

Progress in Monitoring a Mechanical Drive Train Test Rig

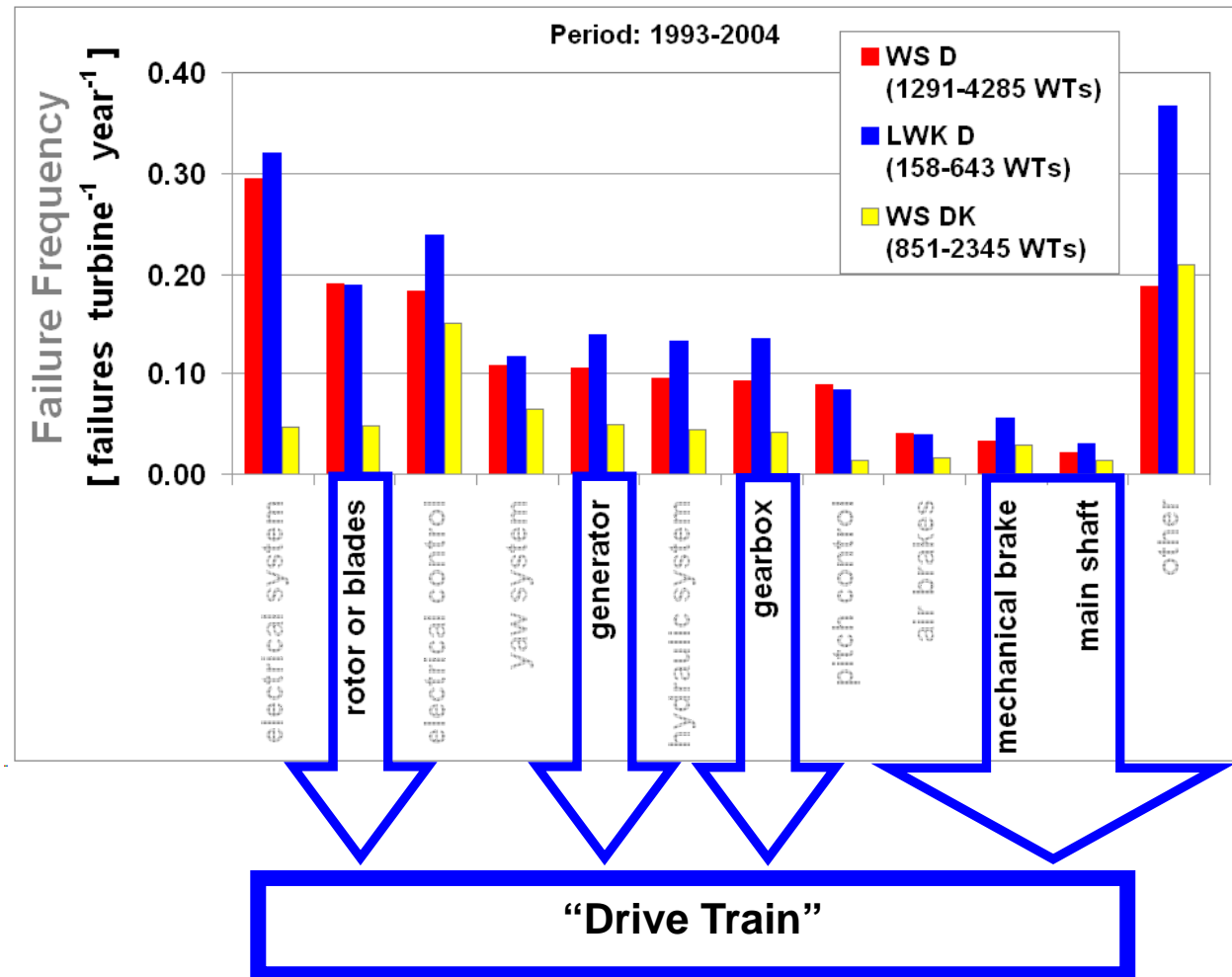
Supergen Theme X Workshop

Energy Group, School of Engineering, Durham University

