


# ONLINE PUBLIC DEMONSTRATION

*17th November 2020, 10:00-12:00 CET*



*InteGrated and PHysically Optimised Battery System for Plug-in Vehicles Technologies*

 This session is being recorded

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GHOST

This project has received funding from the European Union's Horizon2020 Programme for research and innovation under grant agreement No.770019.



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## Sensor-less temperature measurement

*Andreas Berger*



 This session is being recorded

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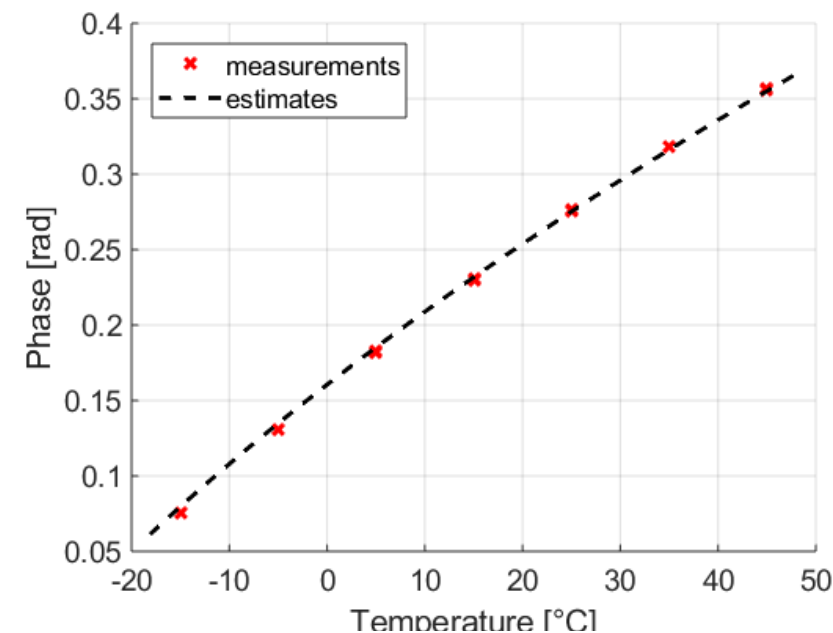
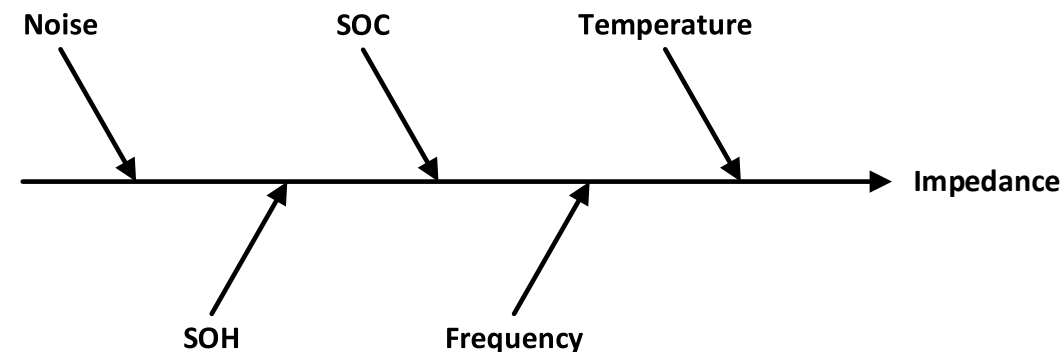
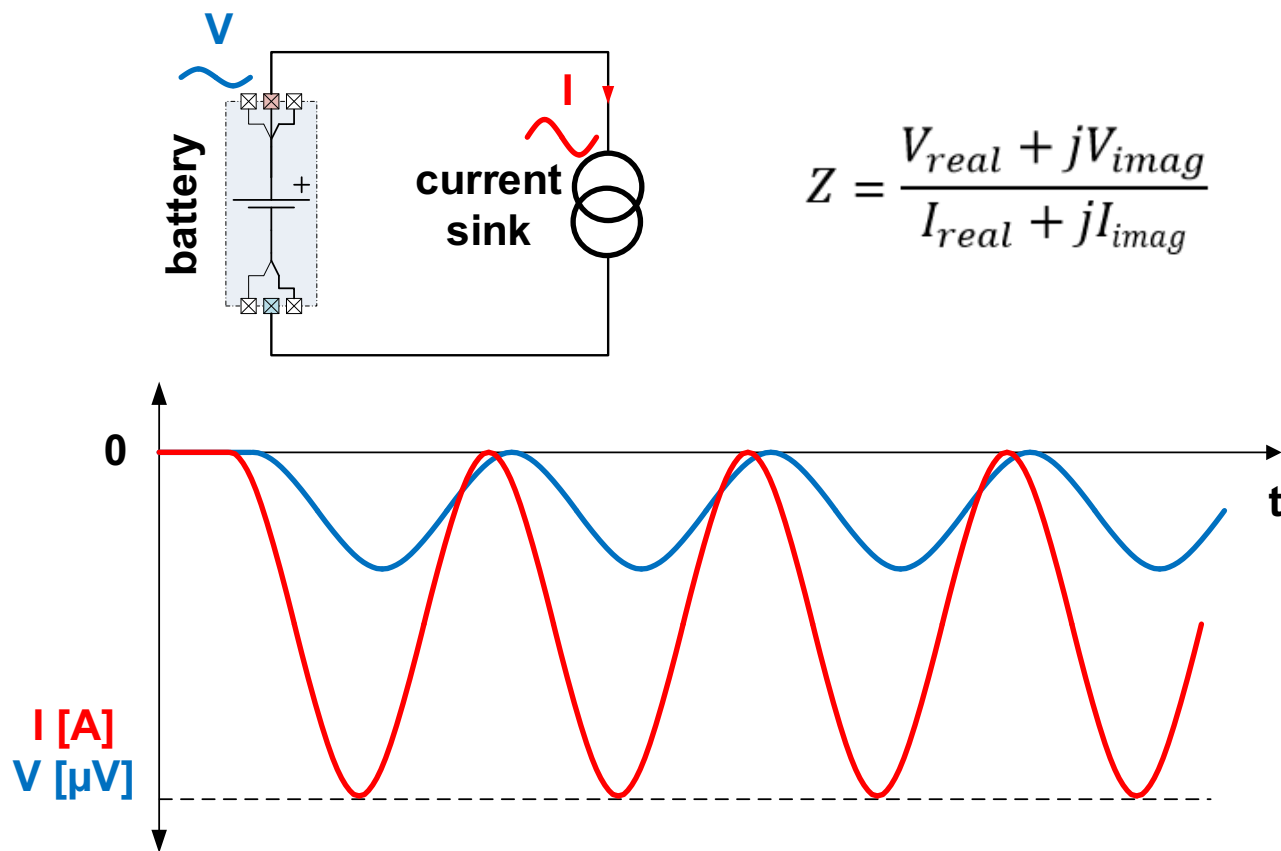
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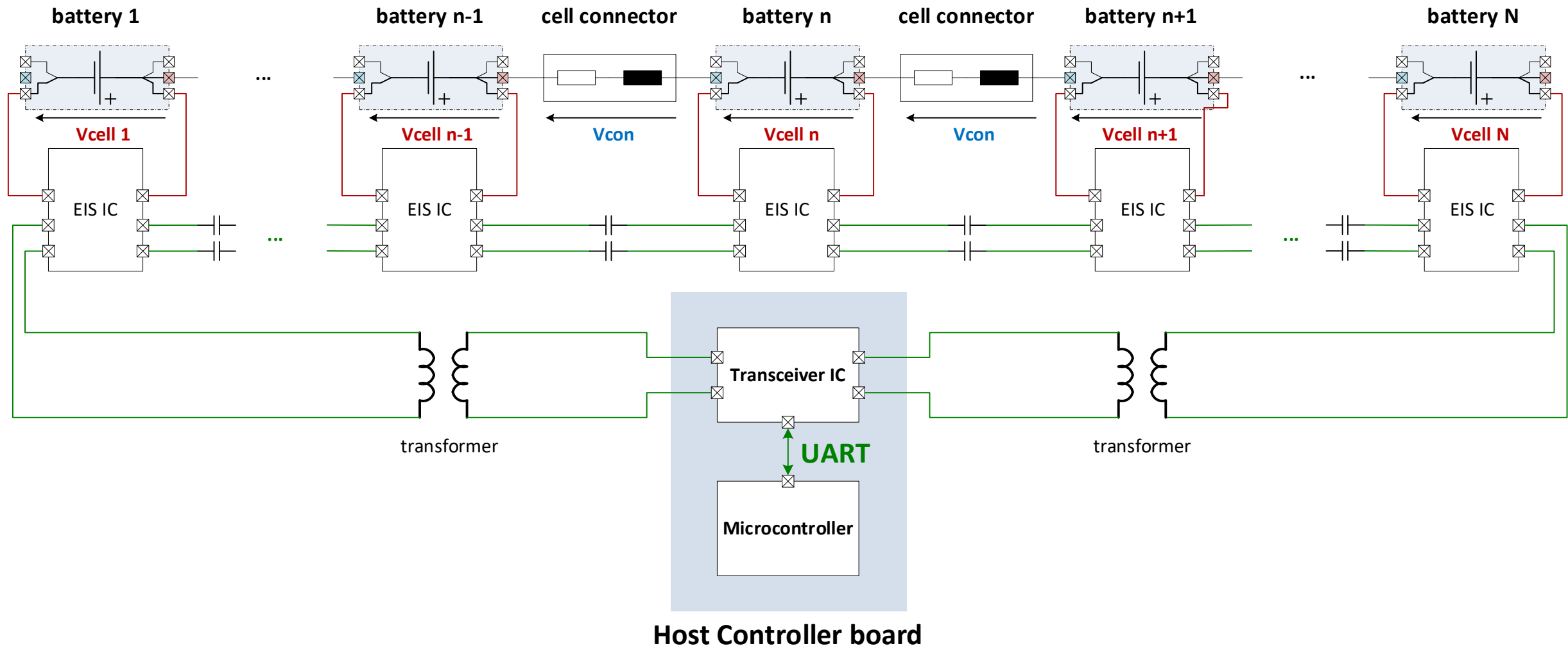
# IFAT Contributions to GHOST

