

DEVELOPMENT OF MECHANICALLY AND THERMALLY ROBUST PAVEMENT EMBEDDED INDUCTIVE POWER TRANSFER SYSTEMS

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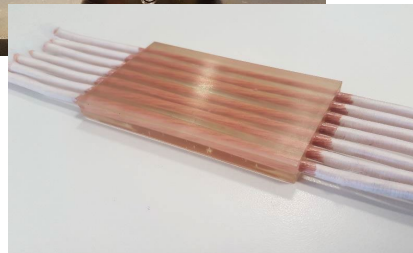
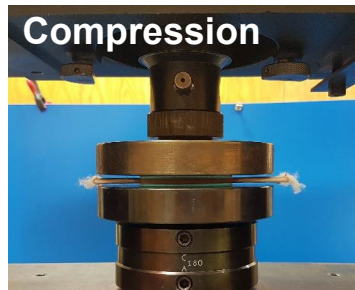
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A broad programme of **material characterisation** and **component durability** investigations, provide capability to **model thermal** and **structural performance**.

- Multi-criteria characterisation and selection (potting, casing, pavements materials)
- Durability studies of IPT componentry (ferrite, SMCs, litz wire, electronics)

Litz Wire:



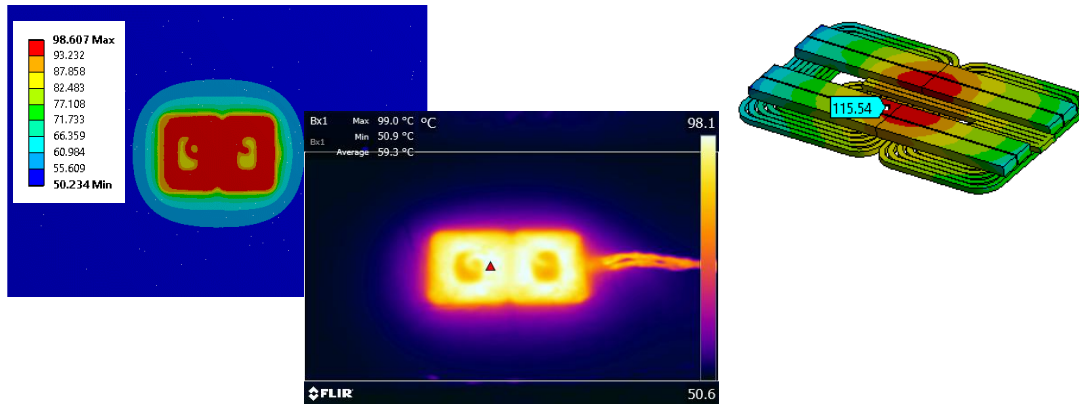
Ferrite, Static and Fatigue:



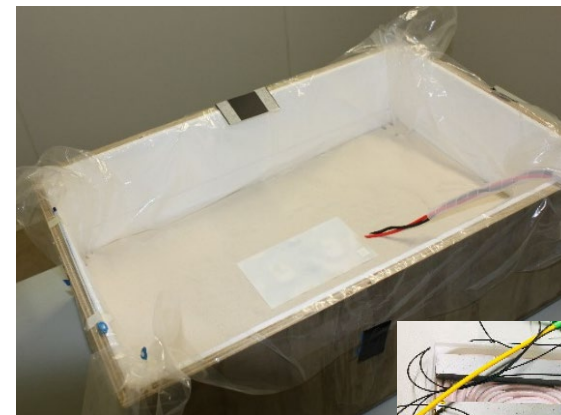
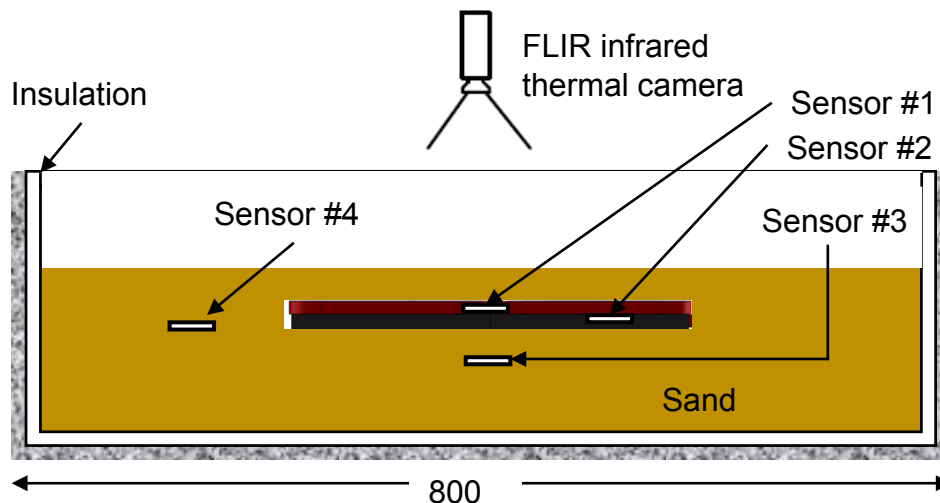
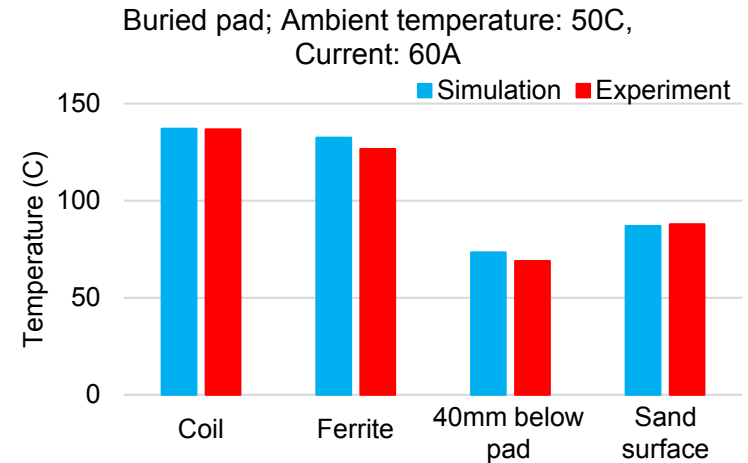
Thermal Properties:



