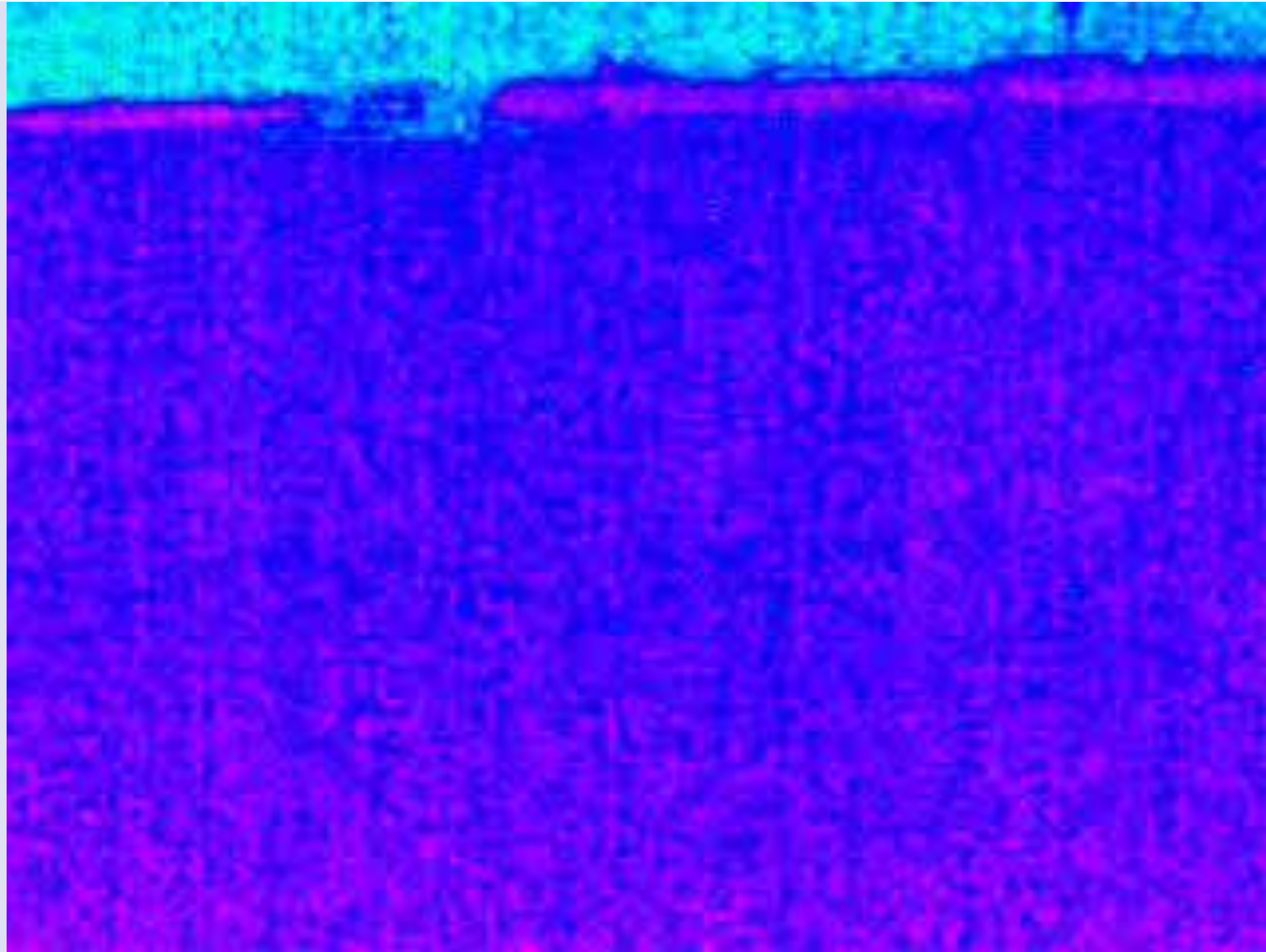
Small scale  
sample  
(direct AC)



Train axle  
(induction)



# *Detection of crack ends with thermography*



# *Hotspot on axle detection*



# *Laboratory Trials*

- Can show crack detection with induction system but not yet with direct application to axle
- Matching Impedances extremely tricky
  - High and distributed inductance
- Why?
  - Current (real) not sufficient?
  - Frequency too low?
  - Modelling
  - Thermal Camera (position or sensitivity)?