- **Integrated Impedance Measurement System**
  - Development of an integrated solution for electrochemical impedance spectroscopy
- **Electro- Thermal Characterization**
  - Indepth electro-thermal characterization of battery parameters on cell level
  - LTO and LiS cells chemistry
- **Impedance based Temperature estimation**
  - Evaluation of impedance based temperature estimation

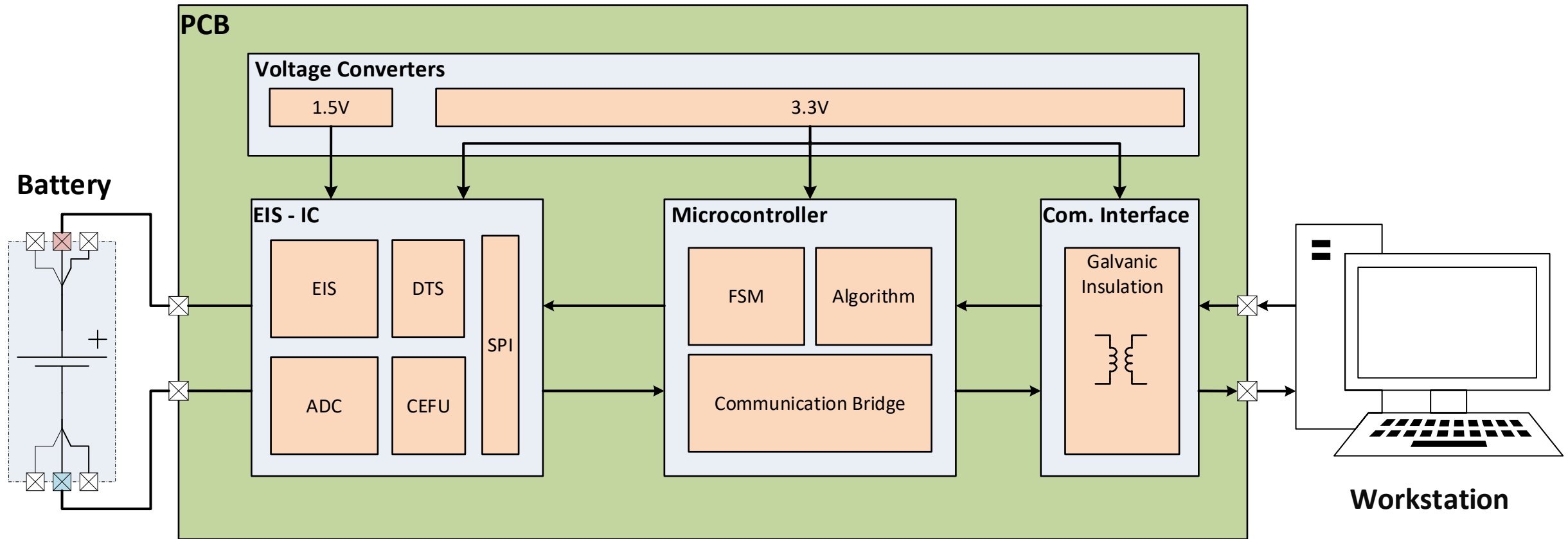
# Electro-chemical Impedance Spectroscopy