Modelling: 1/4-scale embedded pad coupled electro-magnetic/thermal simulations

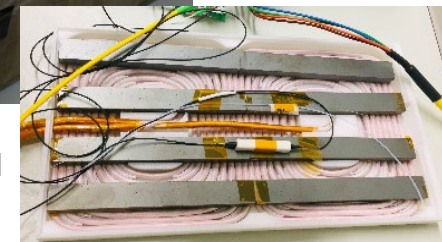


Flush mounted 1/4-scale pad
Ambient temperature: 50 °C, Current: 60 A



Flush mounted
pad in sand box

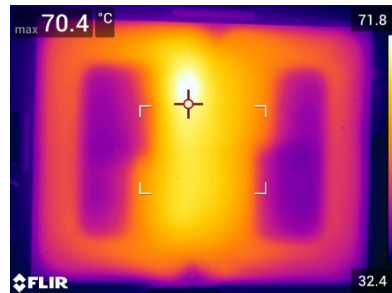
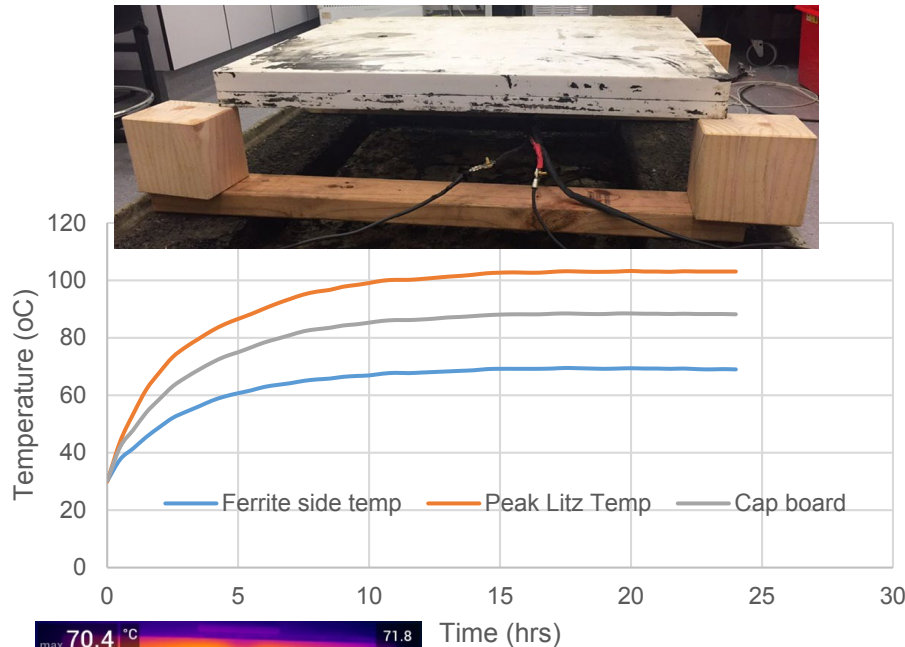
FBG sensor
instrumented pad



