Development of a Low-Cost Electrical Conductivity Meter for Liquids

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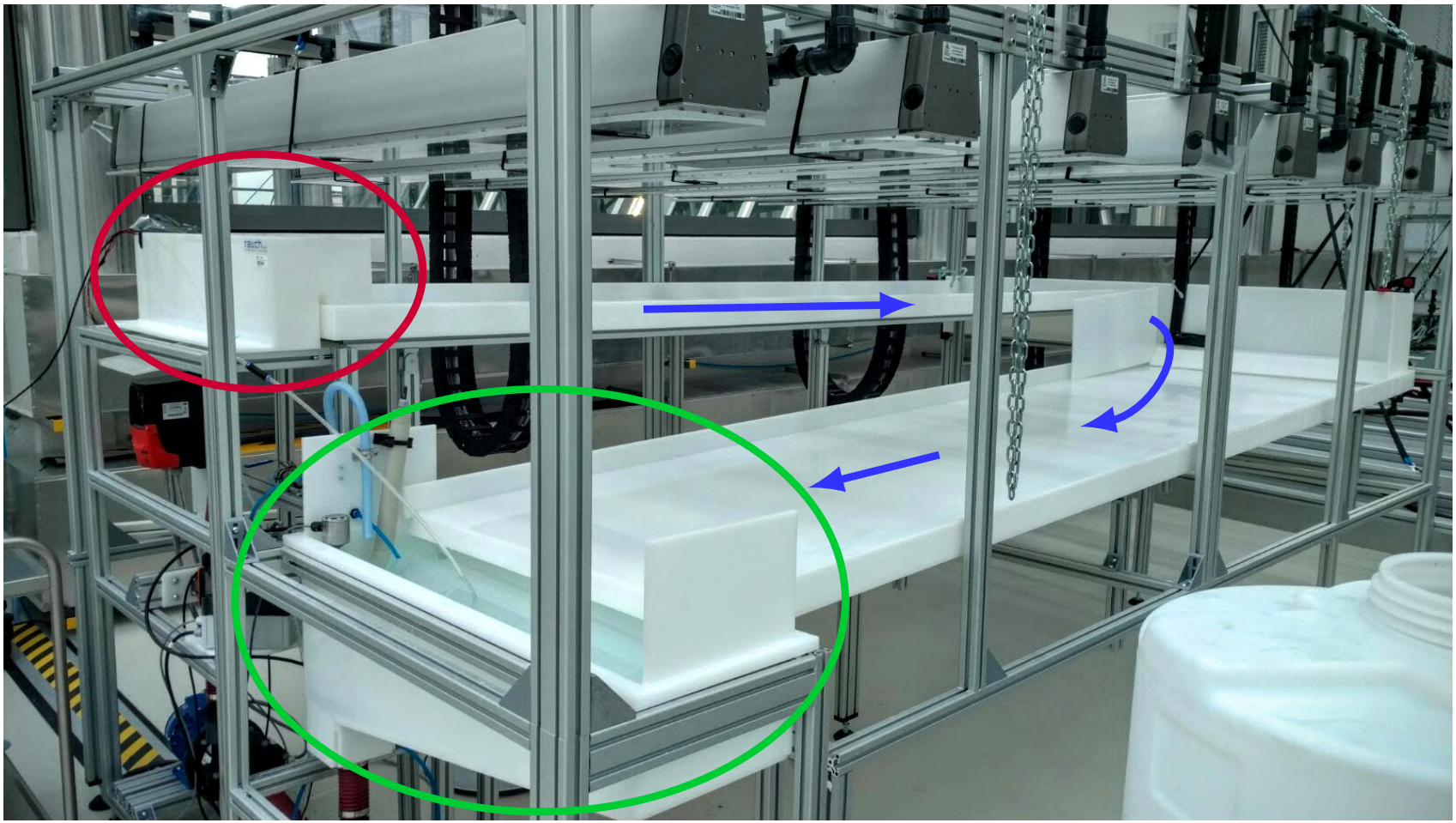
Outline