# EIS in a Battery Pack

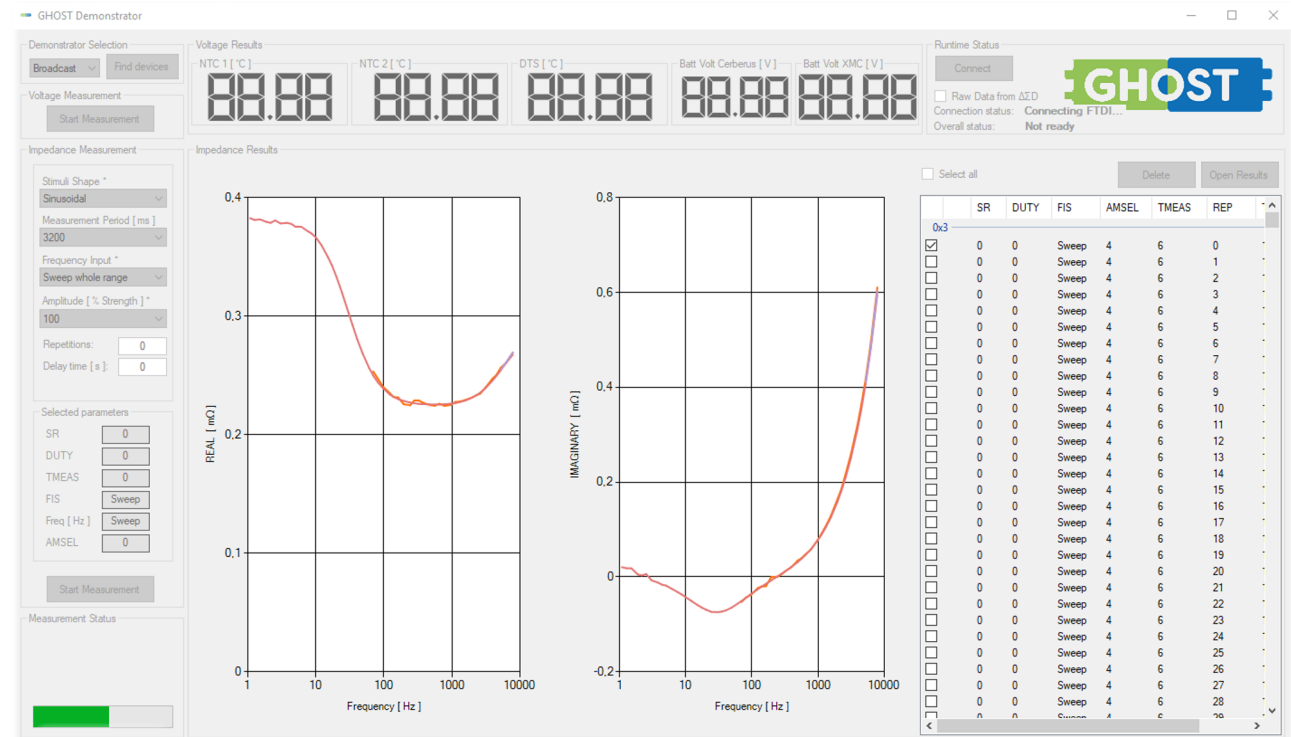
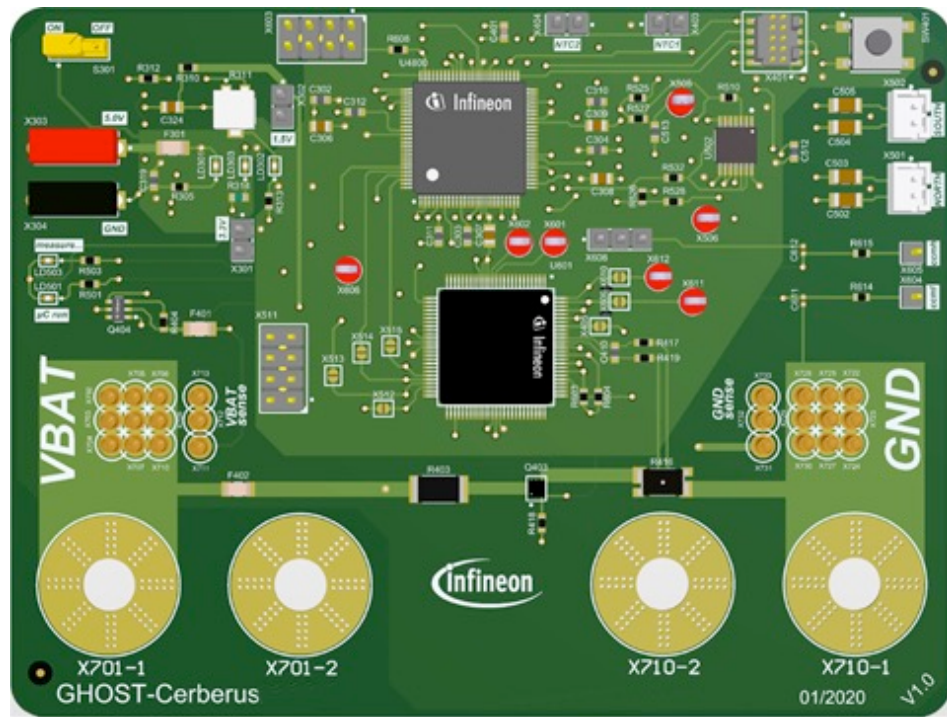