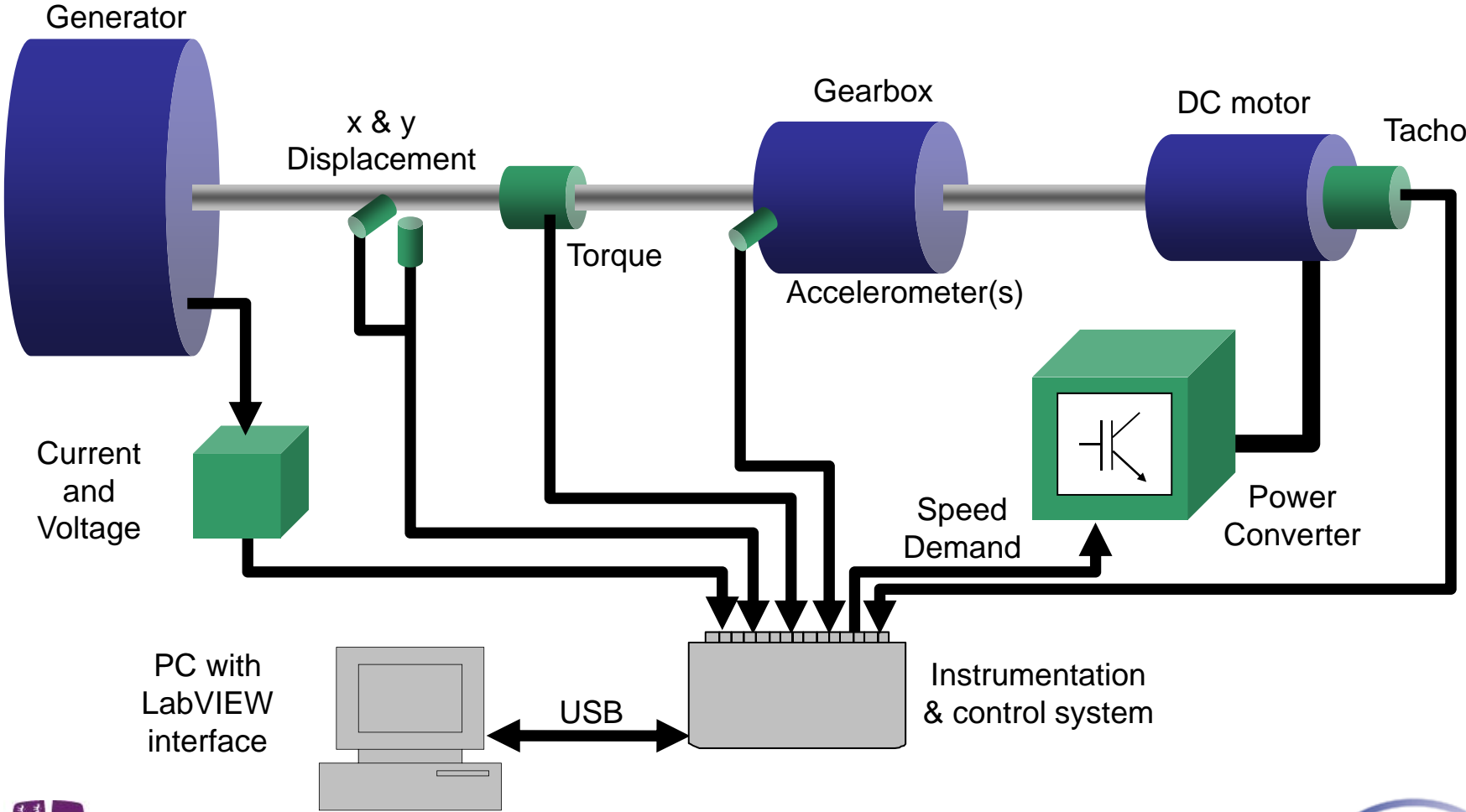
Michael Wilkinson

2nd July 2007

Reliability – Fabio Spinato



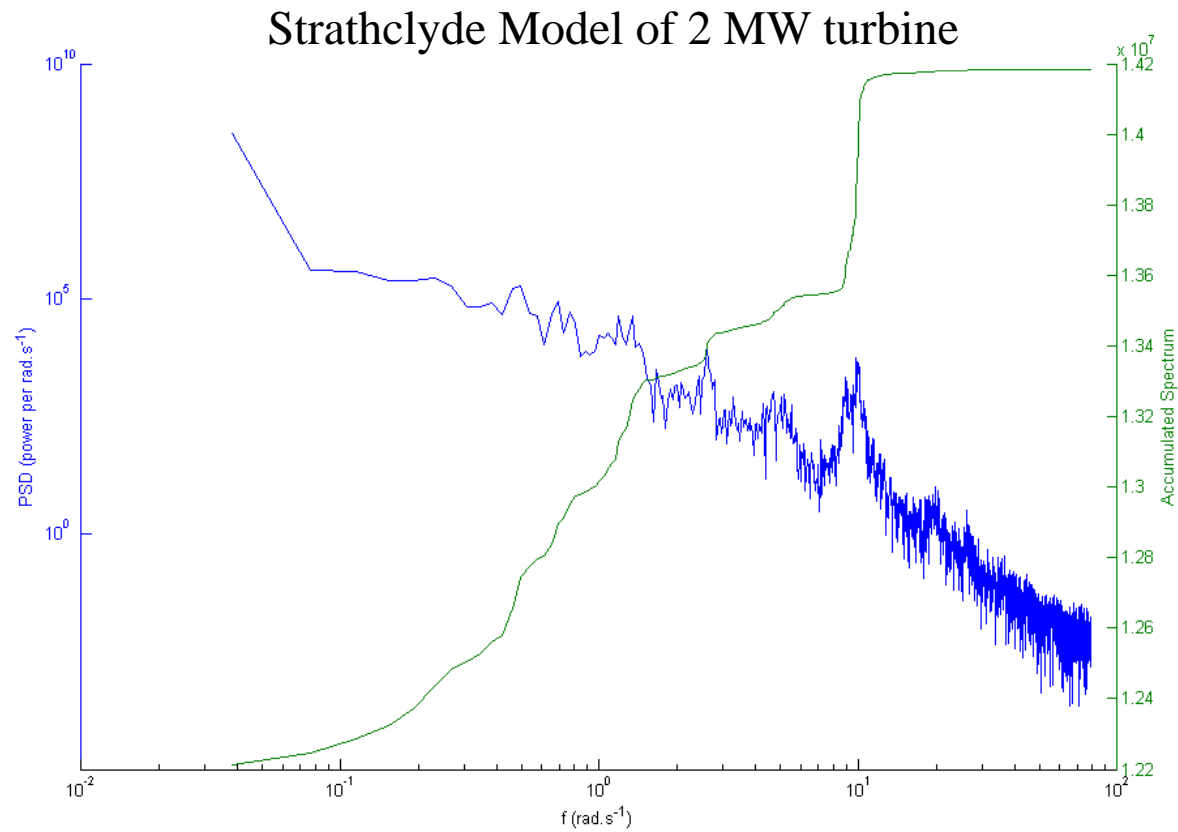
Test Rig



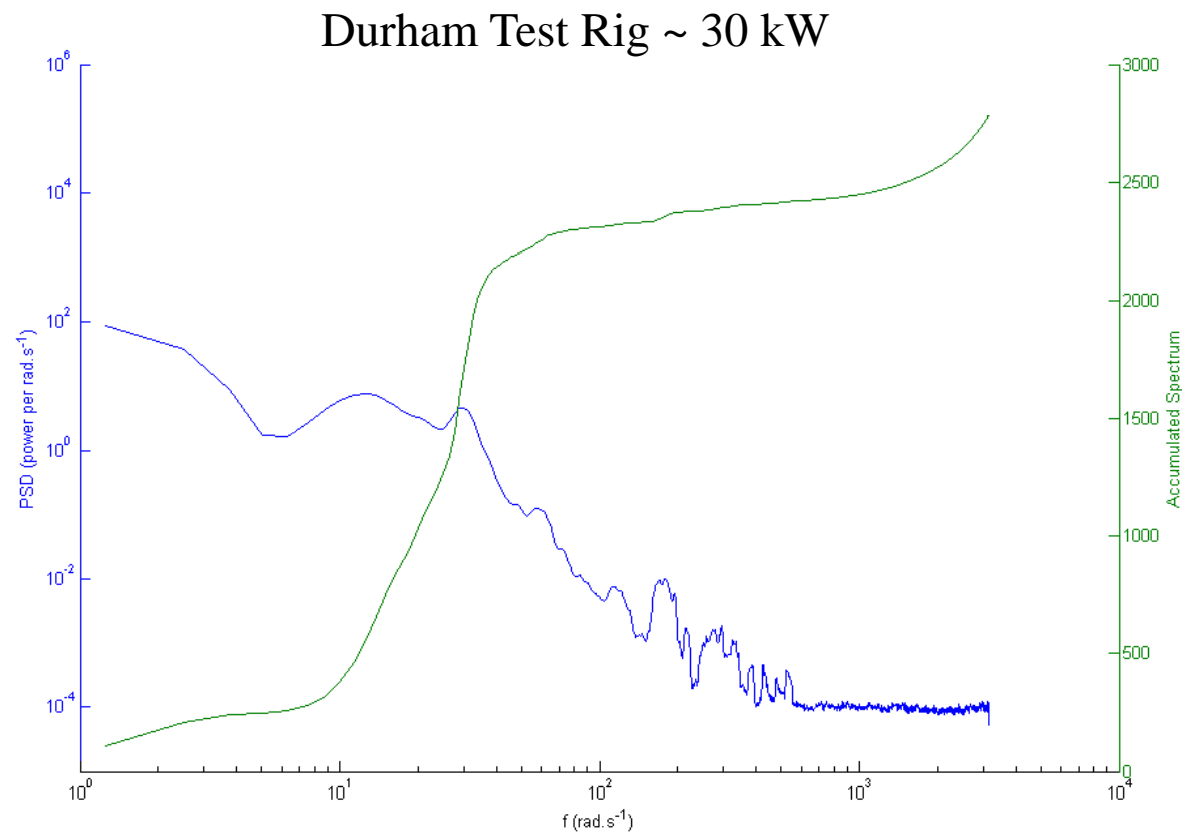
Test Rig



