

# RADICLE

Real-Time Dynamic Control System for Laser Welding



## Welding Sensor Suite Development

# Optical metrology of laser welding of metal components

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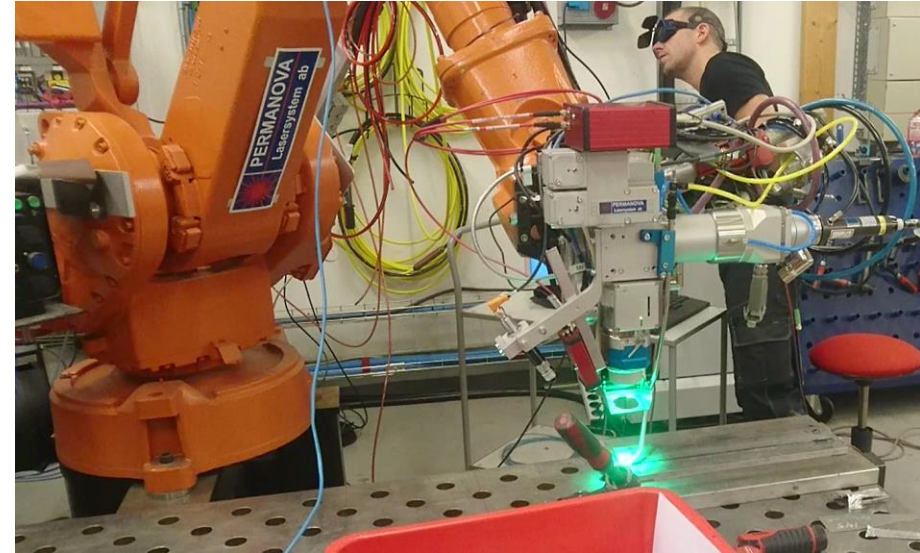
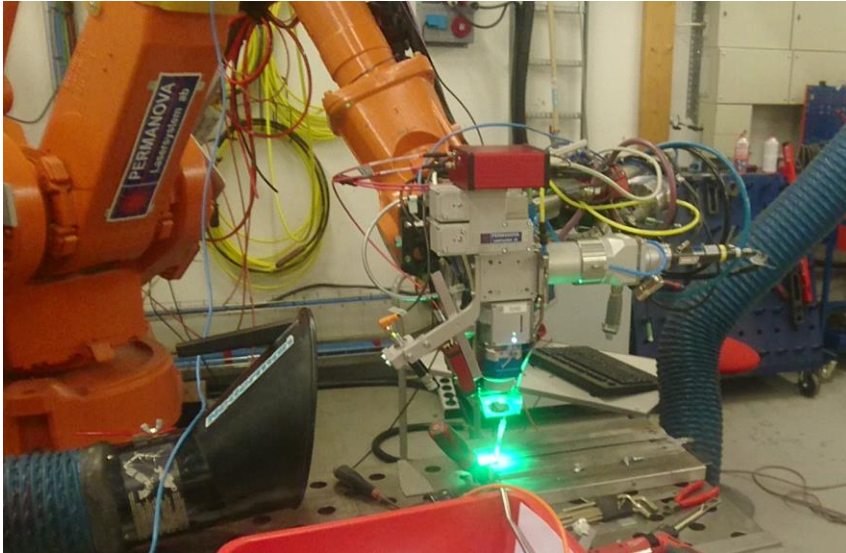
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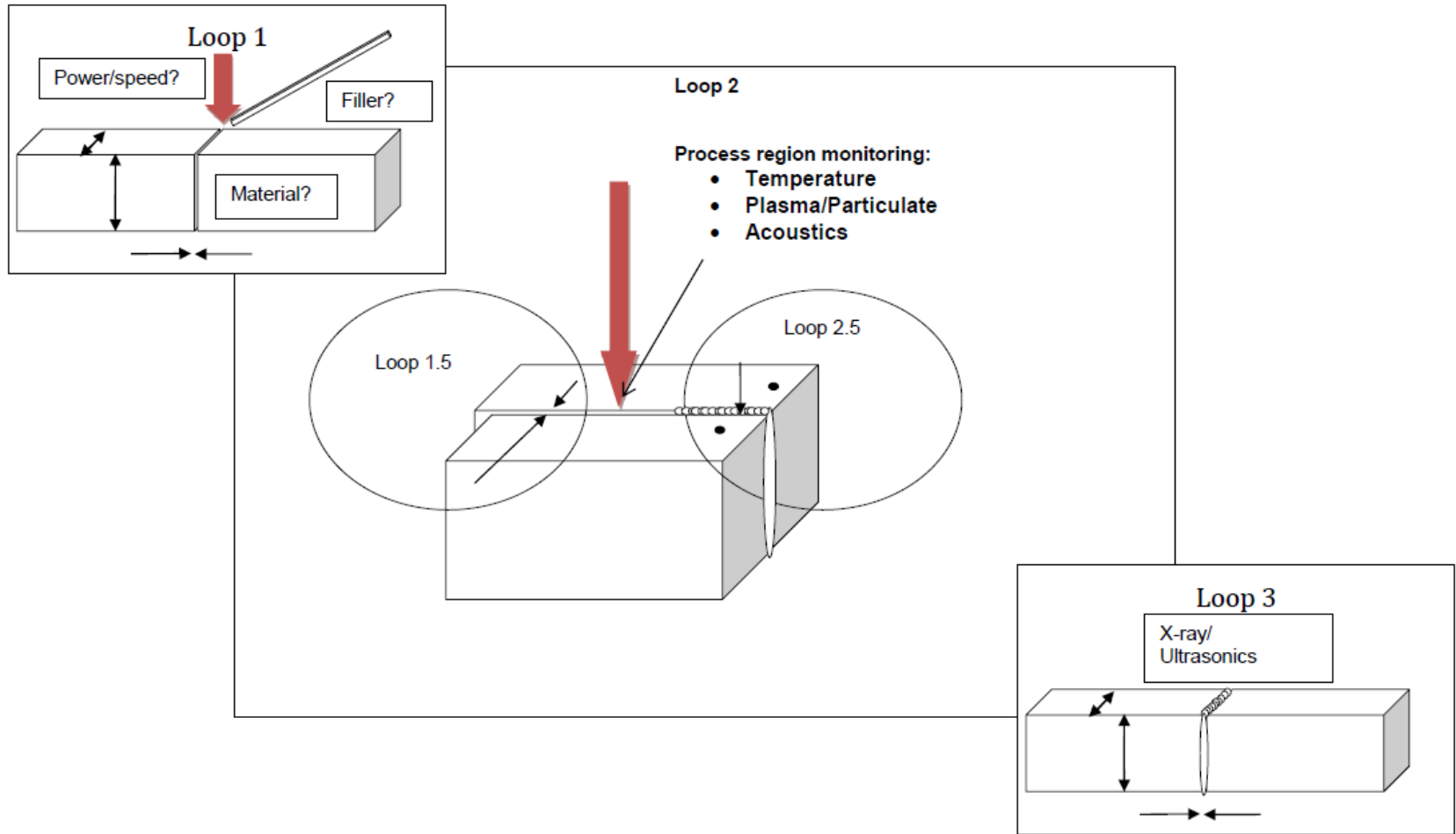
# Introduction

