



# Intelligent Power Electronics

Real-Time Identifications and Adaptive Control  
of Grid-Connected Converters

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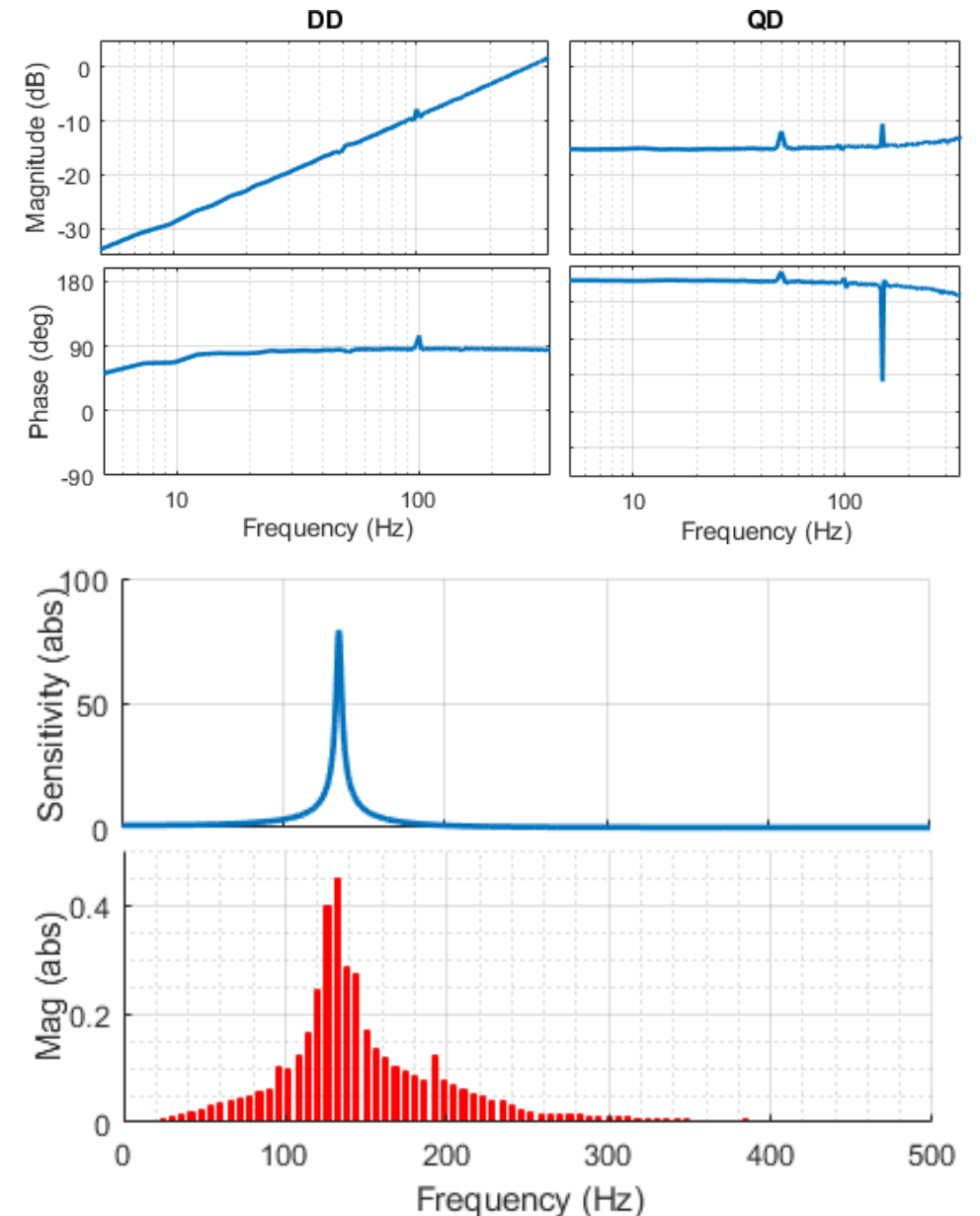
# Grid-Connected Converter

- Grid characteristics have major impact on converter's control performance
  - Grid impedance
  - Voltage quality...
- The grid characteristics vary
  - Weak/strong grids
  - Faults
  - Loading profiles
  - Renewable sources....
- Each situation has its own optimal control tuning