- Introduction
- Objectives
- Design
- Results
- Outlook

Introduction



Objectives

enable experiments to validate simulation

- add saltwater impulse to freshwater stream
- measure changes in salinity over time
  - at multiple points
  - fast

Requirements

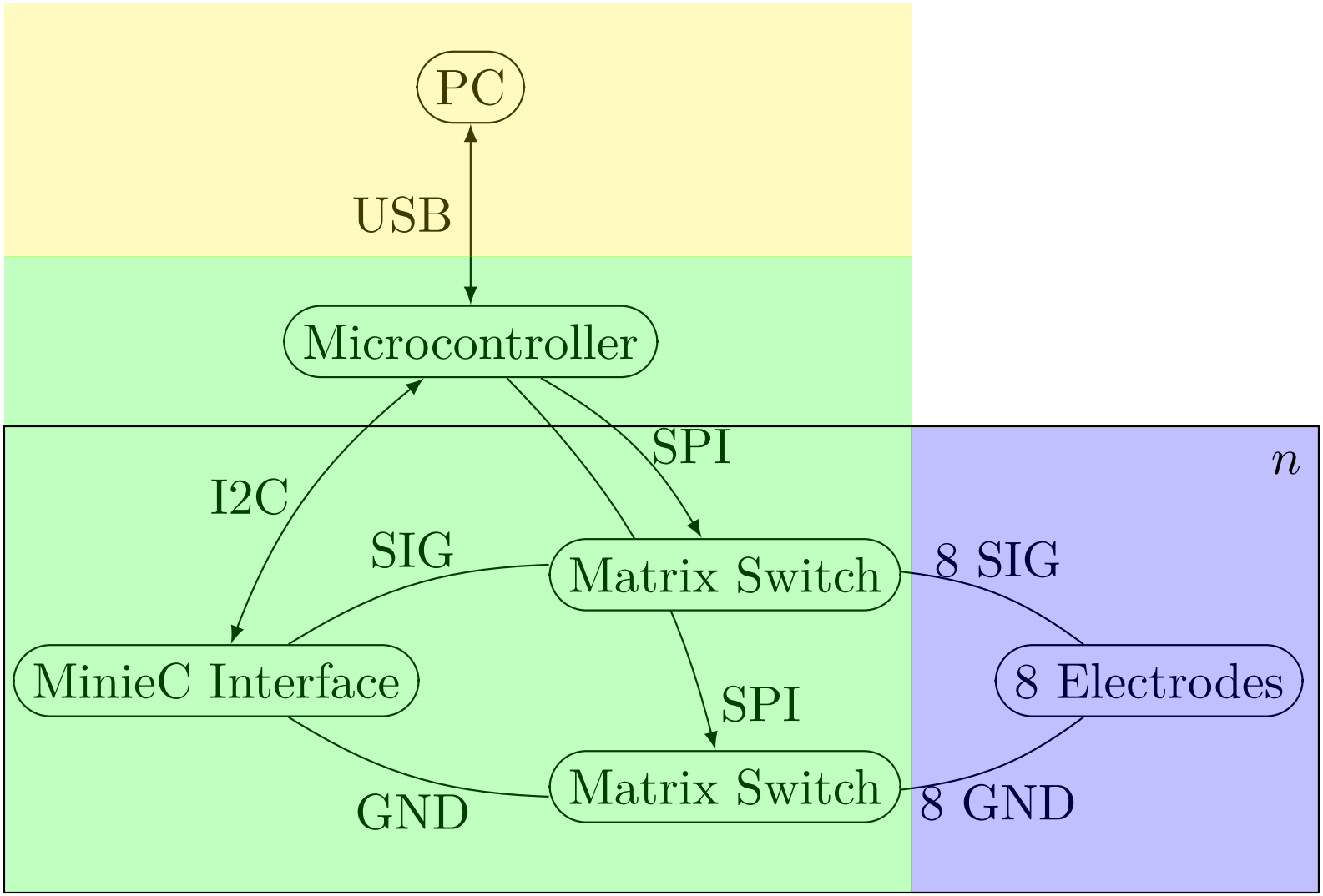
- spacial resolution: 10mm
- sensitivity: 0.1%
- range: 0 to 2.5%
- cost per sensor: $< €25$
- deployable in the algae reactor
- easy to use