# Integrated EIS Measurement System



# Integrated EIS Measurement System

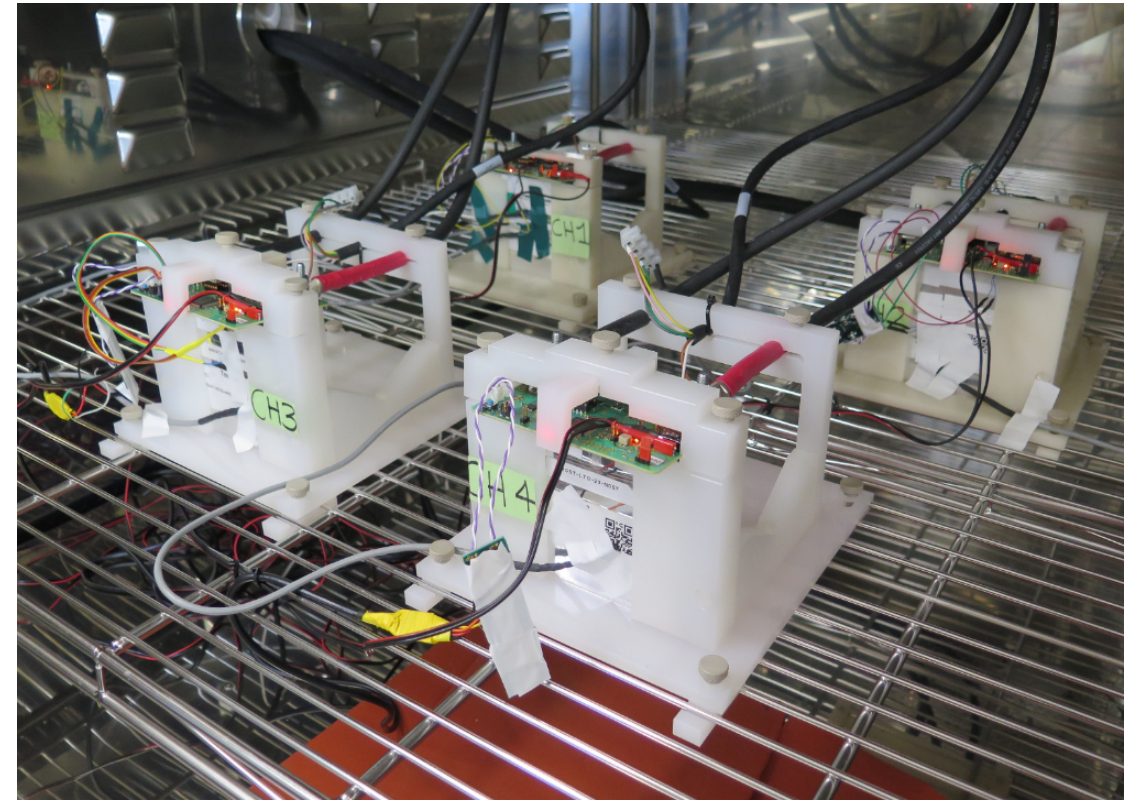