Comparison of Test Rig with Wind Turbine



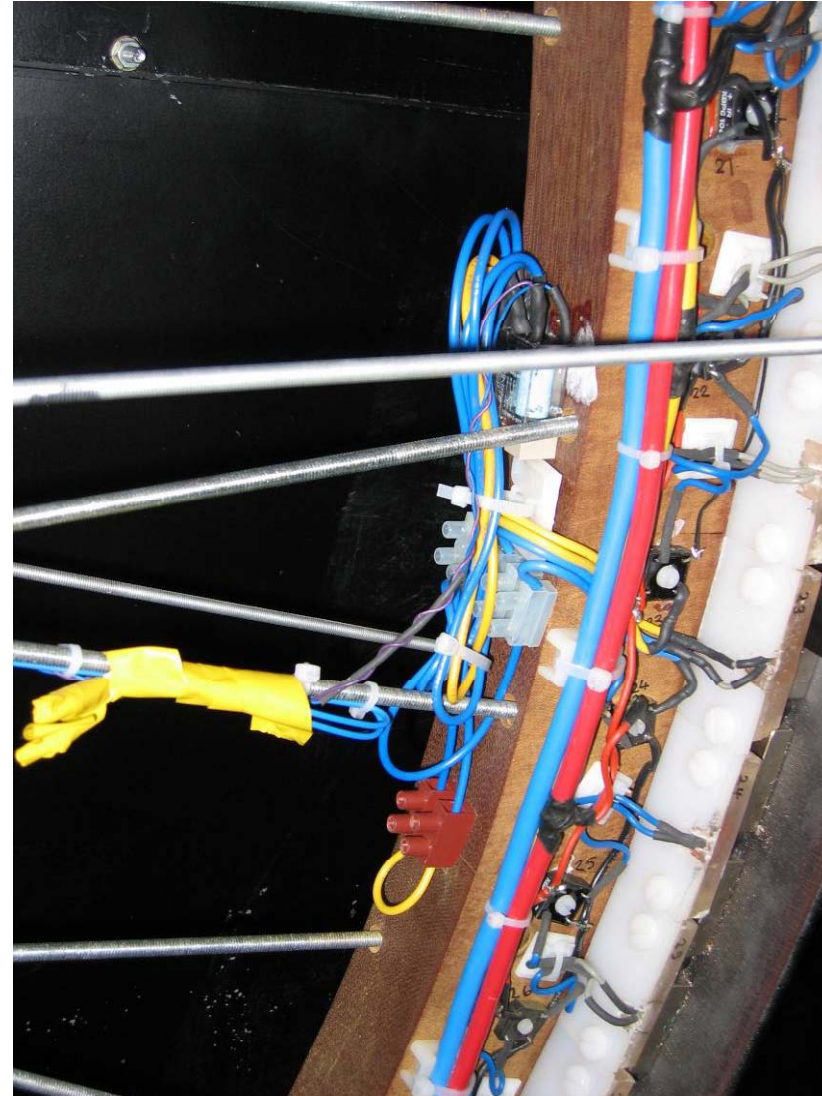
Comparison of Test Rig with Wind Turbine



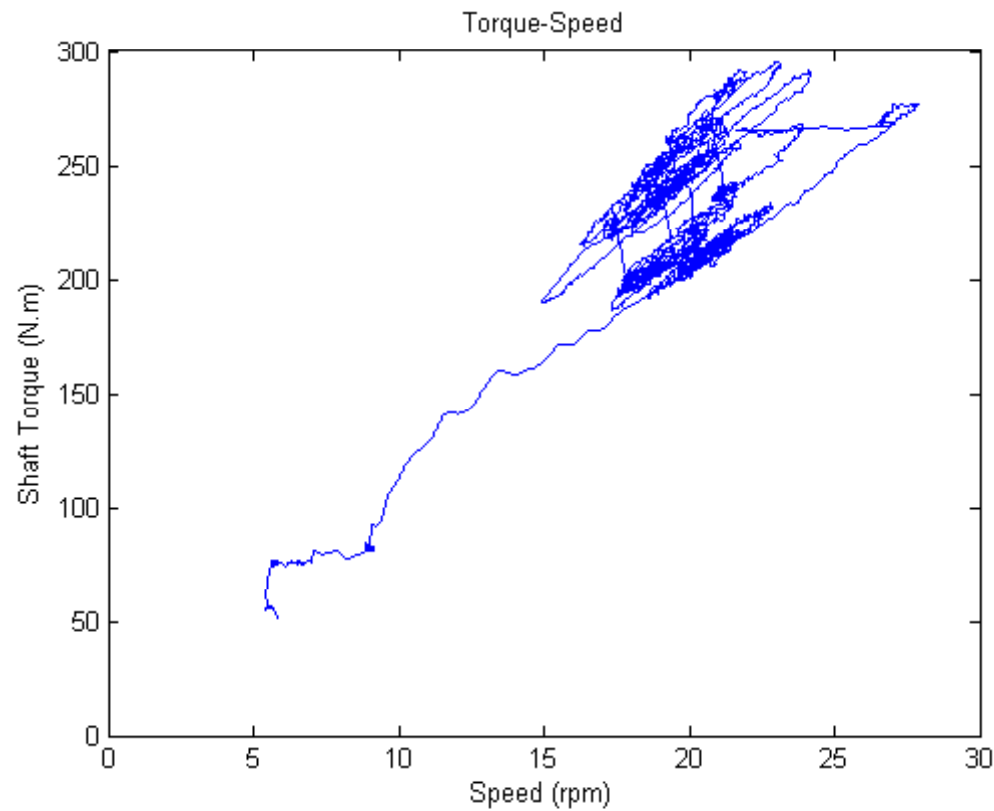
“Fault-like Perturbations”