- Why do we want to measure laser welding?
- How can we measure it?
- Development tools
- Outline results

# Laser welding



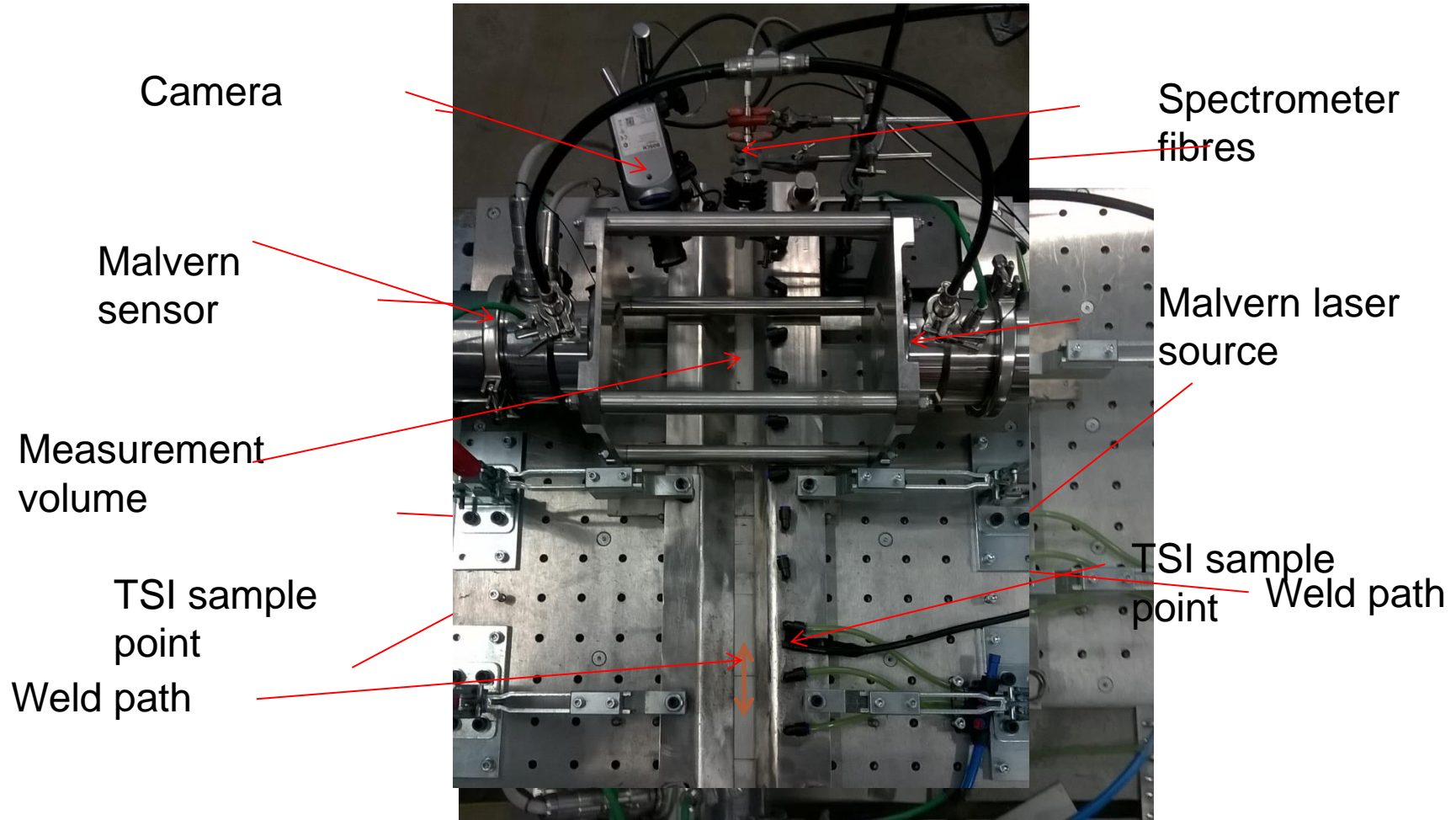
# When to measure?

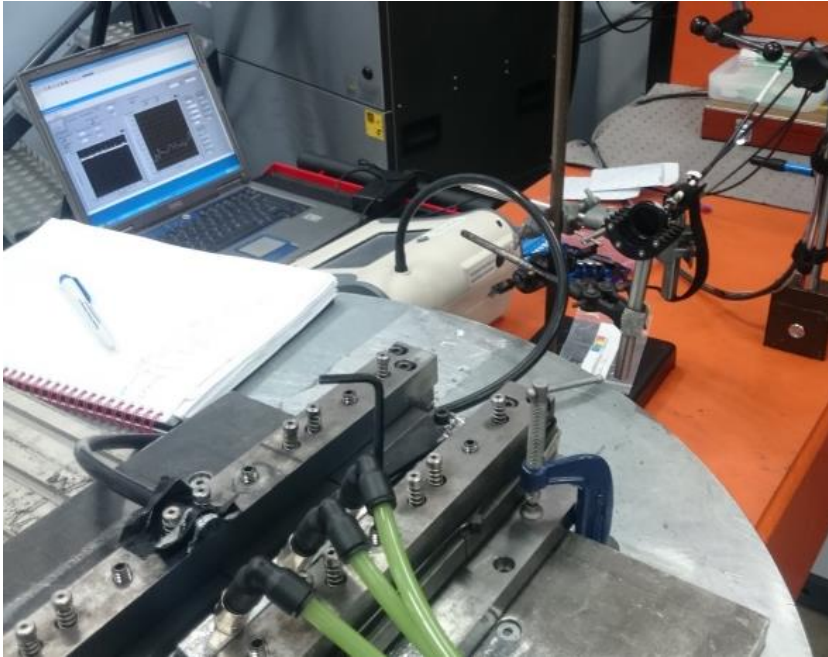


# What will we measure?

- Weld or Keyhole images
- Optical emissions from the weld
- Weld position
- Plume density and size