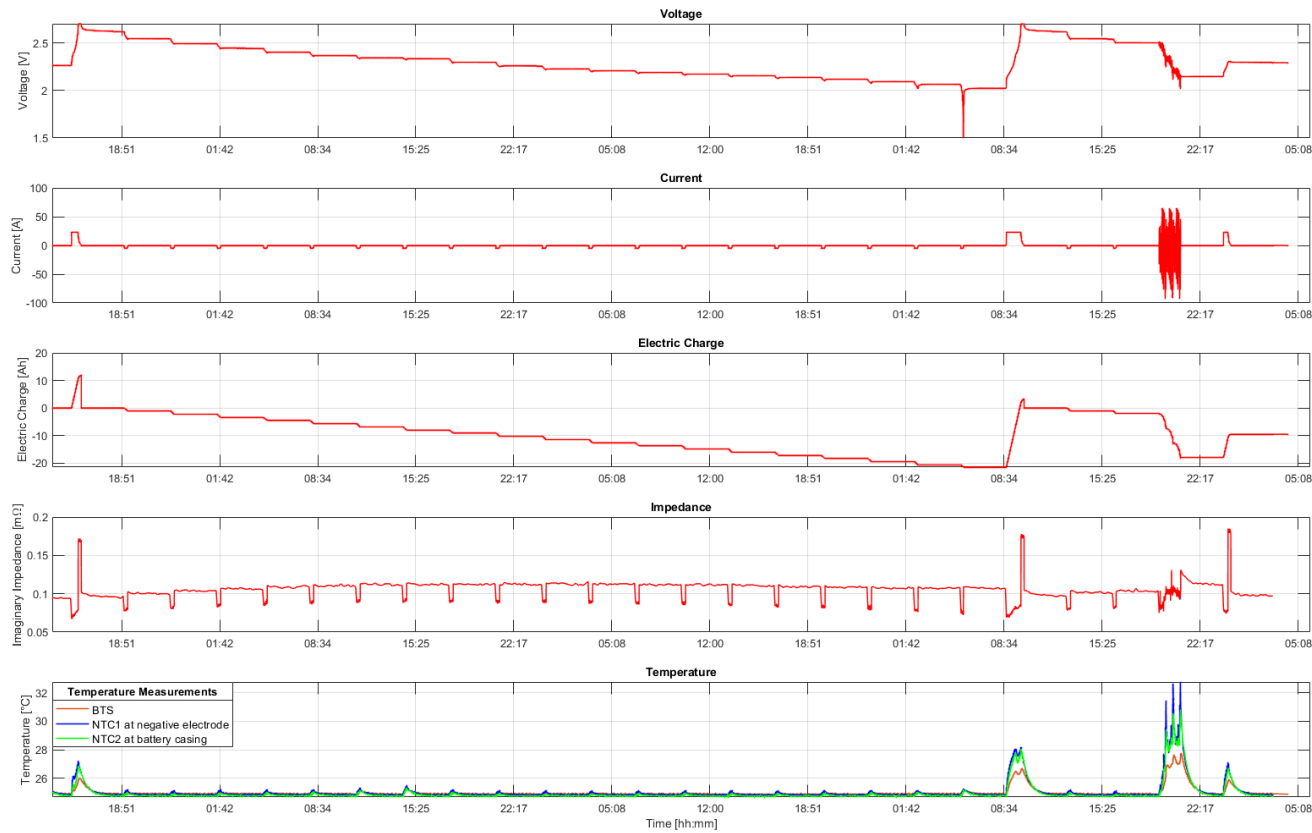
- Form factor EIS evaluation PCB
- Easy to use Graphical User Interface





