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CUMIN - MOUVE

Fast charging station :  
Jaguar I Pace

CATRICE Bastien

HOUEDANOU Gildas

MAKOSSO PAMBOU Briden

Supervisor : S. FADILI

# Outline



**Context and objective**



**Charging strategies**



**Modeling of the system**



**Conclusion and perspectives**



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## Context and objective

# Context and objective



MOUVE Project: MObility and Use of electric VEHicles based on dedicated charging infrastructure



Use of chargers :  
Slow / fast charging?  
Vehicle limitations?

- Our project:
- Analysis of different charging profiles
  - Simulation of charging strategies

**Objective:** Distinguish different charging strategies for the Jaguar I Pace.



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# Charging Strategies

# Studied systems



[www.automobile-propre.com](http://www.automobile-propre.com)

Technical characteristics:

## Jaguar I-Pace

Year: 2018

Battery: 90 kWh (108s4p, type NMC)

Weight: 2,2 t

$P_{MAX}$  in DC charge: 85 kW

## Charging stations:

Ionity HPC 350kW (DC)



[www.moniteurautomobile.be](http://www.moniteurautomobile.be)

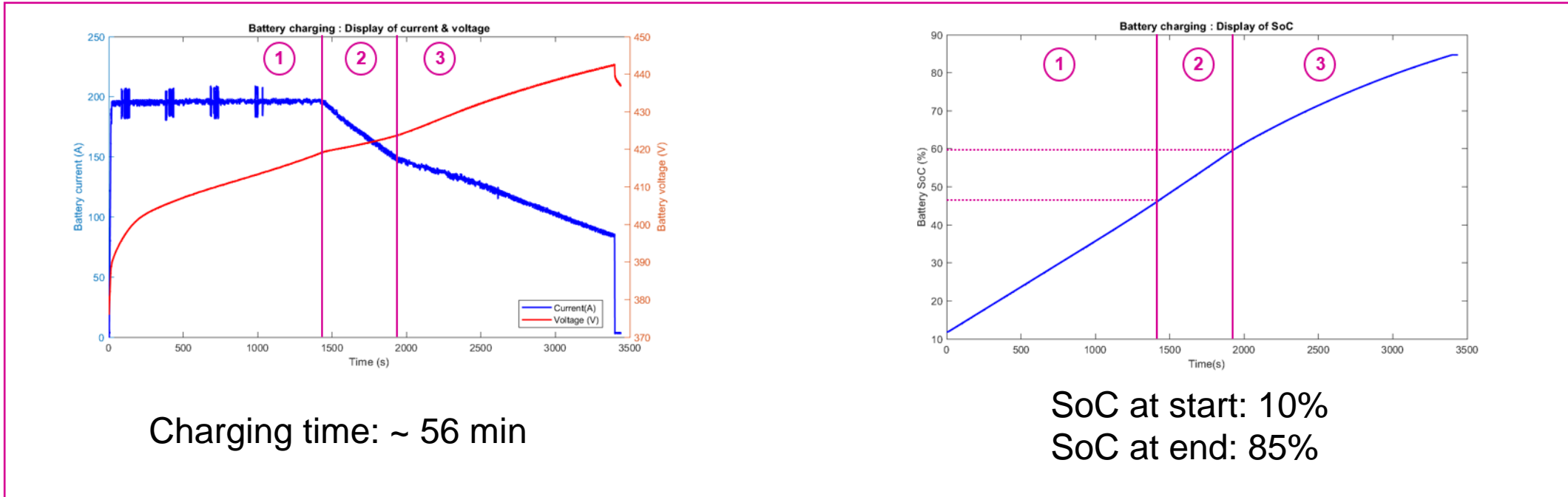
Corri-Door 50 kW (DC)



[www.avem.fr](http://www.avem.fr)

# Charging Strategies

Experimental results from Ionty Charger (350 kW):