- Shorted Coils
 - 84 coils on the stator
 - Remote relays: one, two or three coils connected normally or shorted.
- Load Conditions
 - Switched load bank
 - Various load conditions have been applied to investigate the operational regime under which the strongest detectability level may be obtained.
- Rotor Unbalance
 - Masses added to the rotor of the generator
- Gearbox Oil
 - Drained to investigate effect on vibration

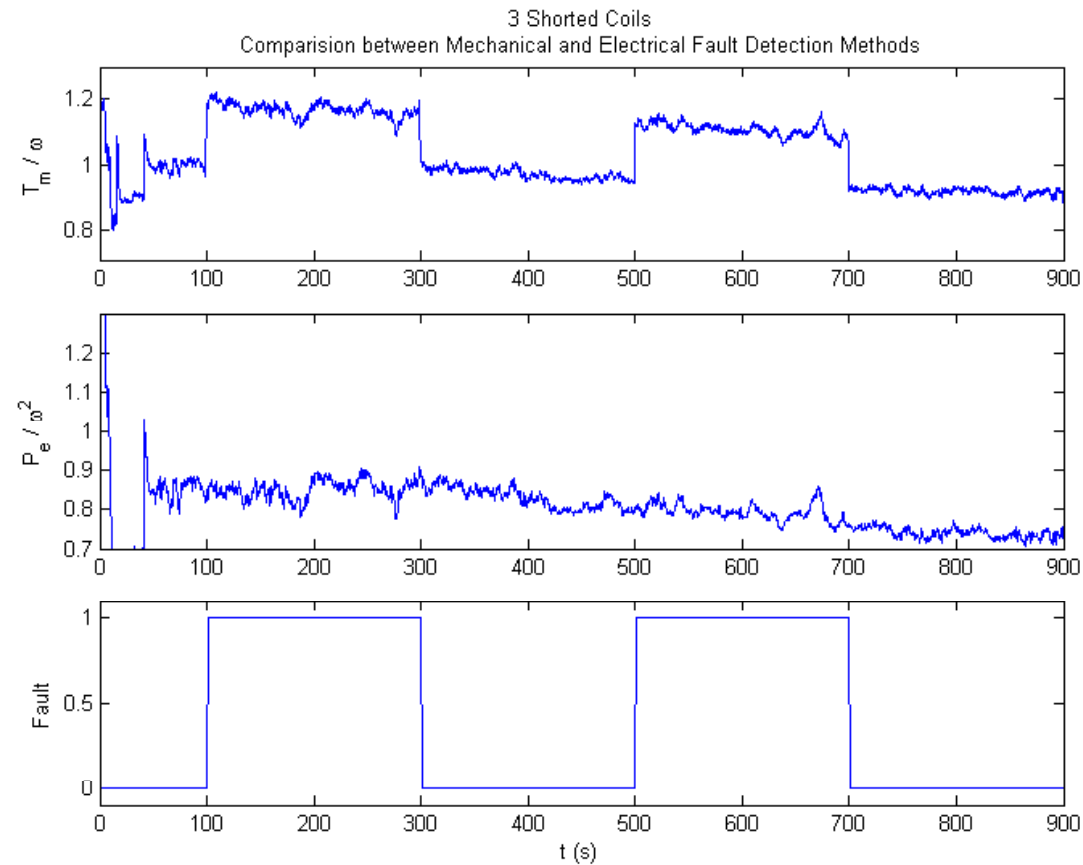
Shorted Coils



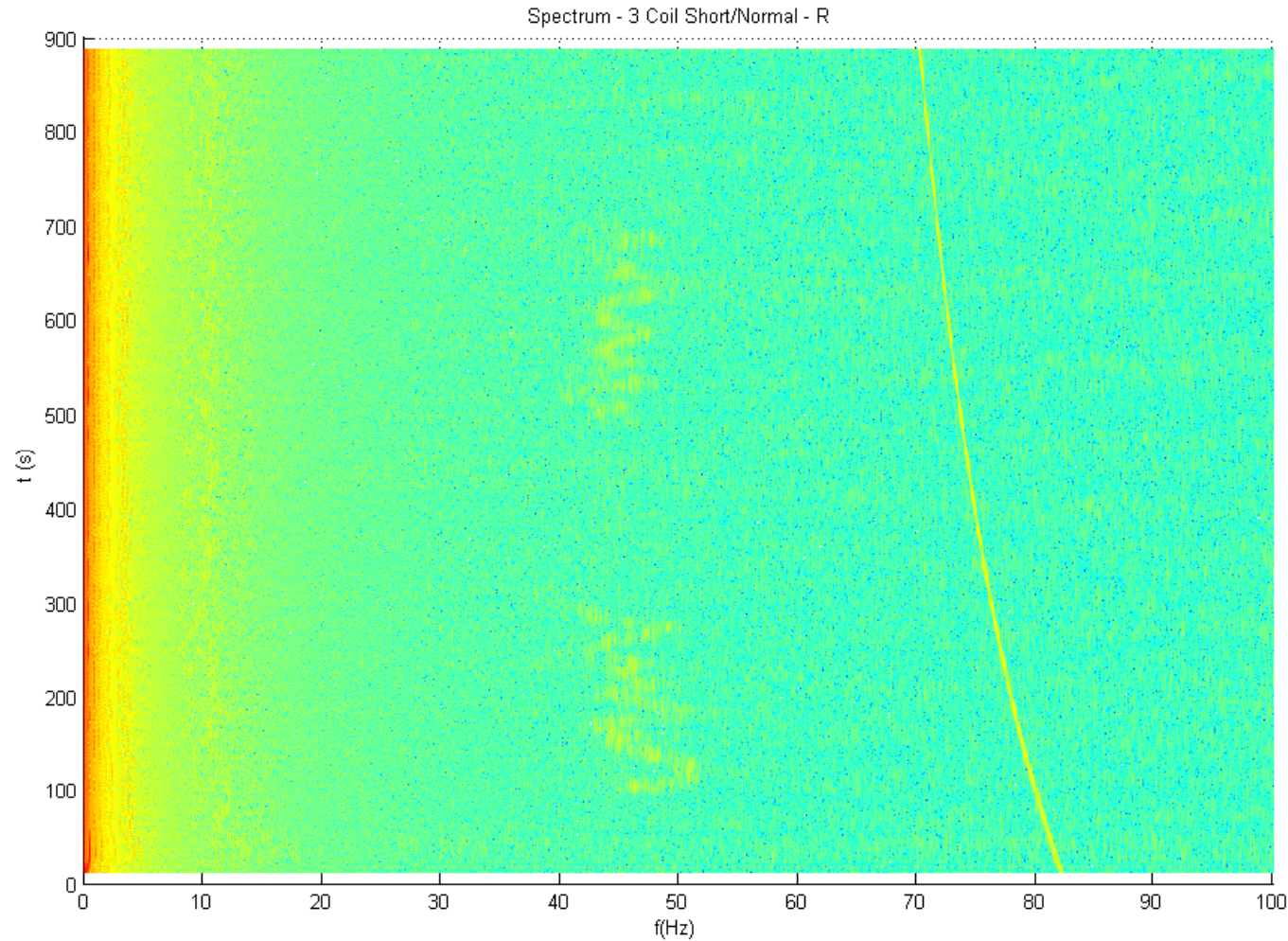
Shorted Coils – Torque-Speed



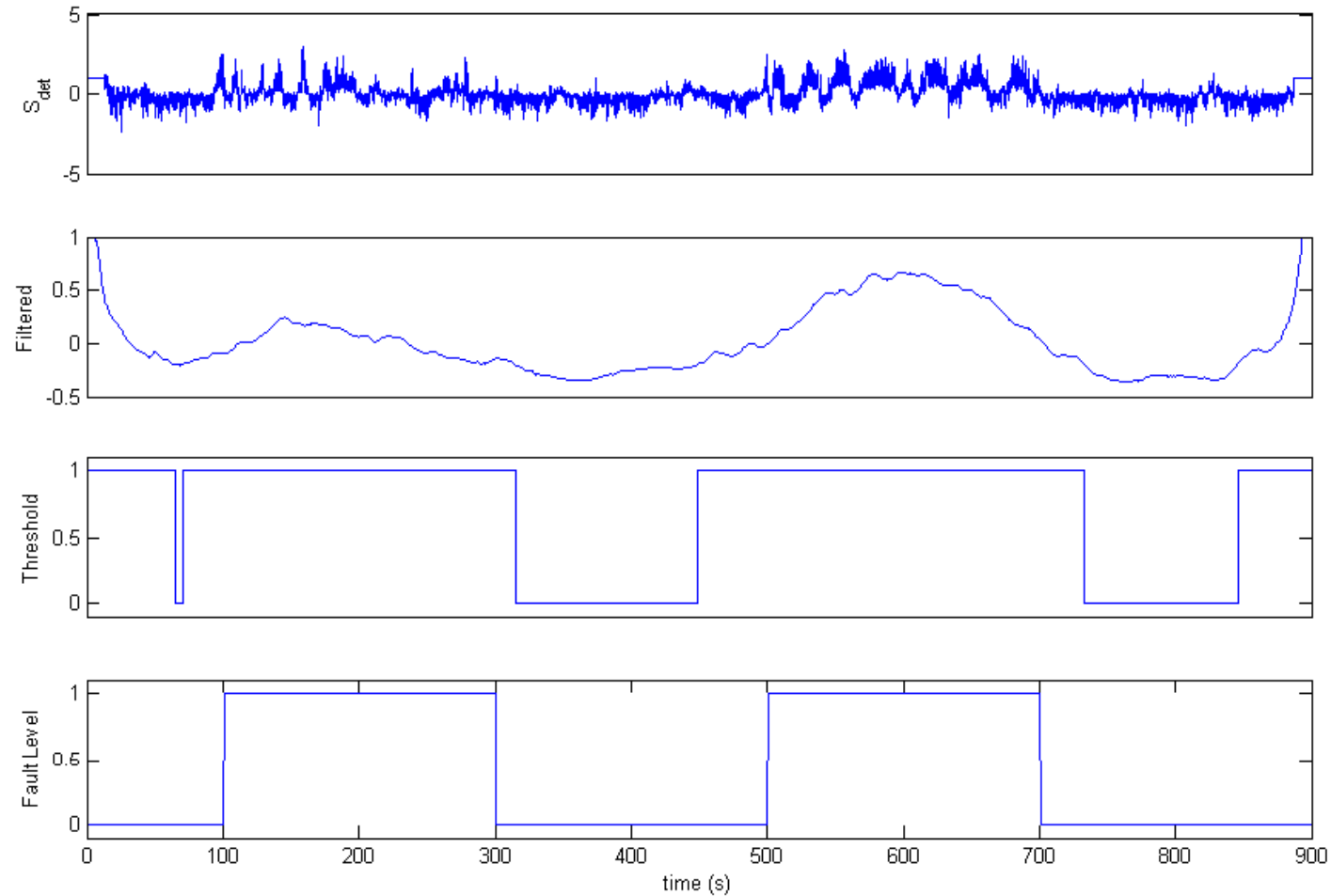
Shorted Coils-Torque/Speed-Detectability