# Learning

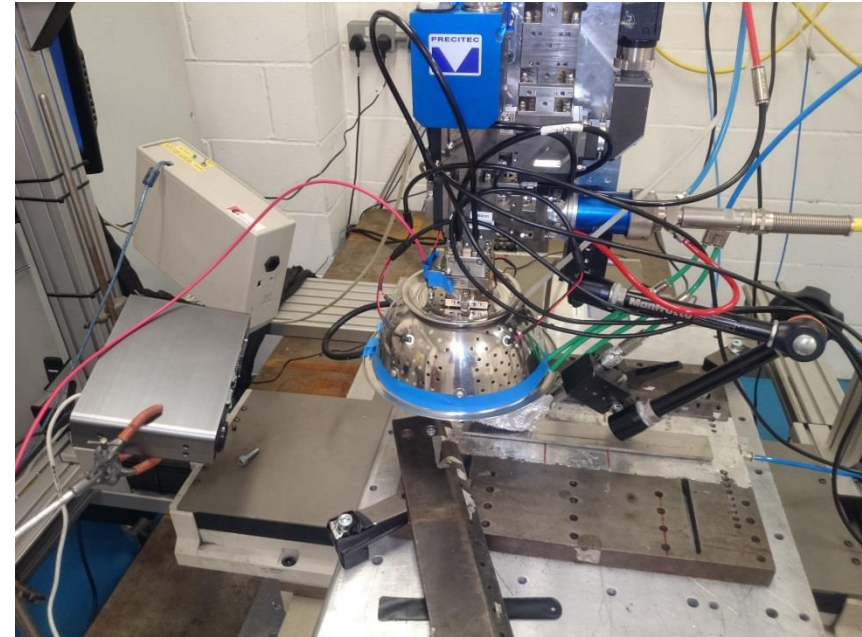
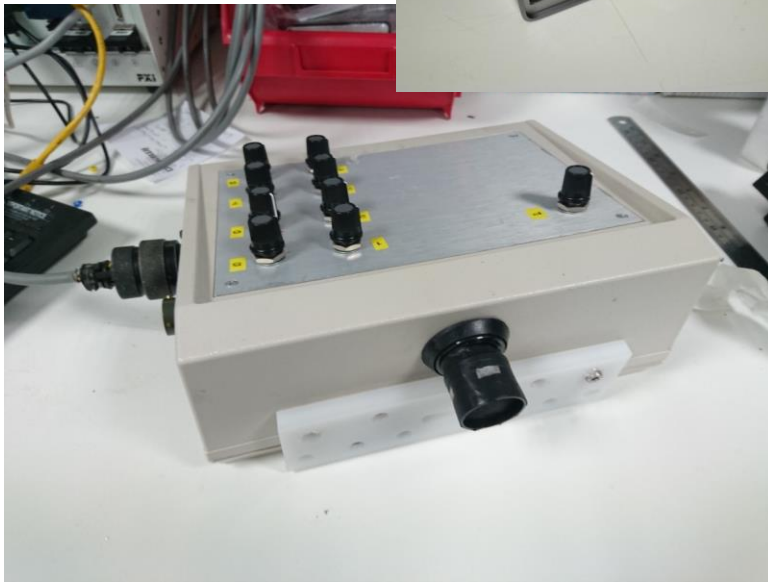




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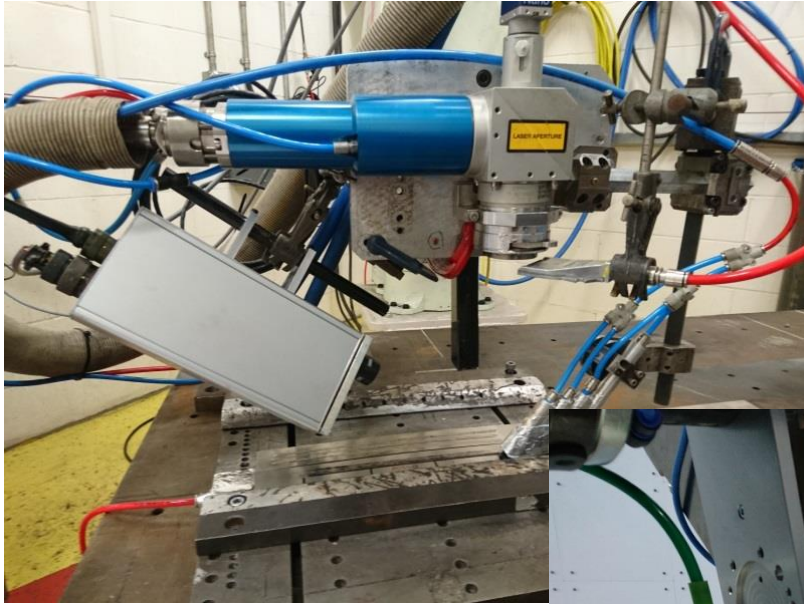


# Development sensors

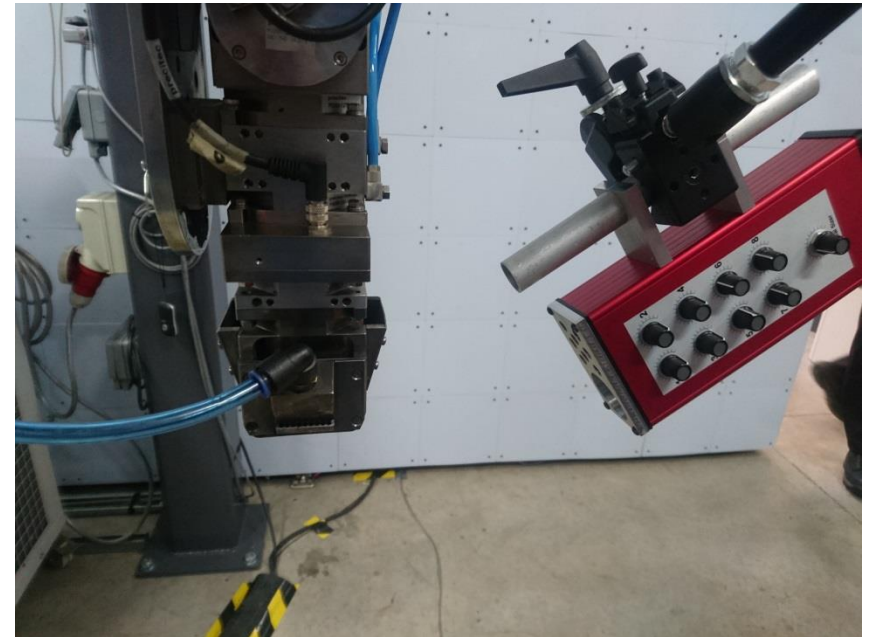
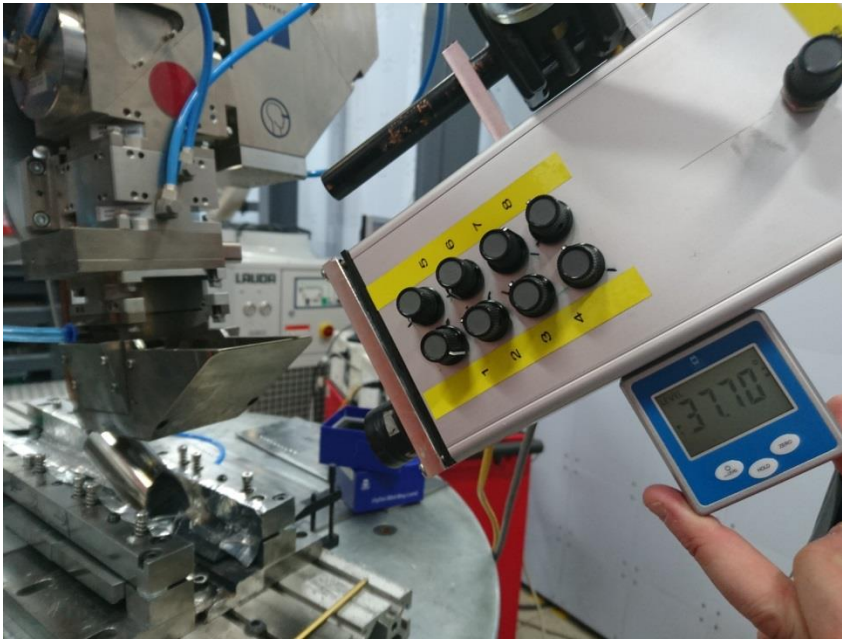