Design

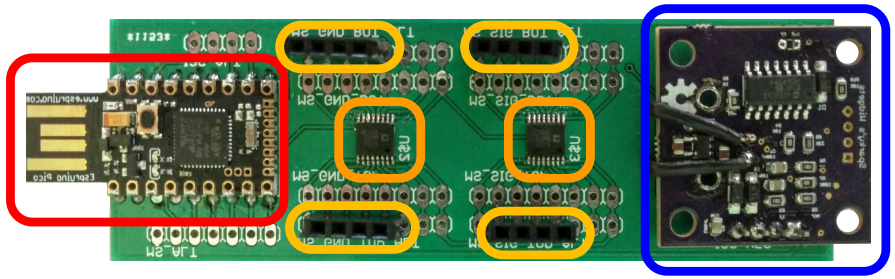
Conductivity

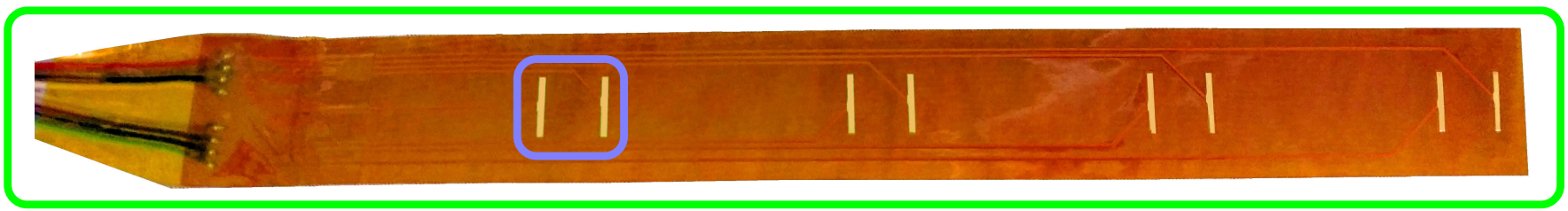
- ability of liquid to conduct electricity
- inverse of resistance
  - liquid is resistance
  - measure voltage drop over resistance