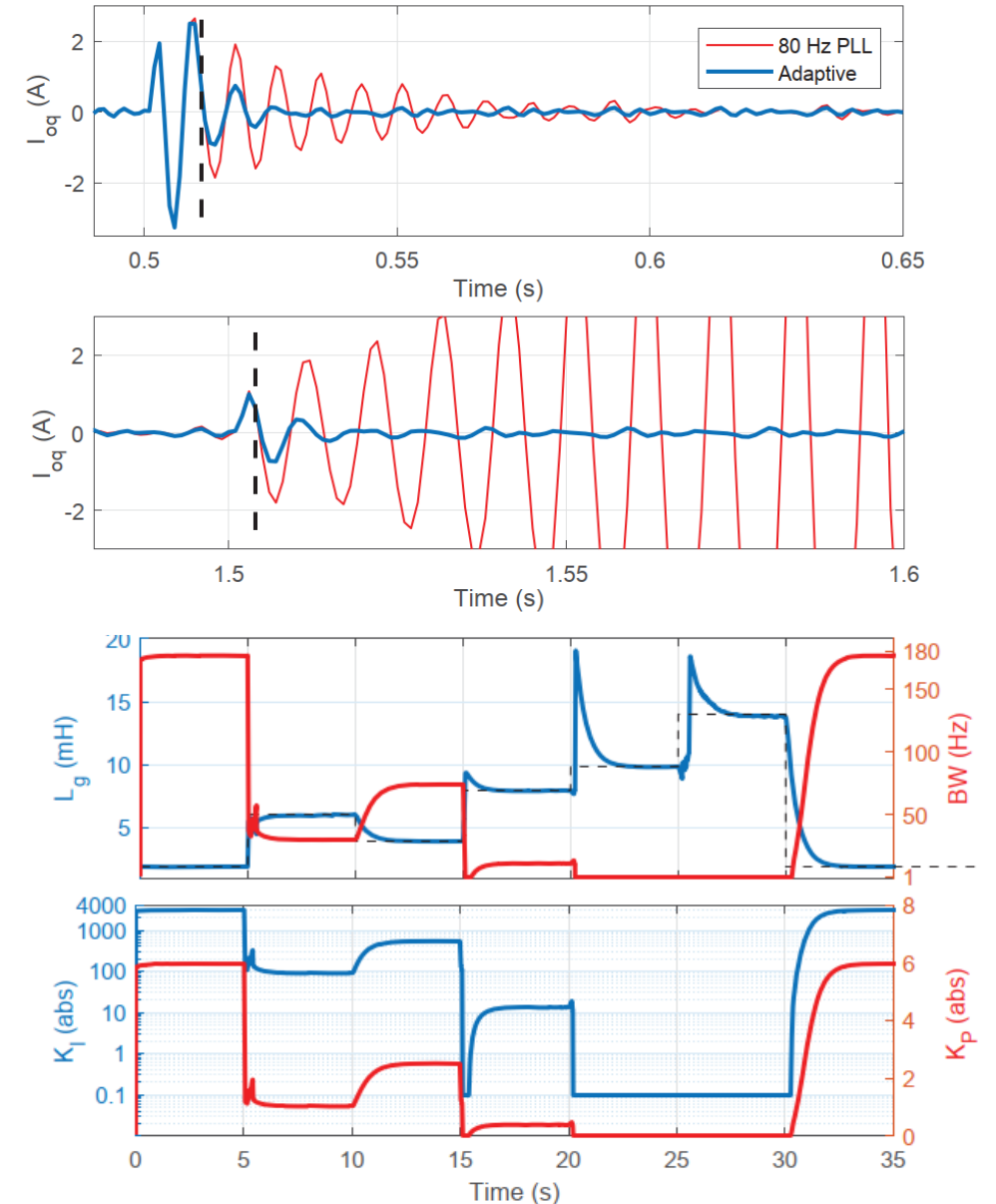
# Real-Time Identifications

- Online measurements are most desired for accurate stability assessment
  - System stability/sensitivity
  - Transient performance
- Real-time identifications
  - Novel control/protection strategies
- Performed by converter itself, based on PRBS and Fourier techniques
  - Fast method, wideband, produce low THD, easy to implement...