Validation: Buried and flush mounted pads, energised in model and real pavements

Modelling: Full-scale pad coupled electro-magnetic and thermal simulations

Full-scale pad including capacitor board
Ambient temperature: 30 °C, Current: 90A

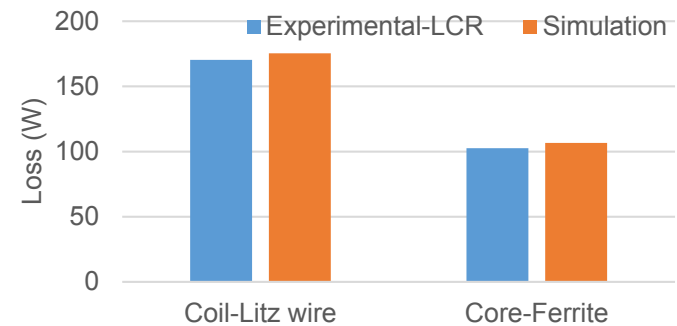


Time (hrs)

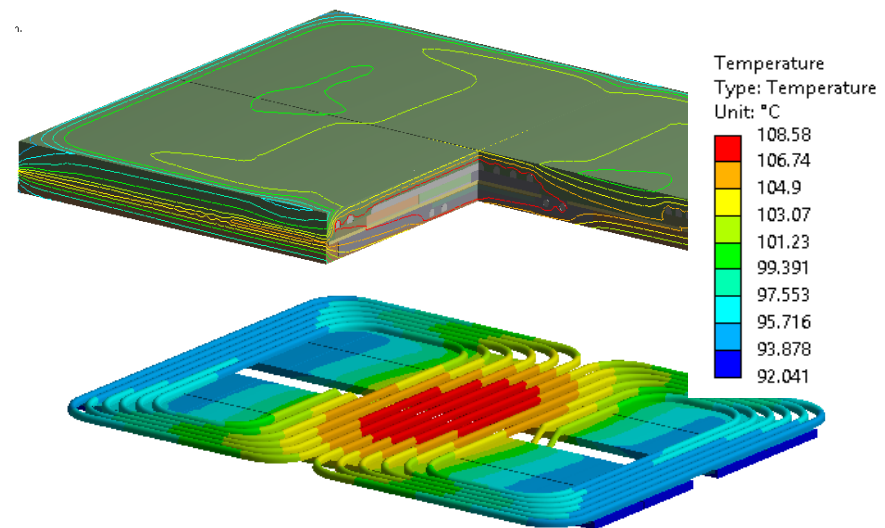
Surface temperature
monitoring using
thermal camera