System Design

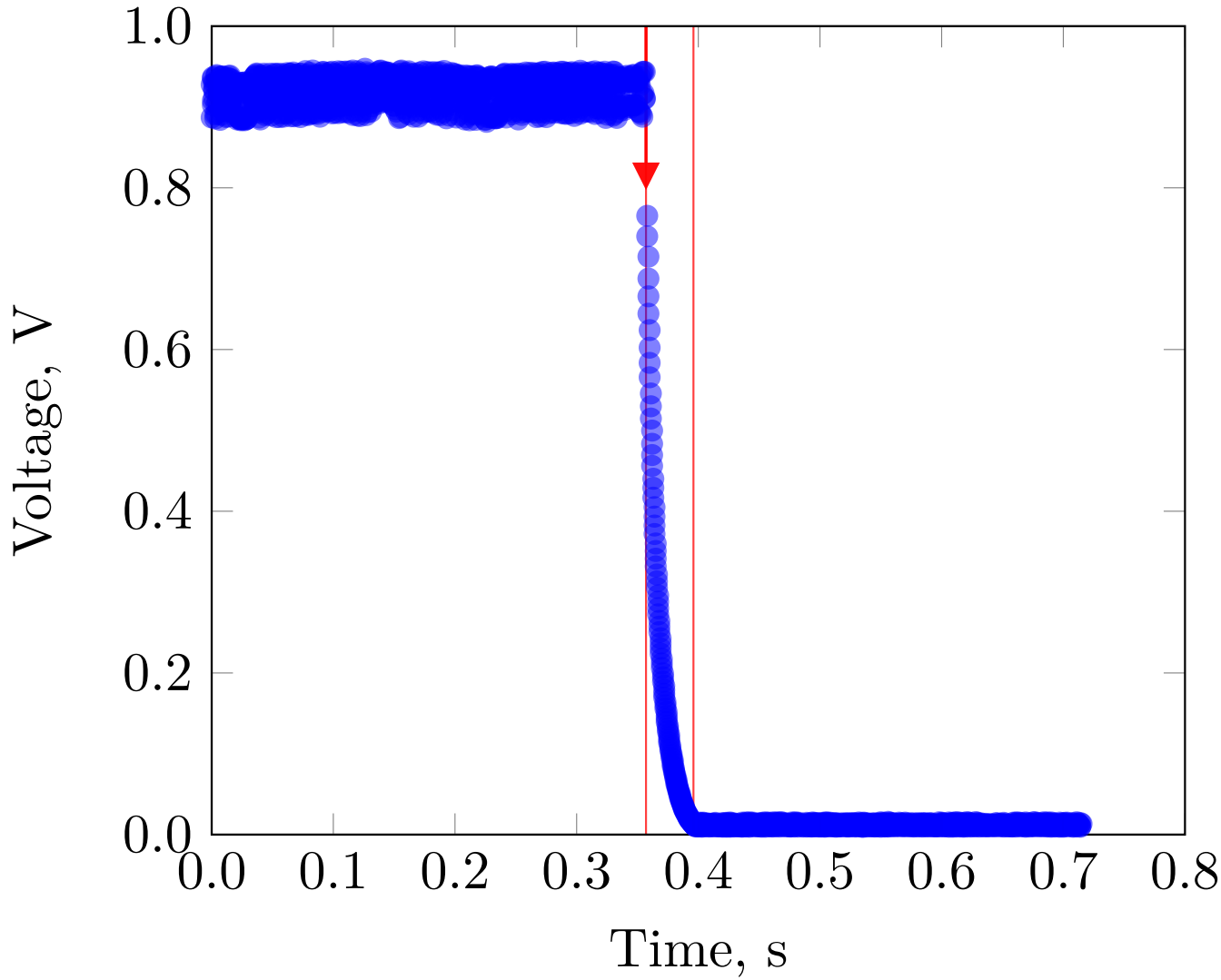


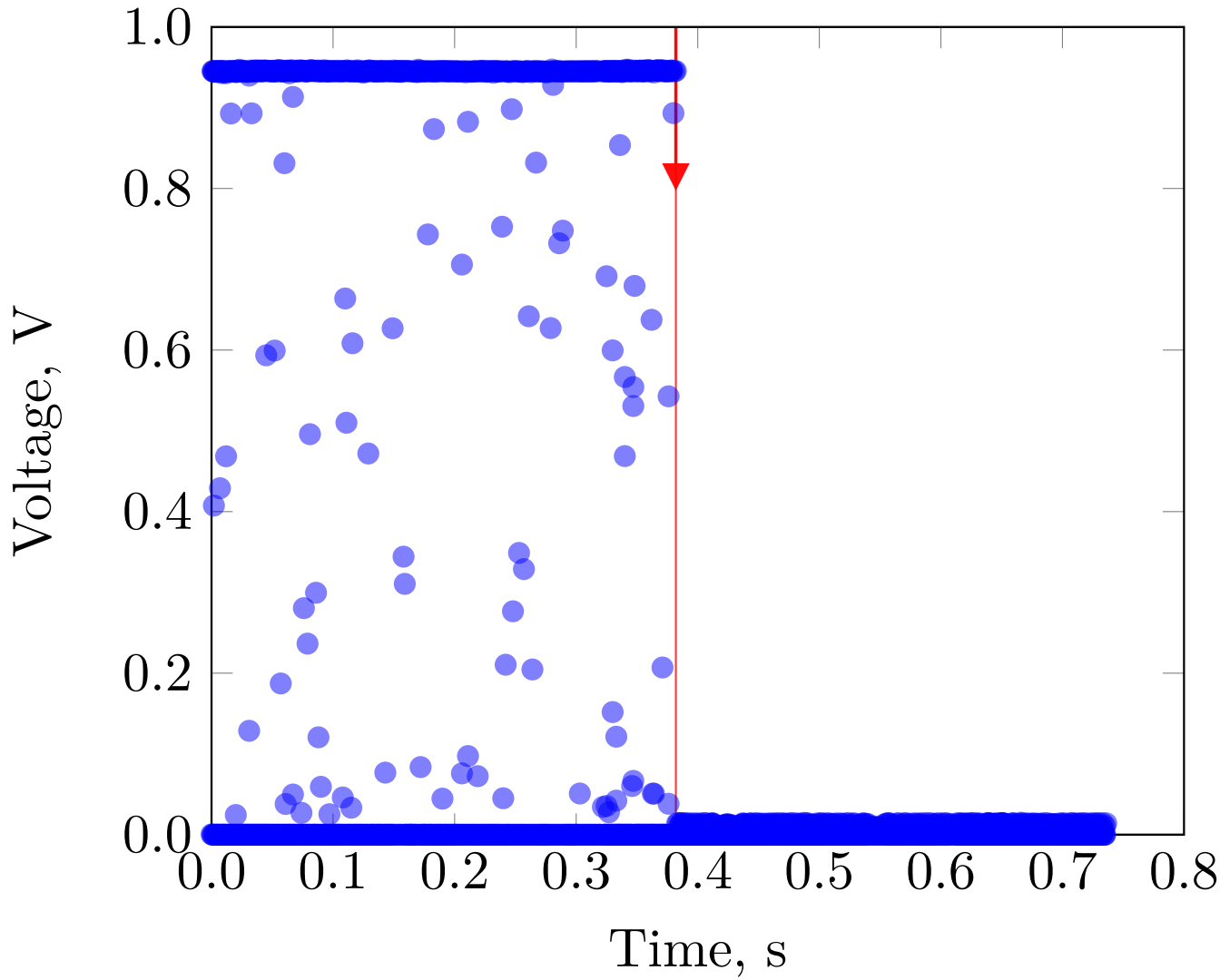
finished Hardware





data processing




1.0
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0.6