# Field Trials

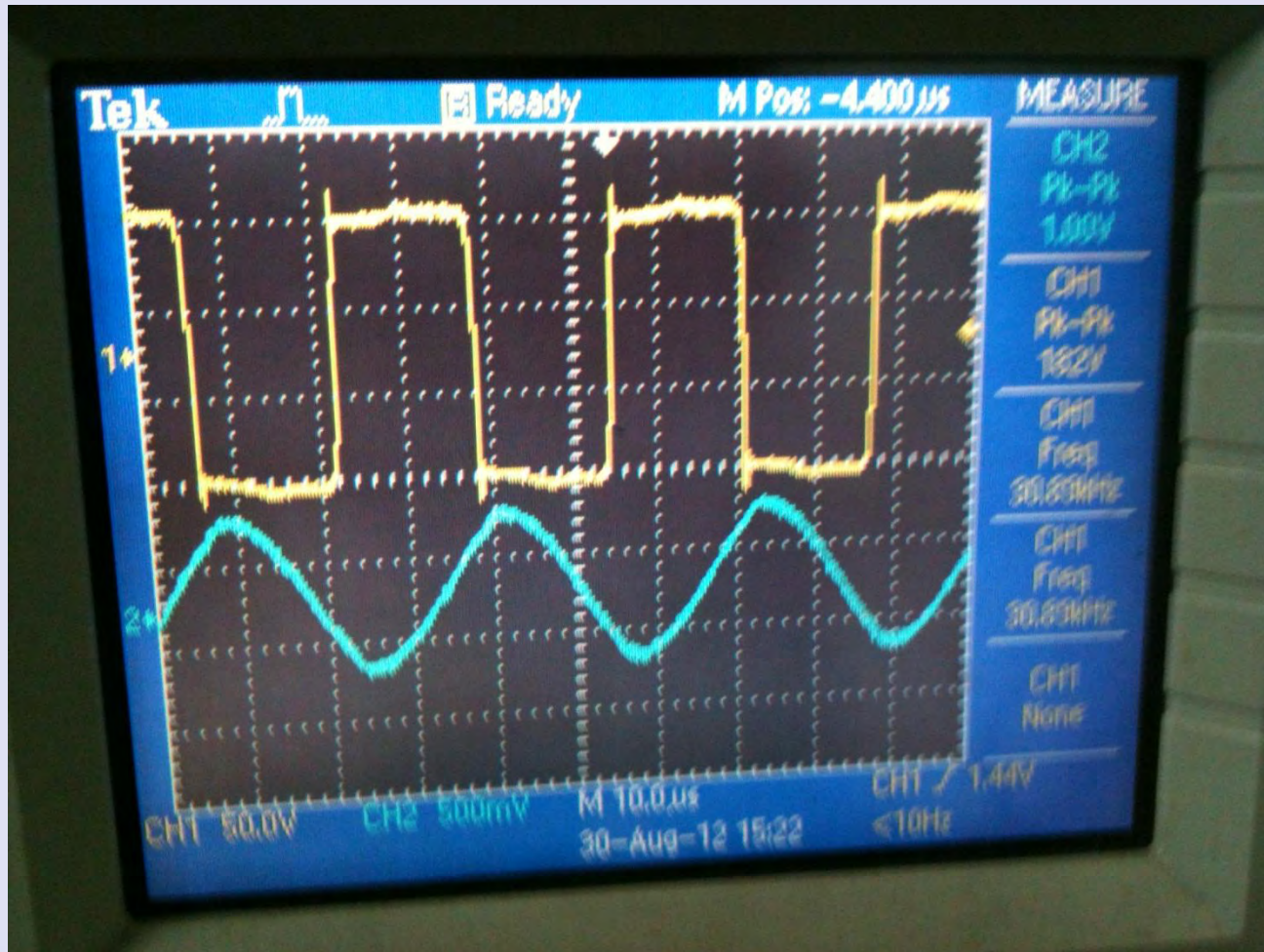




# Field Trials



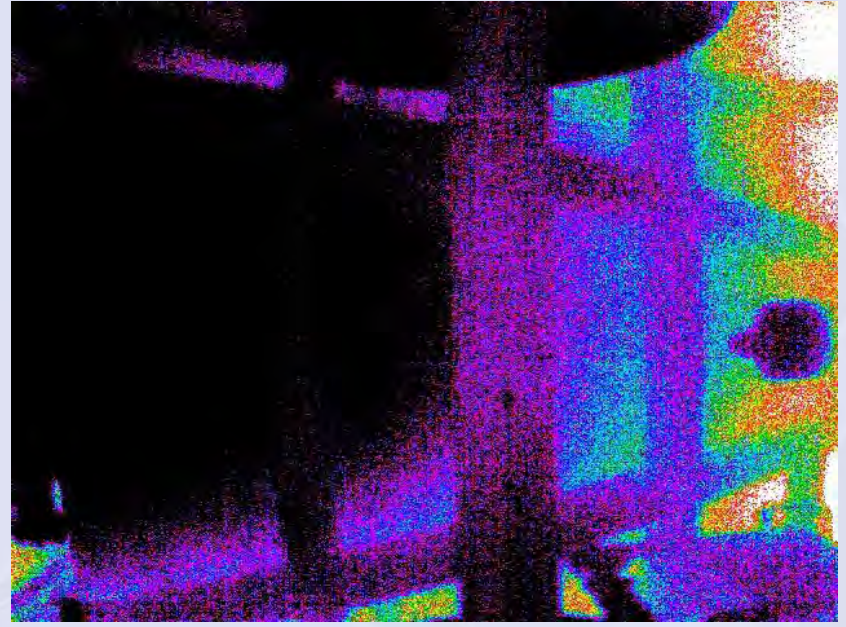
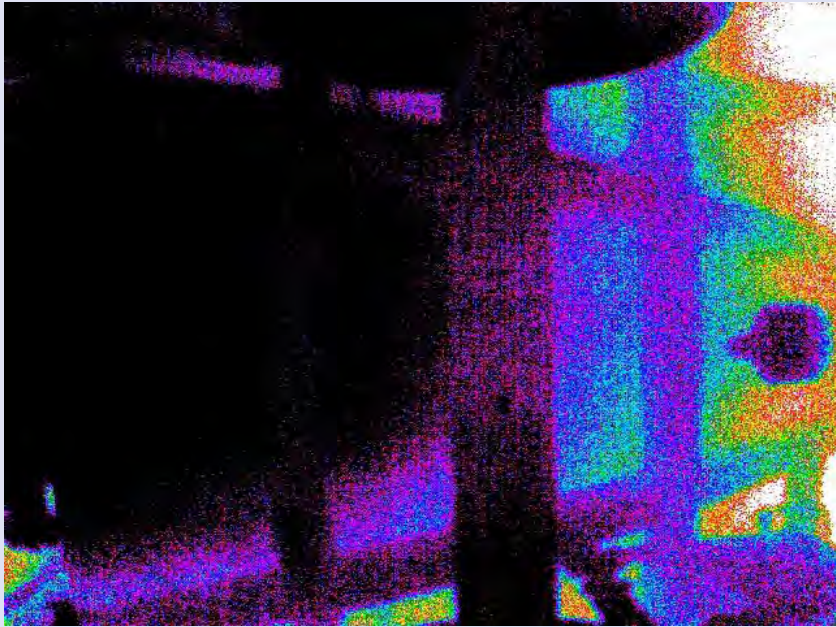
# Field Trials



# *Field Trials*



# *Field Trials*



# ***Field Trials***

- **Carried out September 2012 at Steele and Co, Hamilton, Scotland**
- **Able to show heating effect on vehicle axle**
- **Lessons**
  - **Installation Structure too flimsy**
  - **Sunlight can interfere**
  - **Unexpected sources of heat reflected**

# *Conclusions*

- **For moving train concept OK but engineering problems still to overcome**
- **Induction could provide an inspection system**

# Questions

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