Ambient temp: 30 °C
Current: 100A

Steady state losses at coil and core, full scale

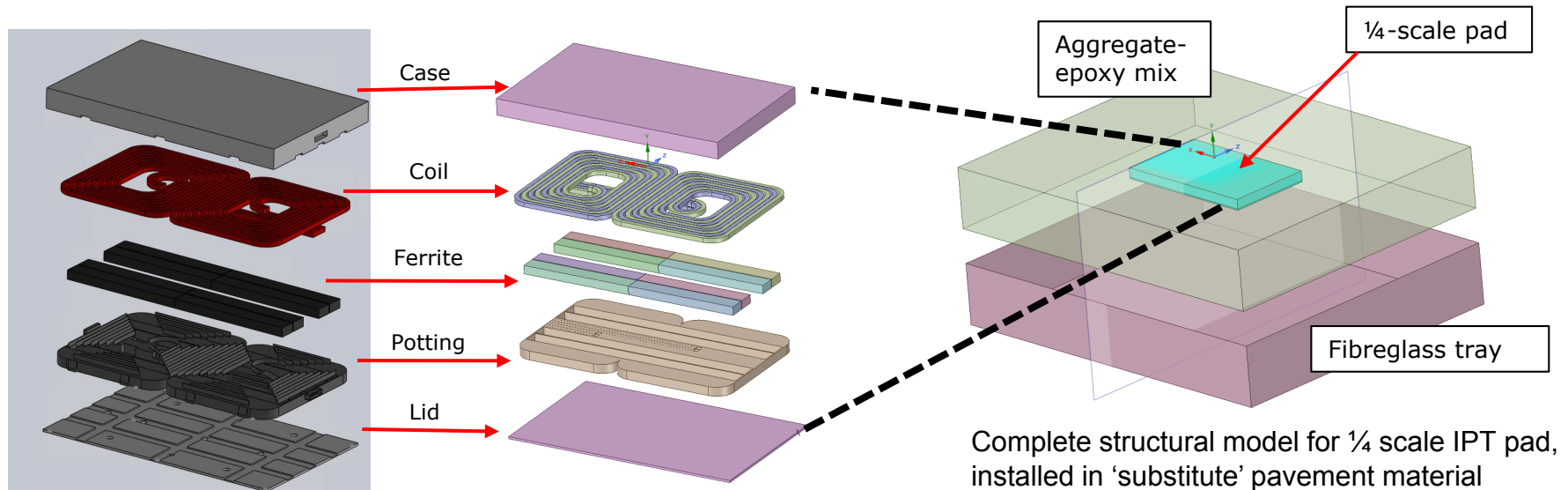


Predicted steady state temperature field

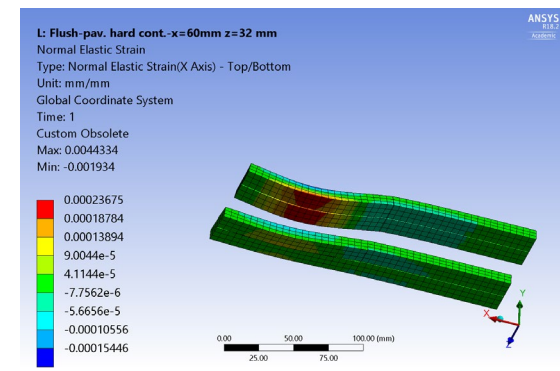
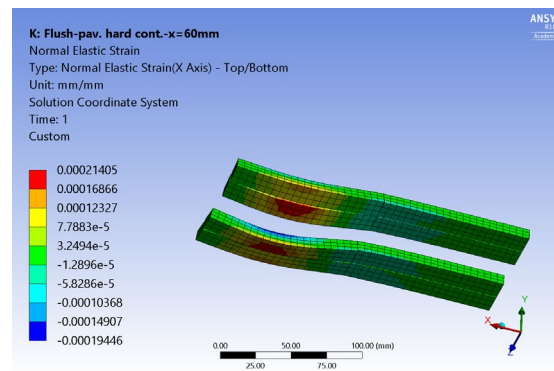
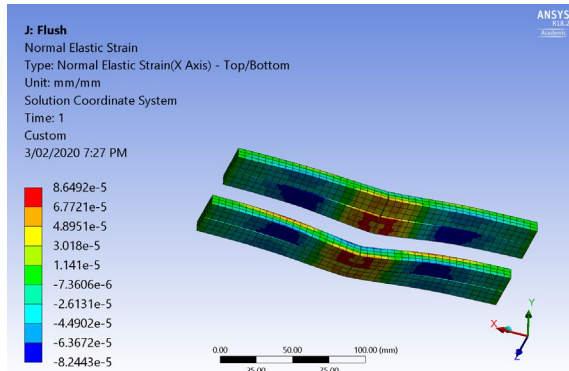


Validation: Pad including capacitor board, aluminum shield and thermal pads

Modelling: 1/4-scale embedded pad structural simulations



Predicted ferrite strain field and deformation, with wheel load at varies positions above pad