0.4
0.2
0.0
Voltage, V
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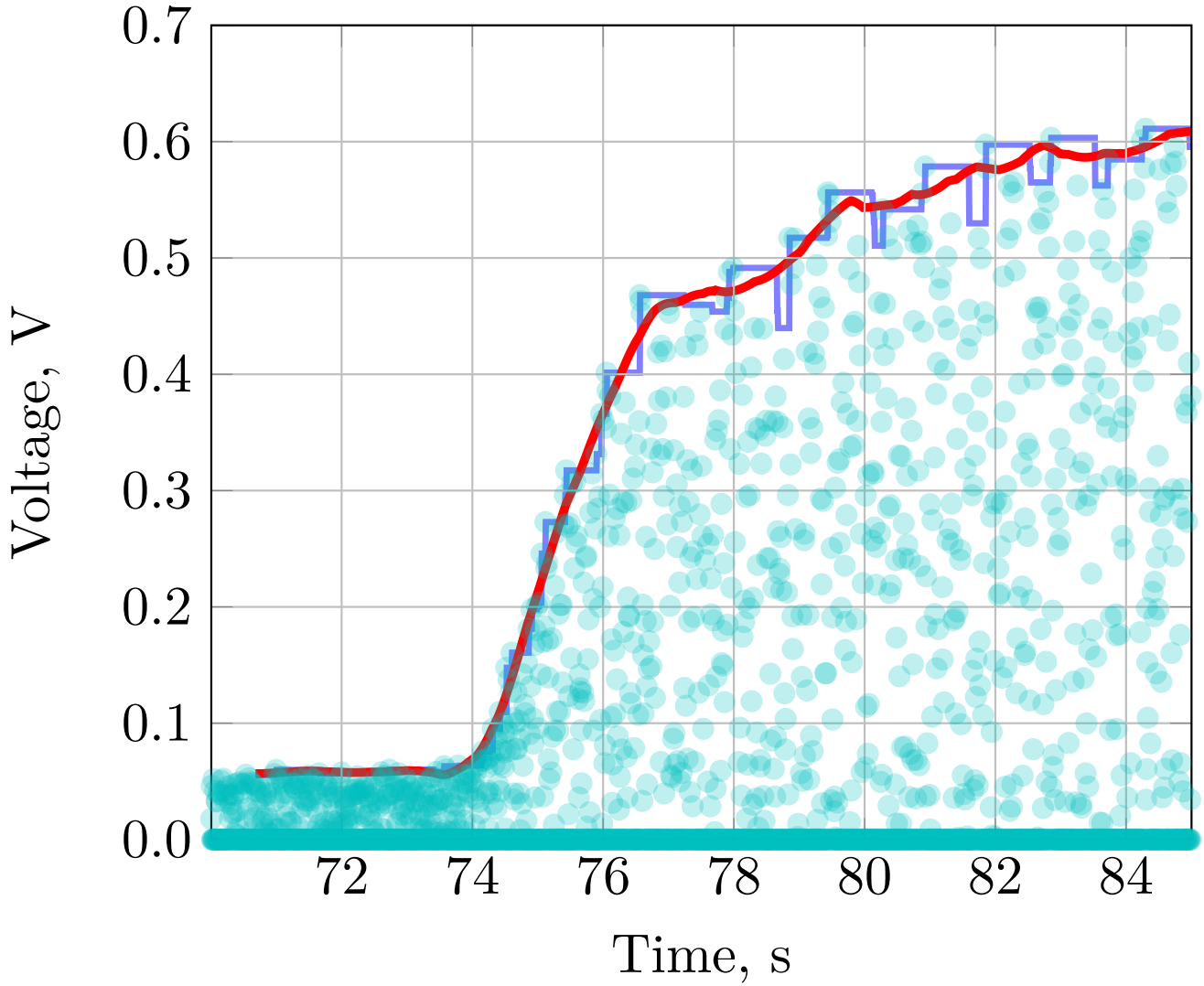
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Time, s