Shorted Coils – Spectral



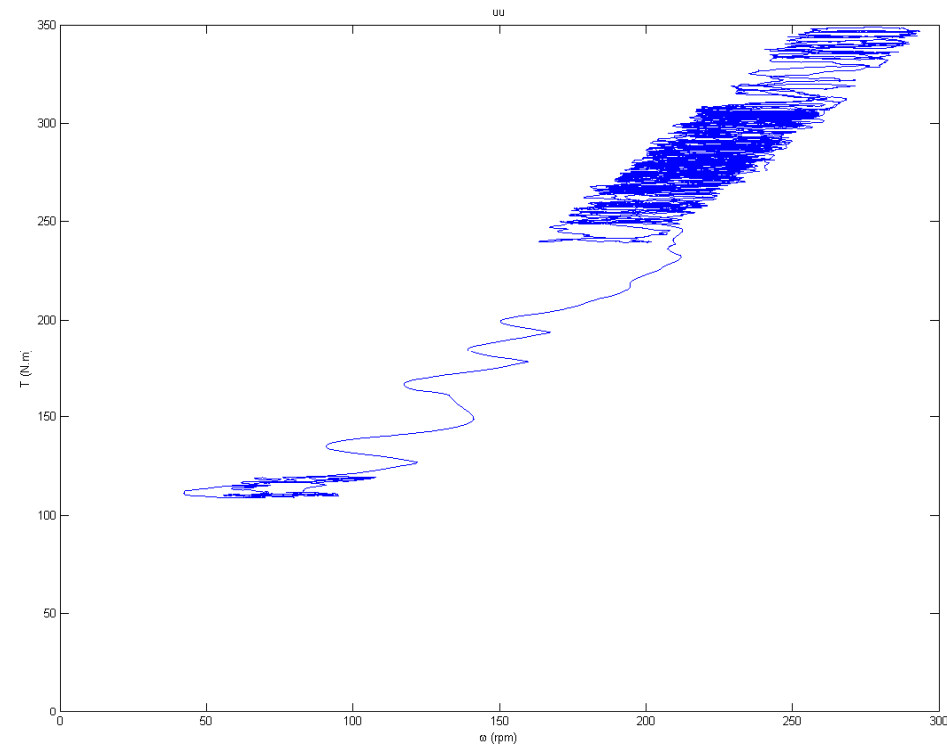
Shorted Coils – Spectral



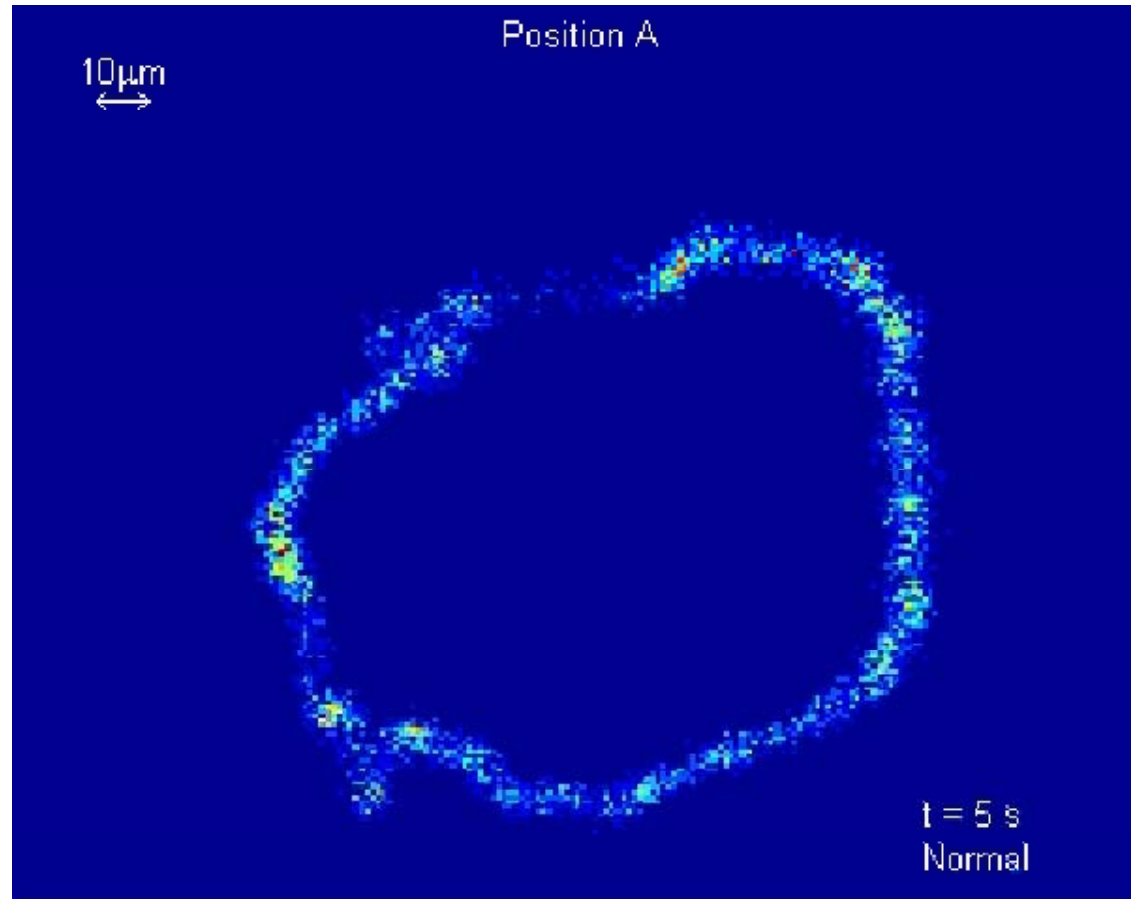
Rotor Mass Unbalance



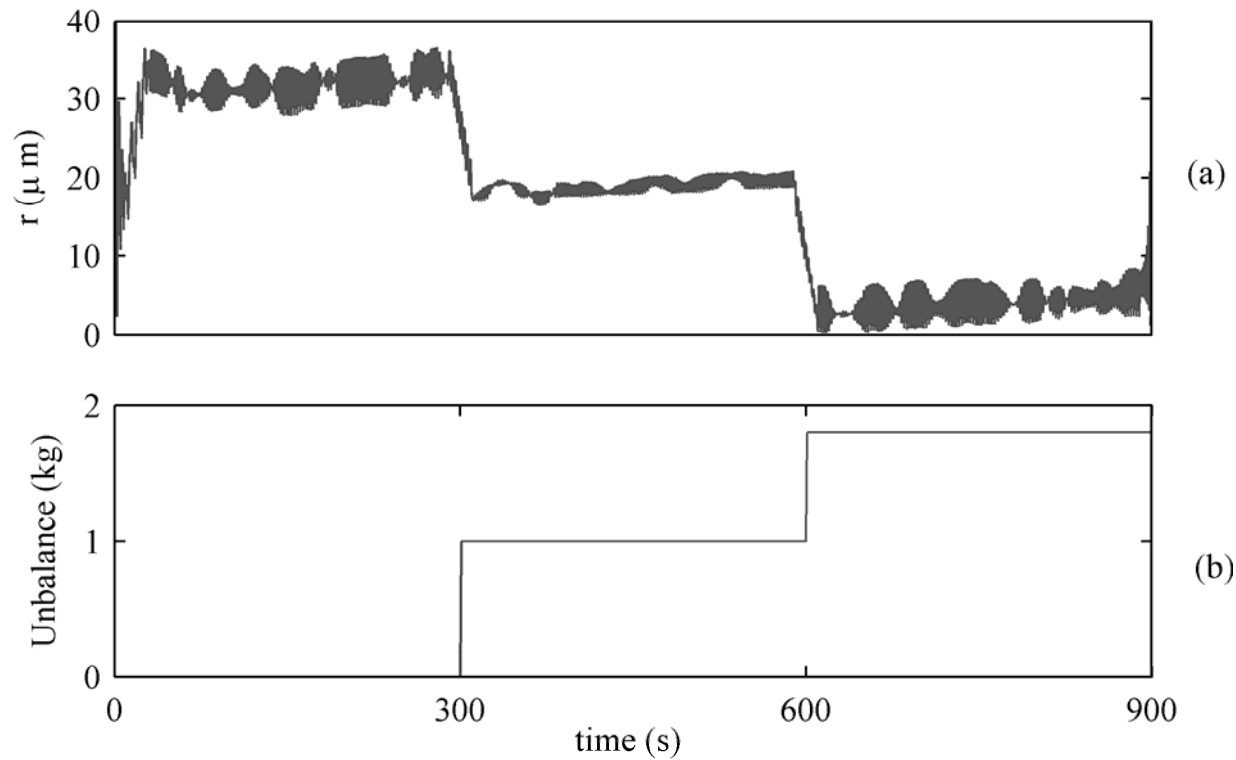
Rotor Mass Unbalance – Torque-Speed



Rotor Mass Unbalance – Displacement