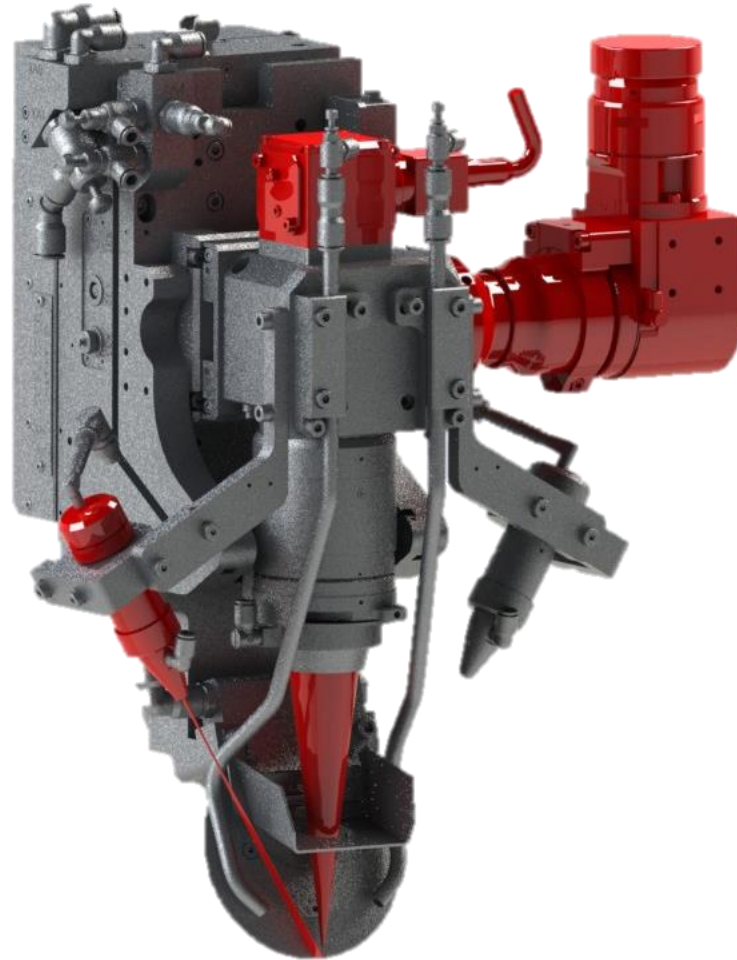
# Welding set ups



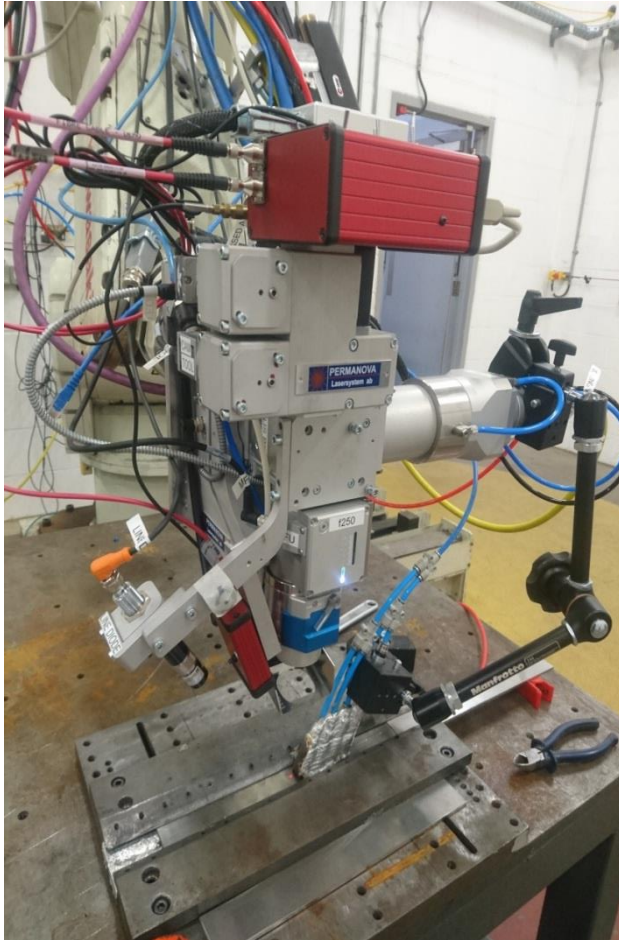
# Off axis sensor heads



# Welding head



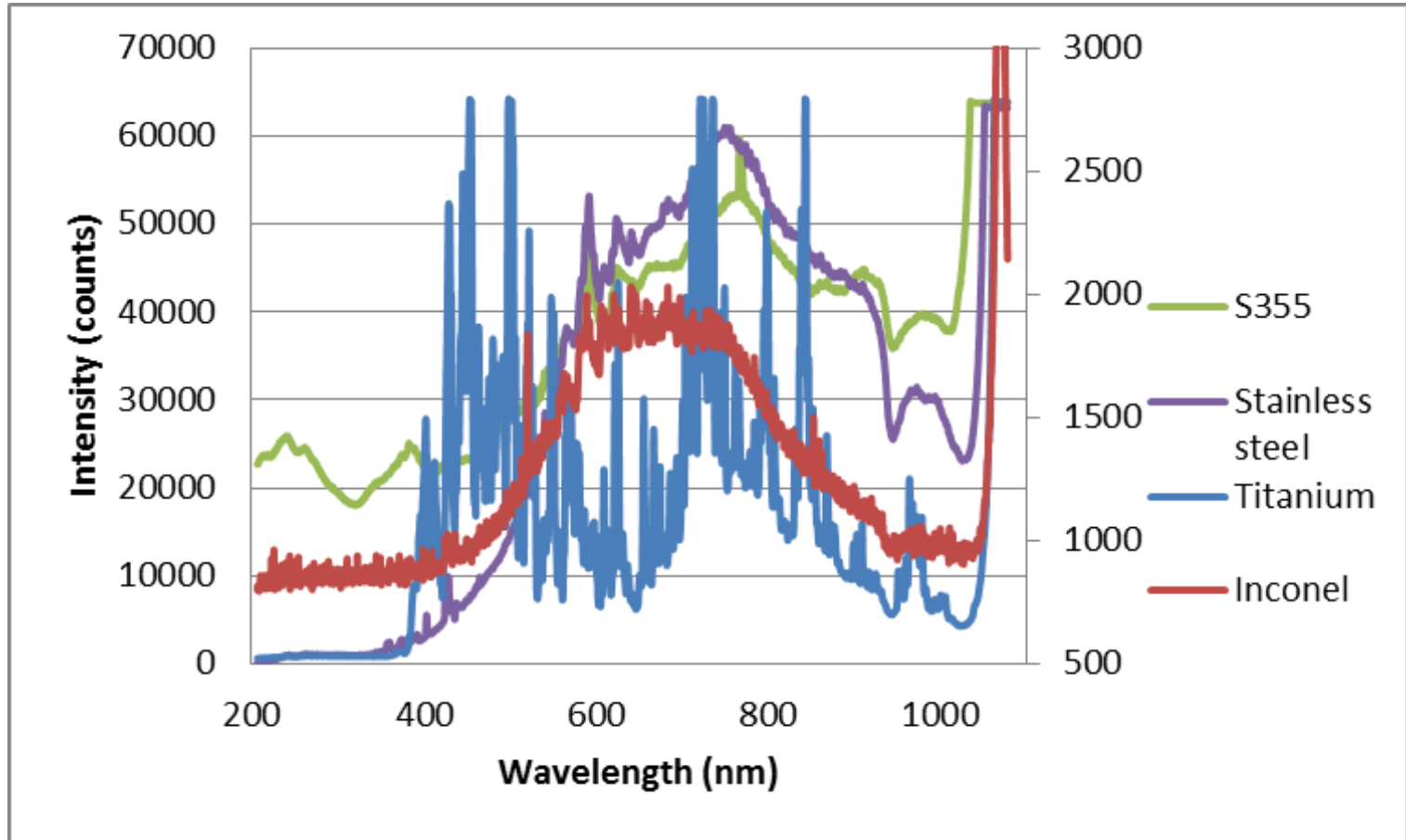