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0.5
0.4
0.3
0.2
0.1
0.0
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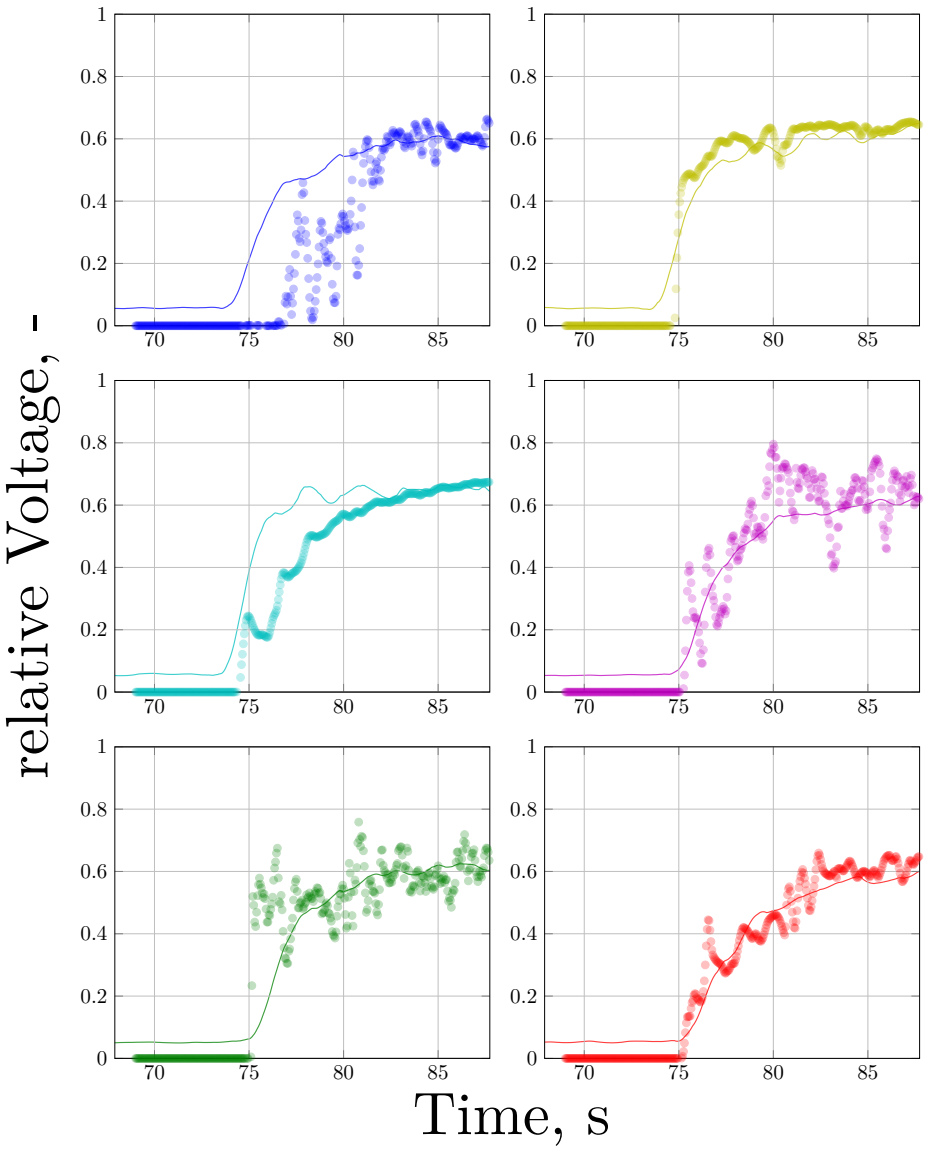
78
80
82
84
Time, s