Validation: Pads installed to model aggregate/epoxy resin pavement

Roadway IPT; Mechanical Systems

STRUCTURAL PERFORMANCE AND PROTECTION

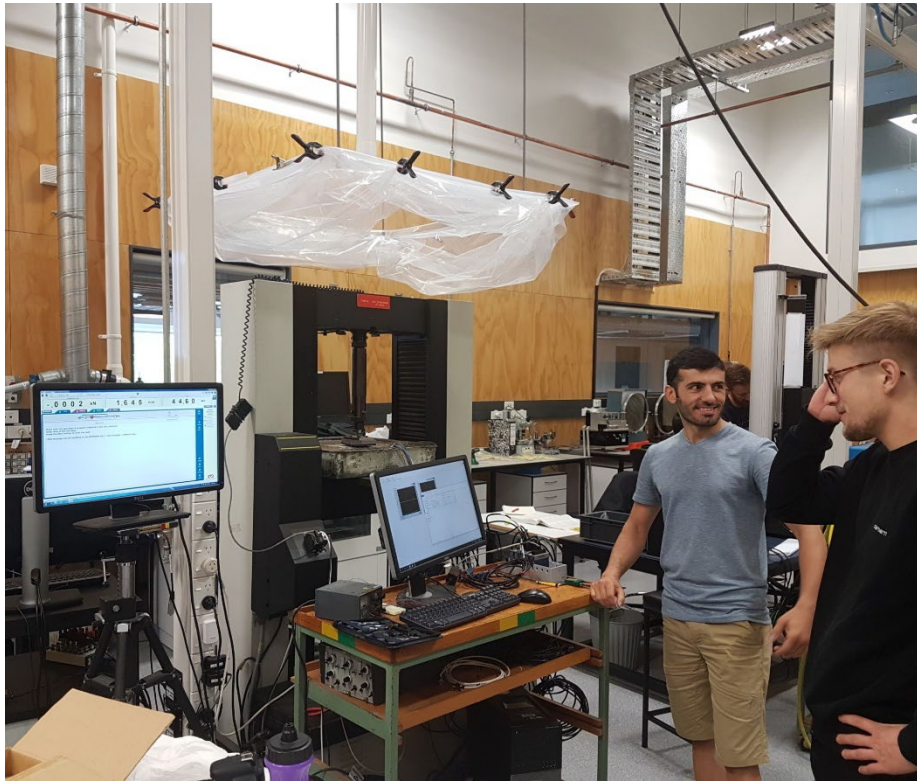


Centre for
Advanced
Composite
Materials



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Te Whare Wānanga o Tāmaki Makaurau
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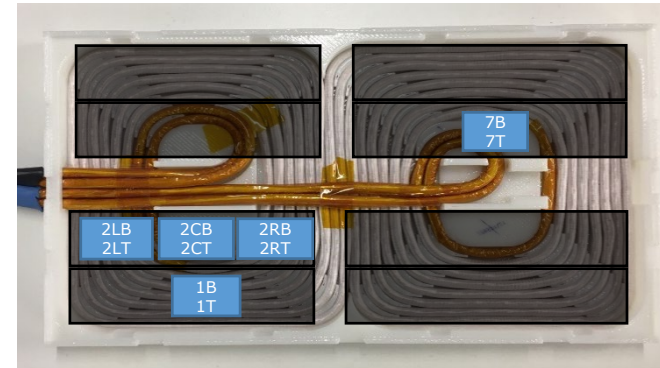
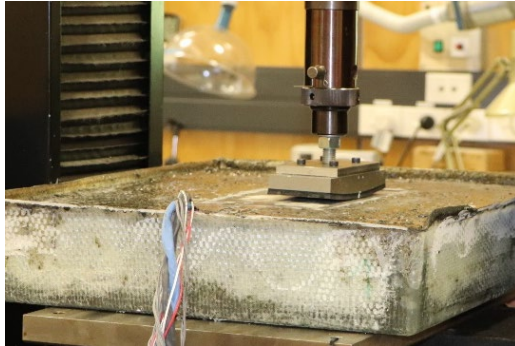
Validation: Mechanical test of 1/4-scale pad flush-mounted in pavement



Roadway IPT; Mechanical Systems

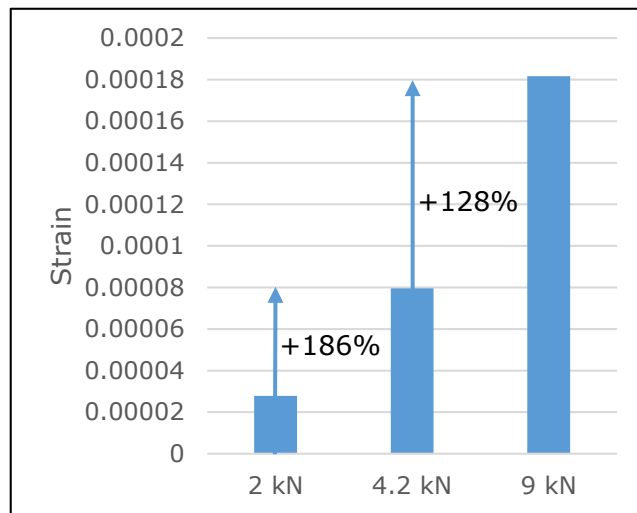
STRUCTURAL PERFORMANCE AND PROTECTION

Validation: Mechanical test of 1/4-scale pad flush-mounted in pavement



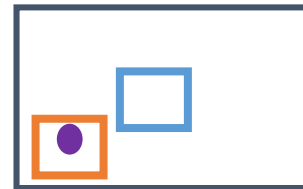
Location of strain gauges (blue)
attached to ferrite bars

**Comparison of Several Load Cases,
Sensor 7T**



Comparison Sensor Location, Load: 4.2 kN

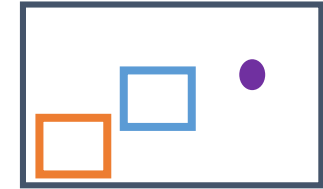
*IPT pad top view,
Sensor 2LT*



● Location Sensor

— Load case 1

*IPT pad top view,
Sensor 7T*



— Load case 2