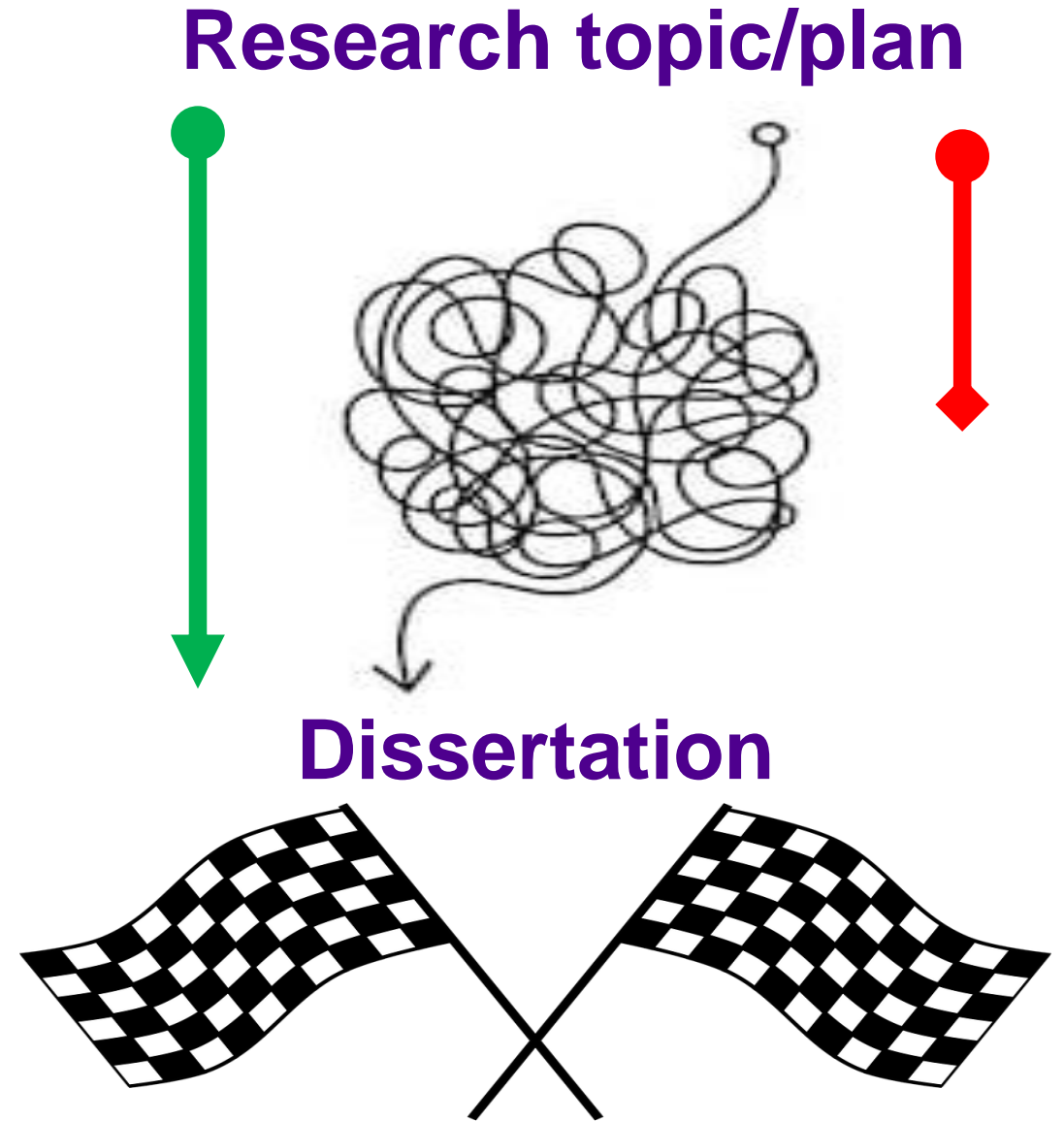
# Adaptive Control

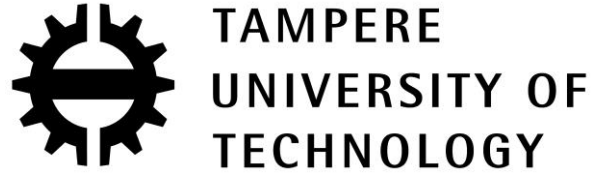
- Control system optimization based on measurements of interfaced grid
  - Online re-tuning
  - Avoid stability issues
  - Improve power quality
- System becomes more predictable
  - Tune controllers so that system sensitivity follows design rules
  - Grid-effect can be compensated



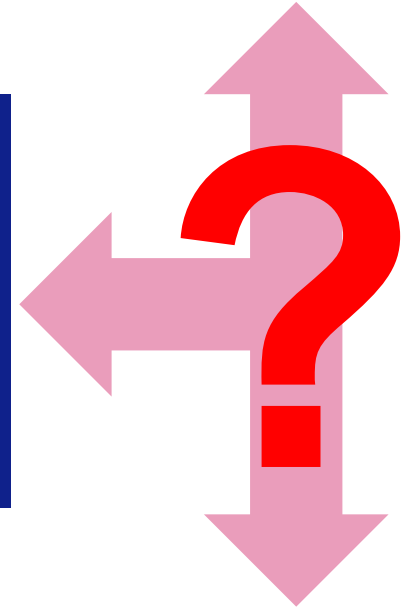
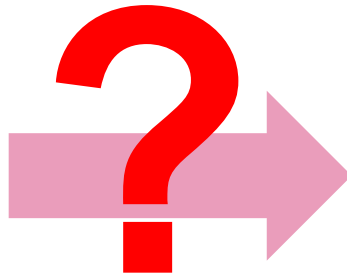
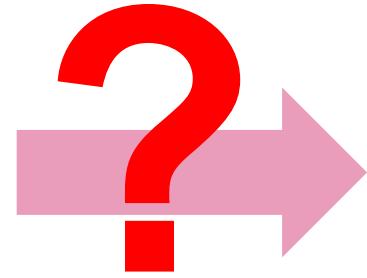
# Grant

- My third Fortum Foundation grant
- During this third grant I will finish my dissertation
- Have relieved stress about funding
  - One can ...
    - focus on research
    - plan the future
  - Don't have to fund research work, for example, by teaching





# Grant



**FORTUMIN SÄÄTIÖ**  
**FORTUM FOUNDATION**



Research projects(?)

Thank you!