Results



Demo

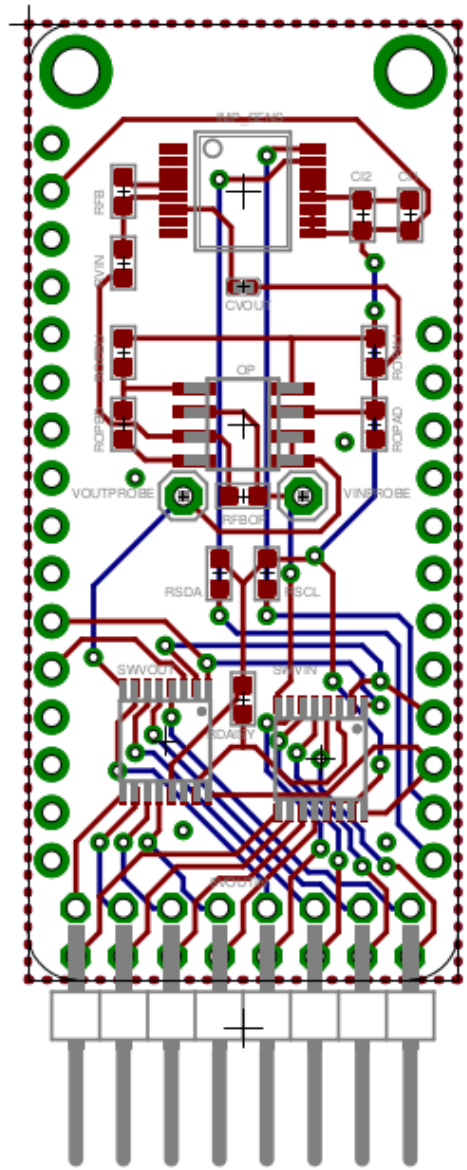
Outlook

Problems

- half-wave due to removal of filter cap makes data ugly
- only real part of imaginary resistance is measured

Solution

- move to real impedance measuring


CI2
CVOUT
OP
VOUTPROBE
VINPROBE
RFBLOP
RSDA
RSCL
SWVOUT
SWVIN