# Co-axial sensor



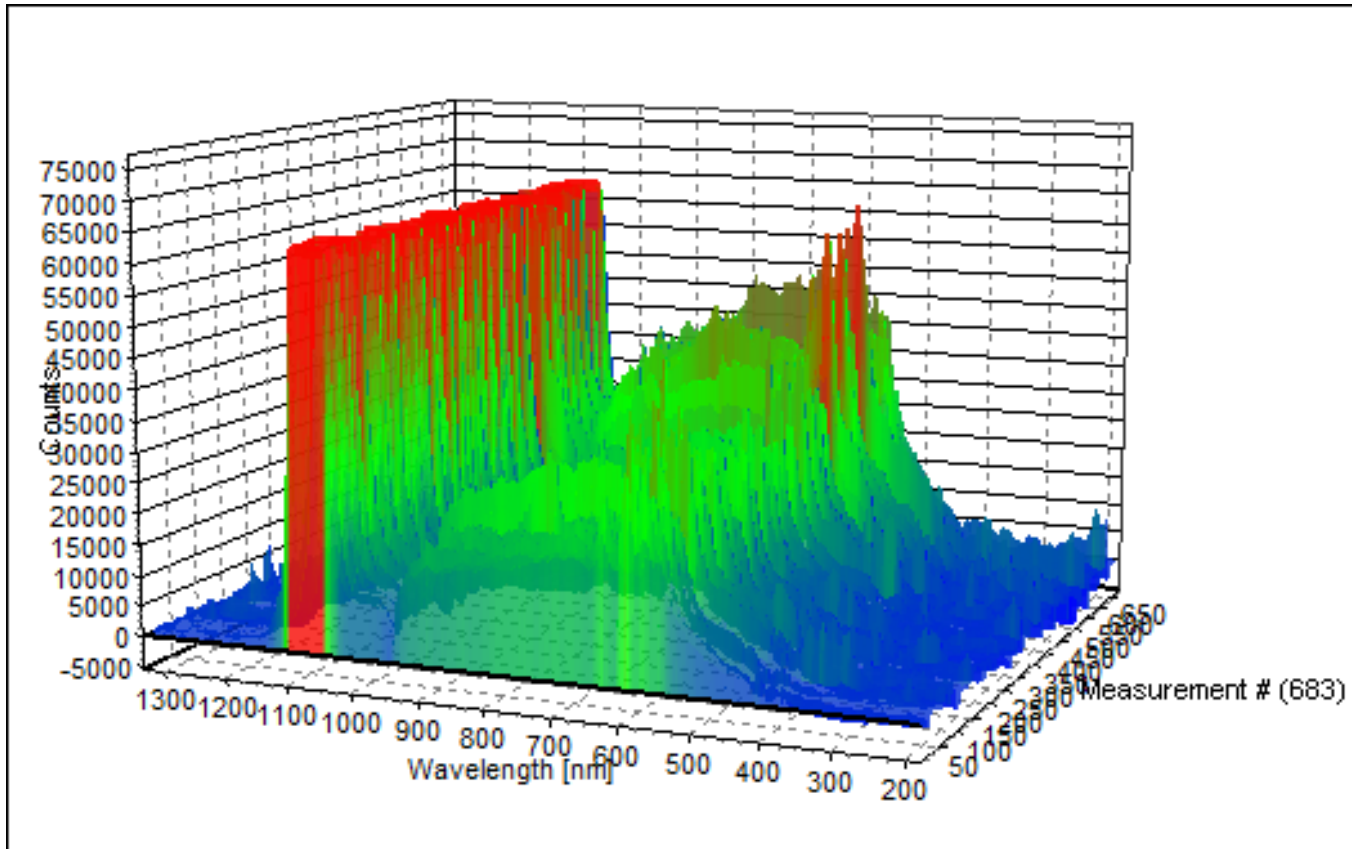
# Coaxial welding video



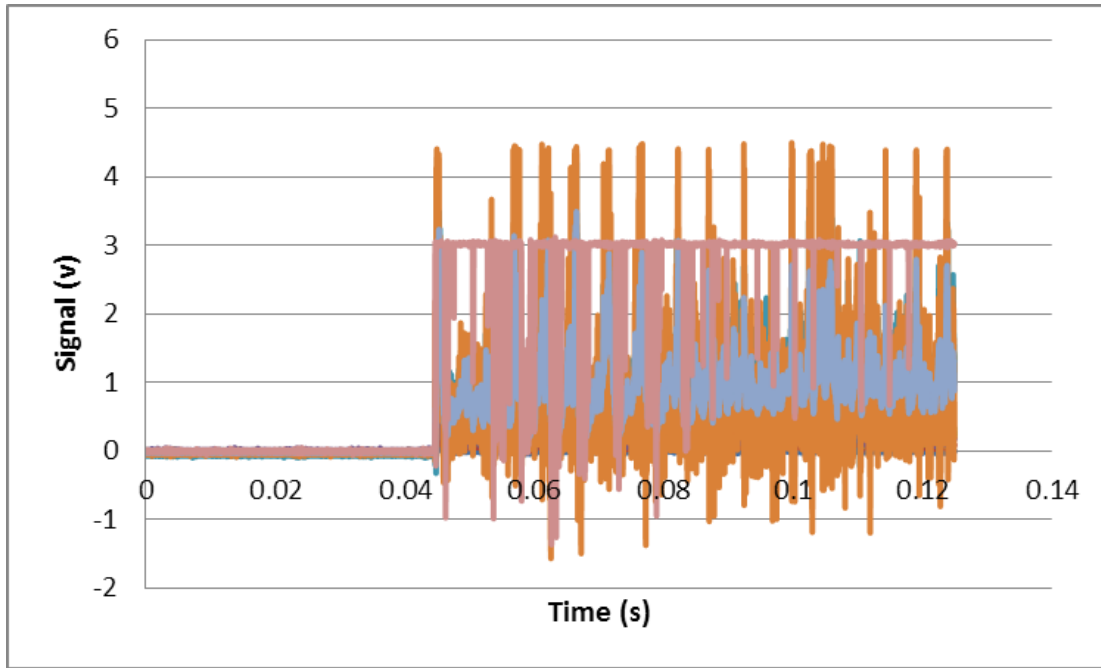
# Spectral signatures



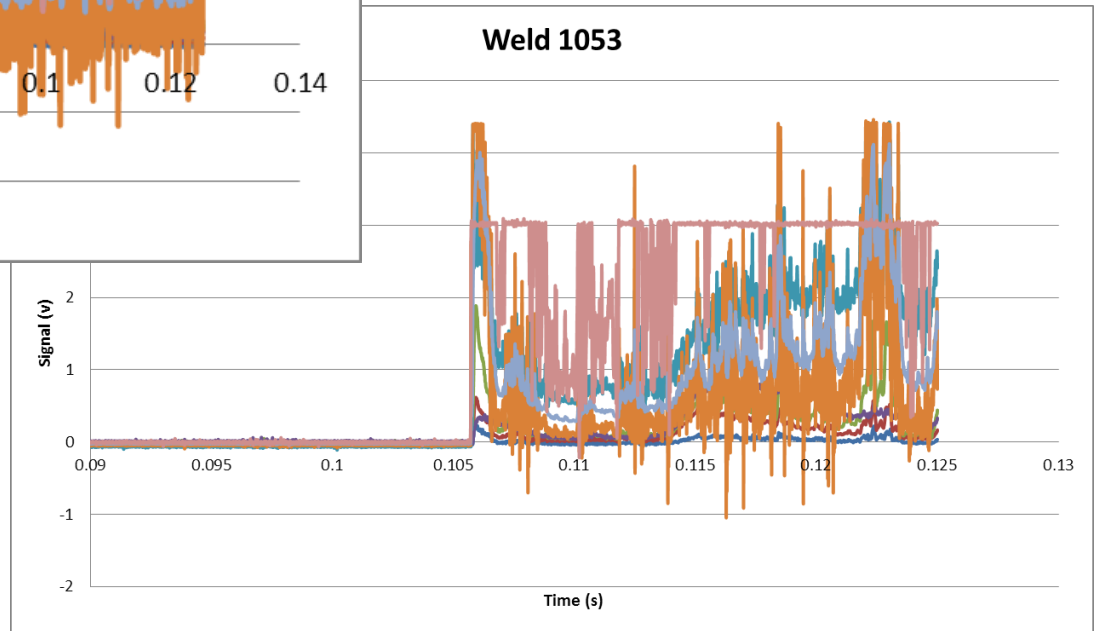
# Variation during weld



# Weld initiation