# Electro-thermal characterization

- Characterization of Complex Impedance over SoC and Temperature



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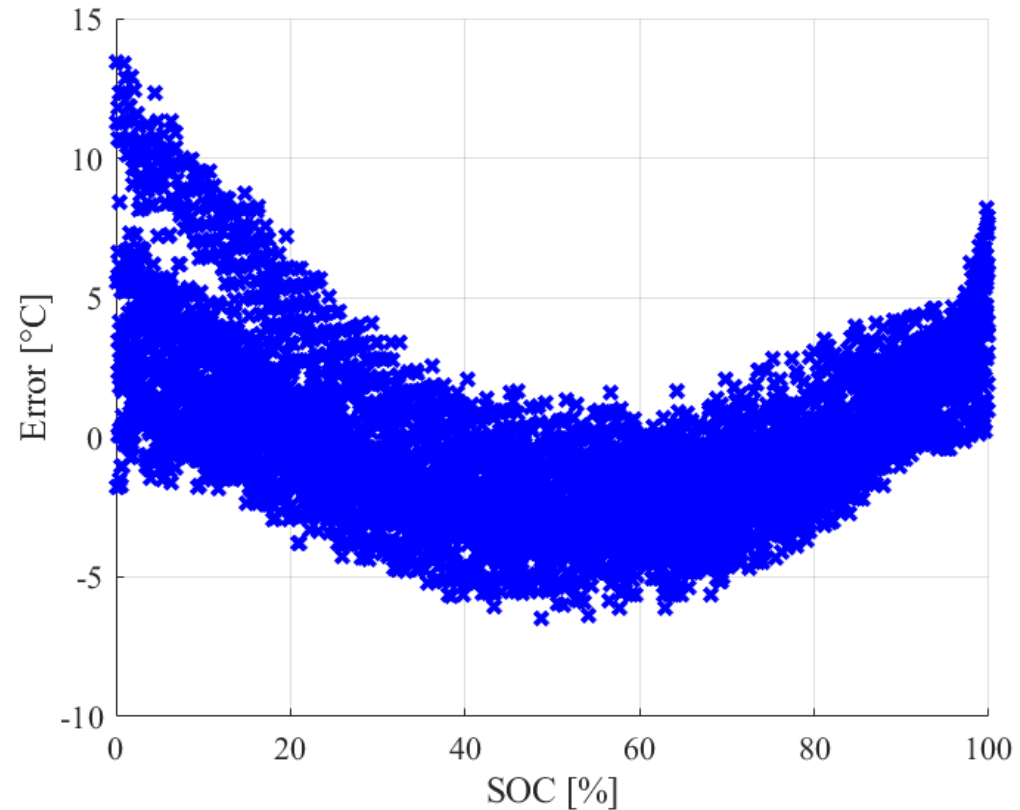
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17<sup>th</sup> November 2020



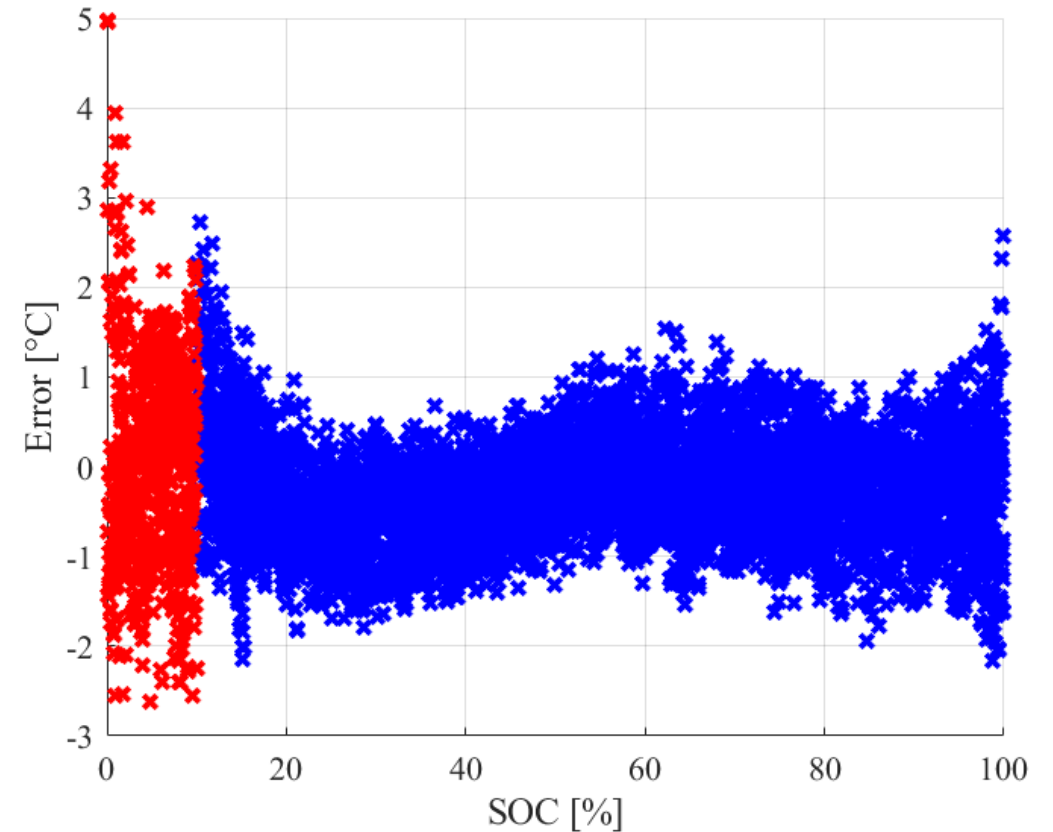
# Impedance based Temperature Estimation