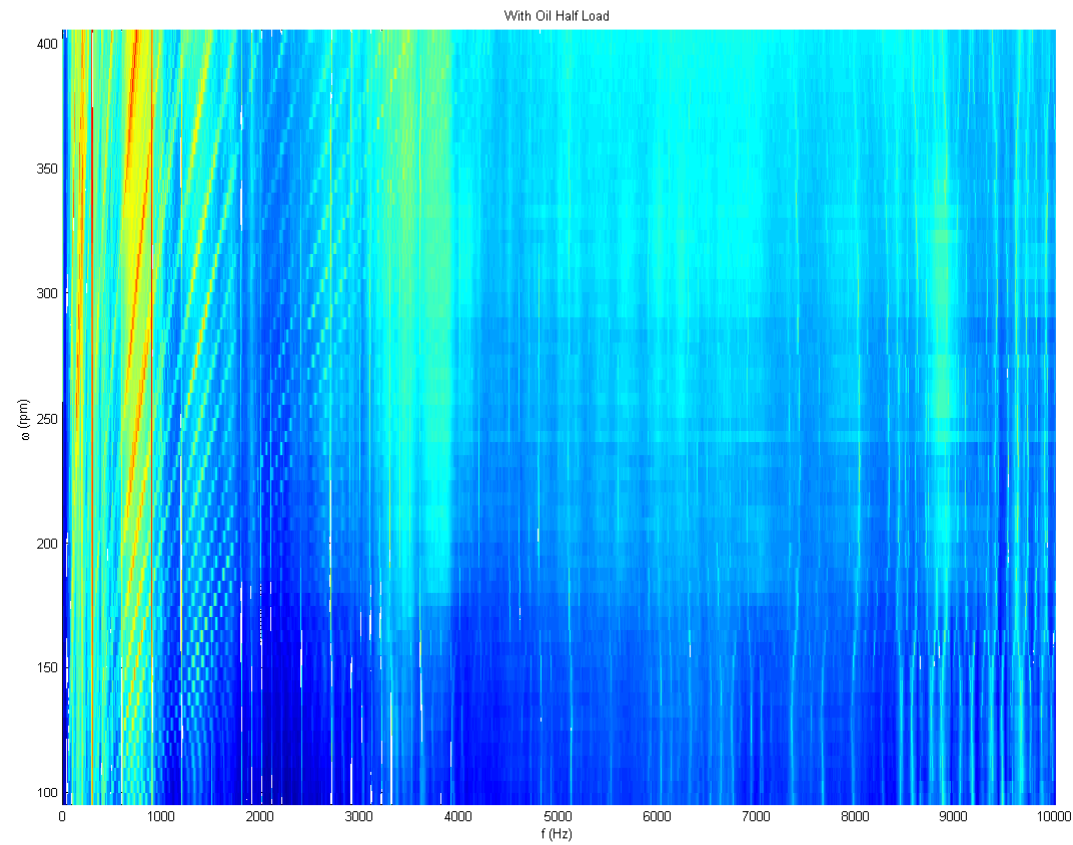
Rotor Mass Unbalance – Displacement



Gearbox Vibration

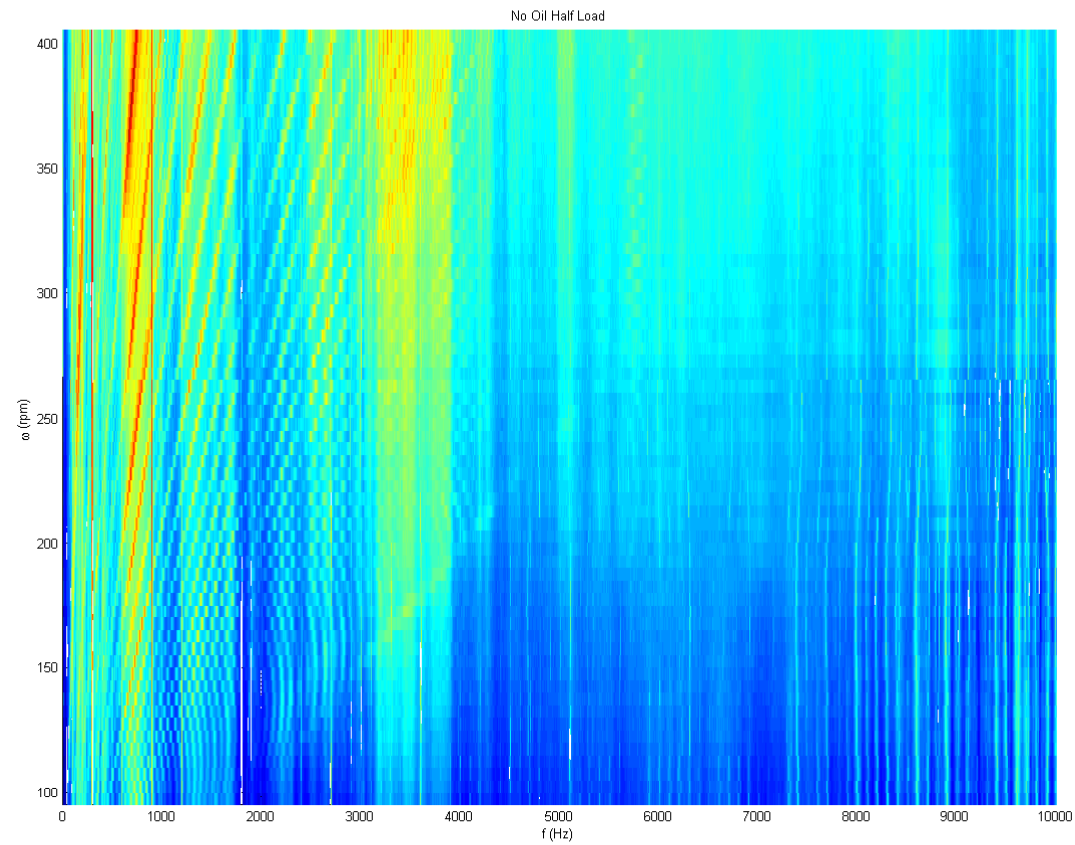


Gearbox Vibration



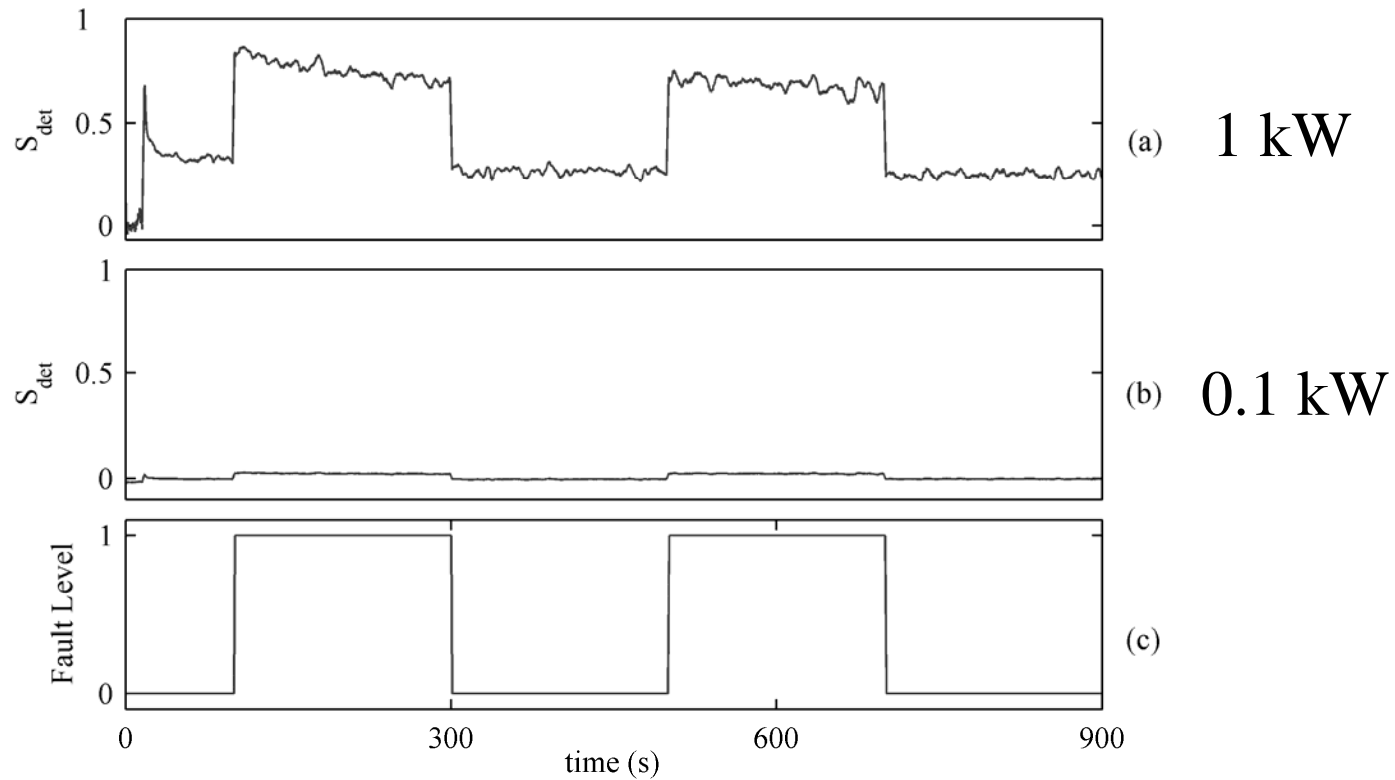
With Oil

Gearbox Vibration



Without Oil

Load Conditions – Shorted Coils



Conclusions / Summary

- Test rig has features of a wind turbine
- “Fault-like perturbations” Applied
 - Shorted Coils
 - Load condition
 - Rotor Mass Unbalance
 - Gearbox Oil
- Sensor Suitability Assessed
 - Torque Transducer / Current & Voltage
 - Shaft Displacement
 - Accelerometer