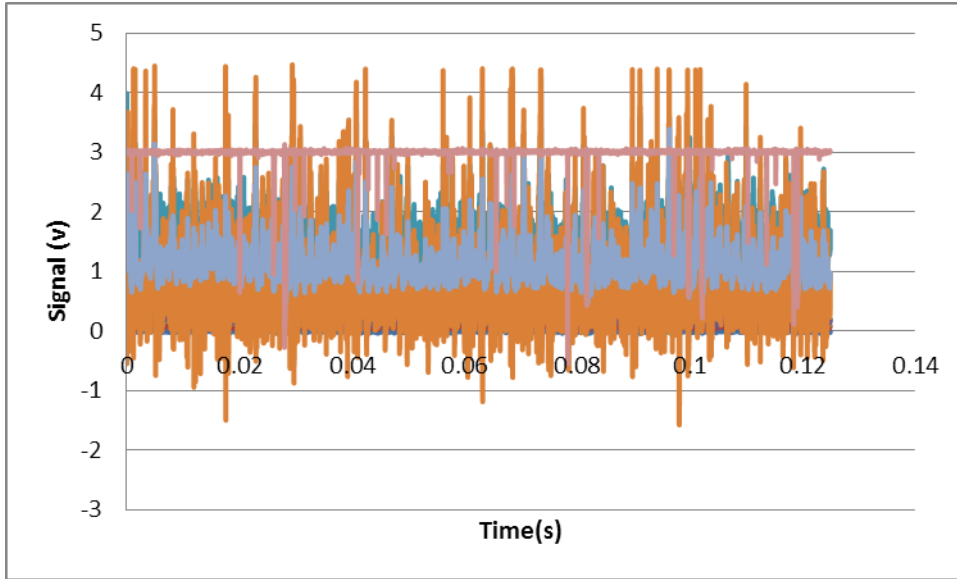


Low and high power

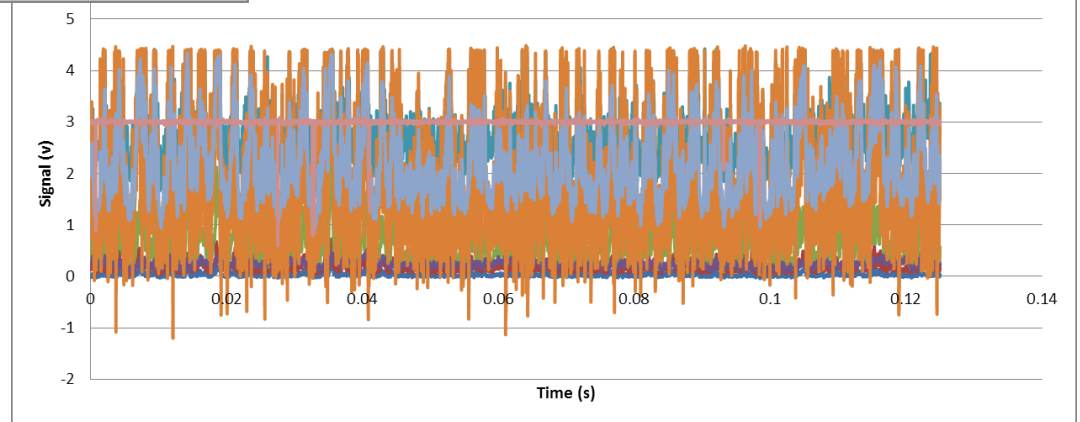




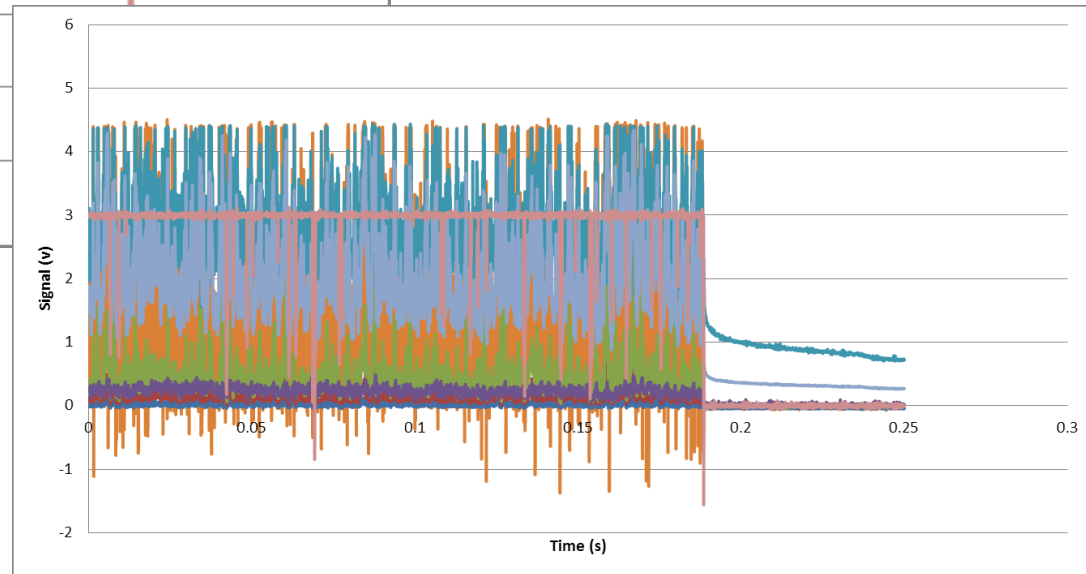
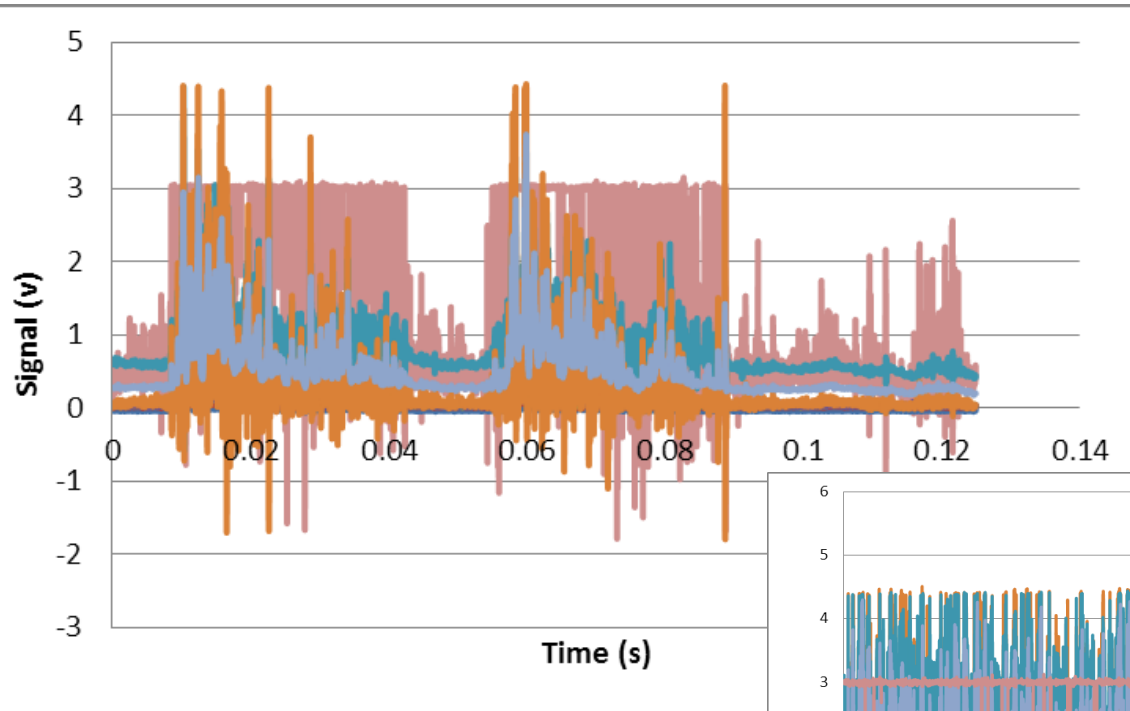
# Stable weld