- Used input features
  - Real
  - Imaginary
- Estimation accuracy
  - SOC: 0 – 100%
  - Temp: 0 – 45°C
  - Range: -7/+14°C



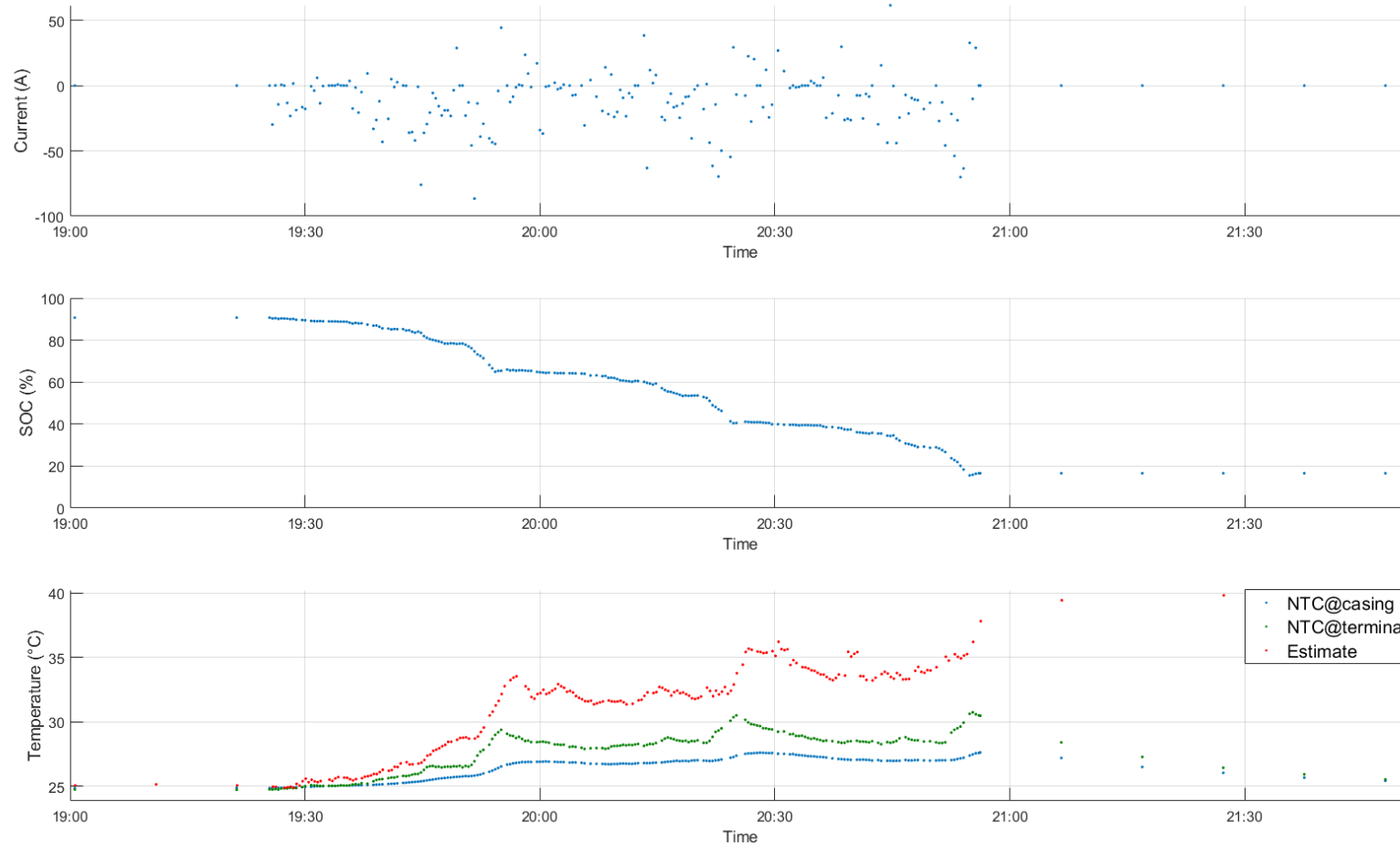
# Improved Temperature Estimation

- Used input features
  - Real
  - Imaginary
  - SoC
    - split in two estimation regions
- Estimation accuracy
  - SOC: 0 – 100%
  - Temp: 0 – 45°C
  - Range: -3/+5°C



# Impedance based Temperature Estimation

- Dynamic temperature estimation during driving profile



# Thank you



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# Consortium



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AUTOMOTIVE TECHNOLOGY  
RESEARCH CENTRE



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