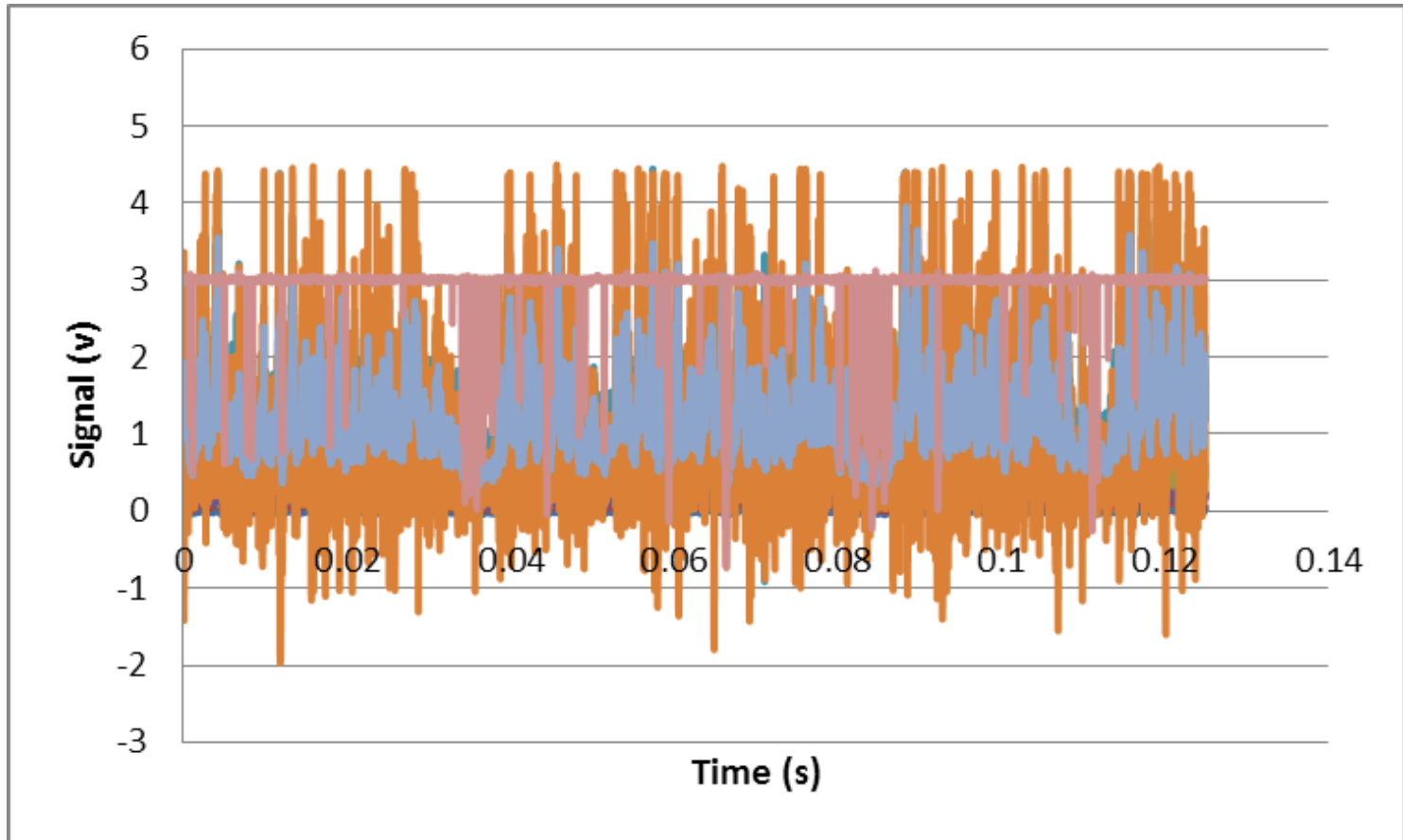
**Weld 1053**



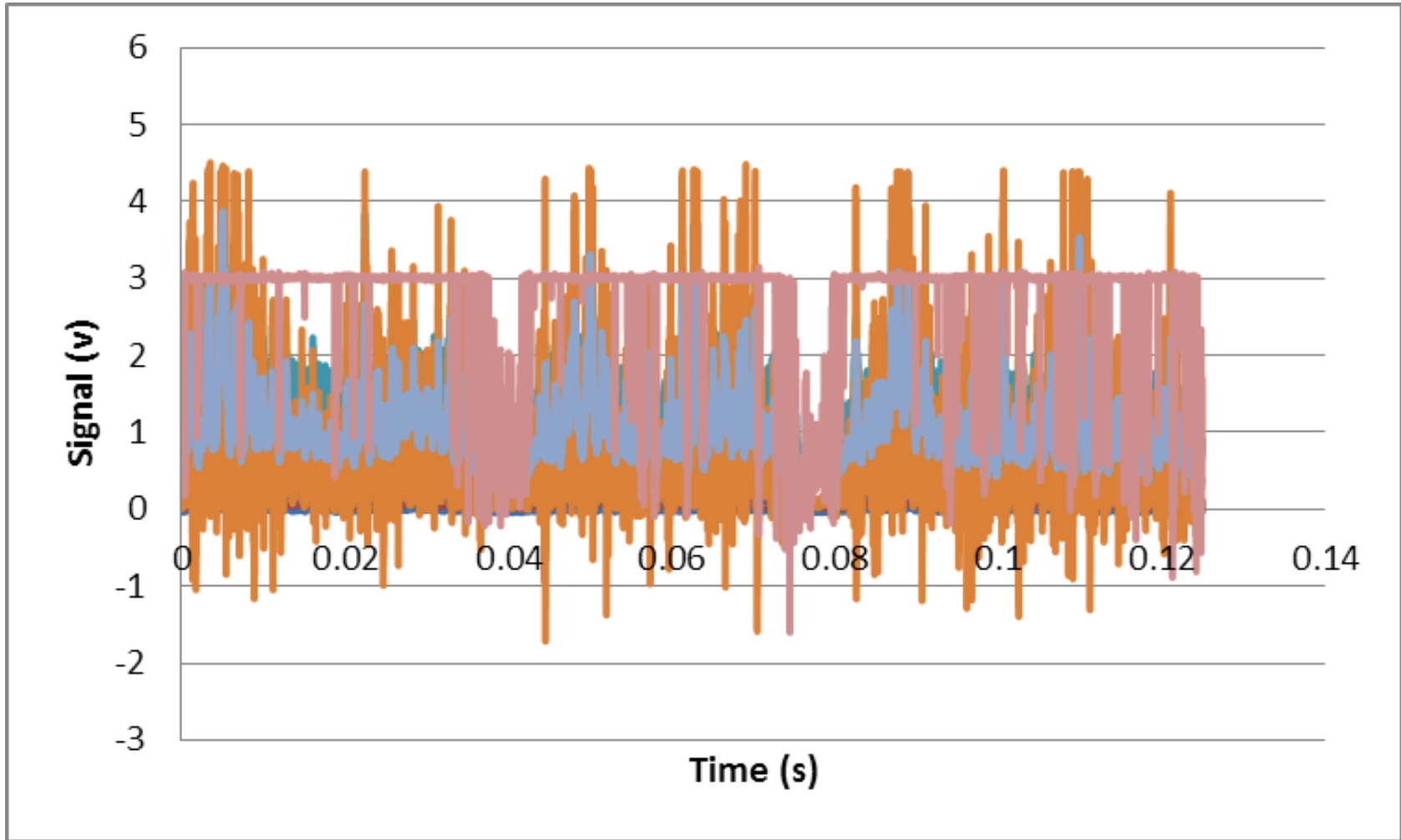
# Weld end



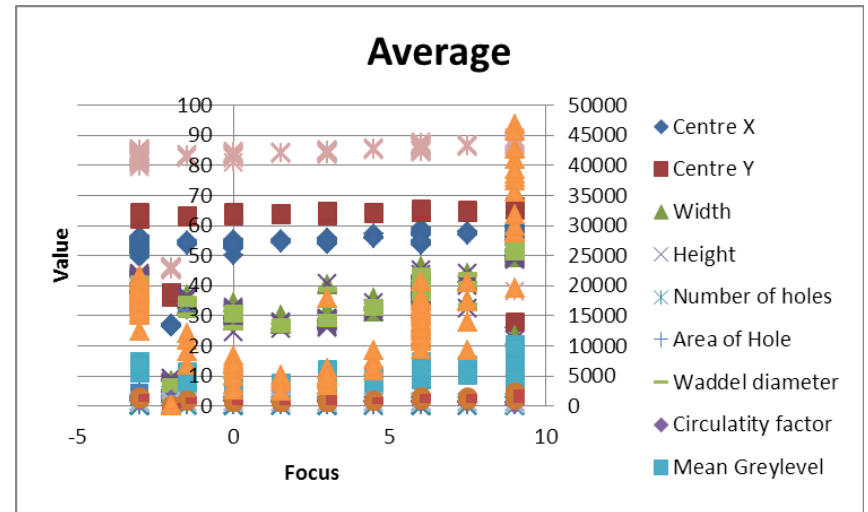
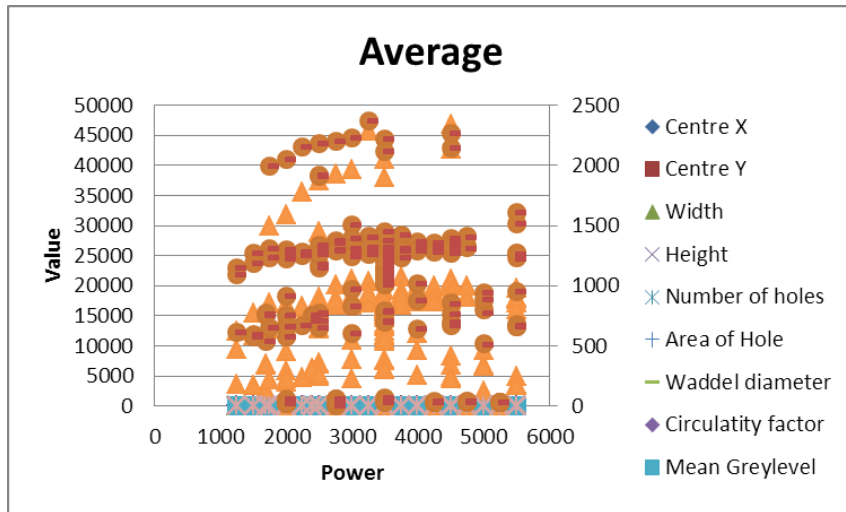
# Instability forms



# Gap in weld



# Trends by comparing welds



# Any questions?

- Radicle project



- EU Horizon 2020 funding no. 636932.



- <http://radiclelaser.eu>

## Thanks for listening