- ① CC charge ~ 195 A; SoC → 48%
- ② Decrease @ 0.1 A/s; SoC → 60%
- ③ Decrease @ 0.04 A/s



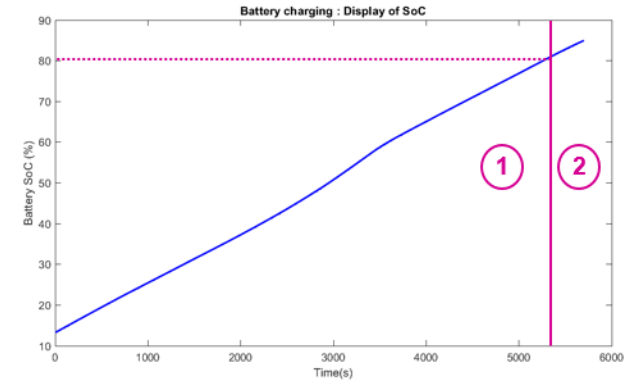
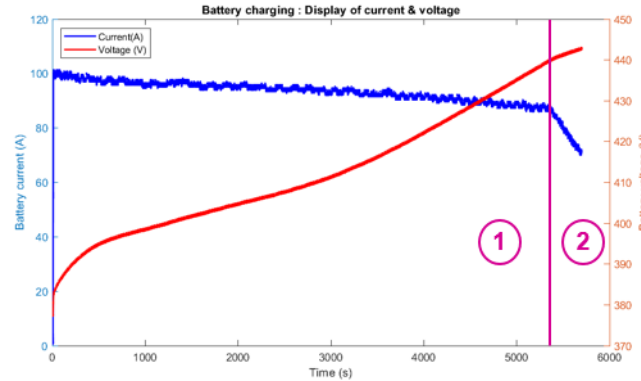
**CC-CV strategy with adaptive charging**

# Charging Strategies

Experimental results from Corri-door Charger (50 kW):

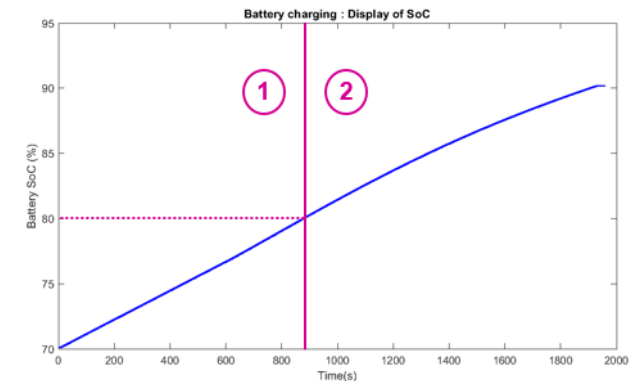
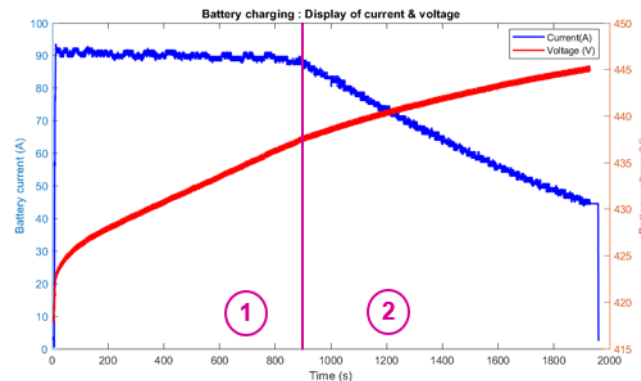
## Charge 1:

- SoC at start: 13%
- SoC at end: 85%
- Charging time: ~ 1h30



## Charge 2:

- SoC at start: 70%
- SoC at end: 90%
- Charging time: ~ 30 min



① CC charge with current depending on  $T^\circ$ ; SoC  $\rightarrow$  80%

② CV charge ( $\Delta V = 10$  V)



**CC-CV strategy like**

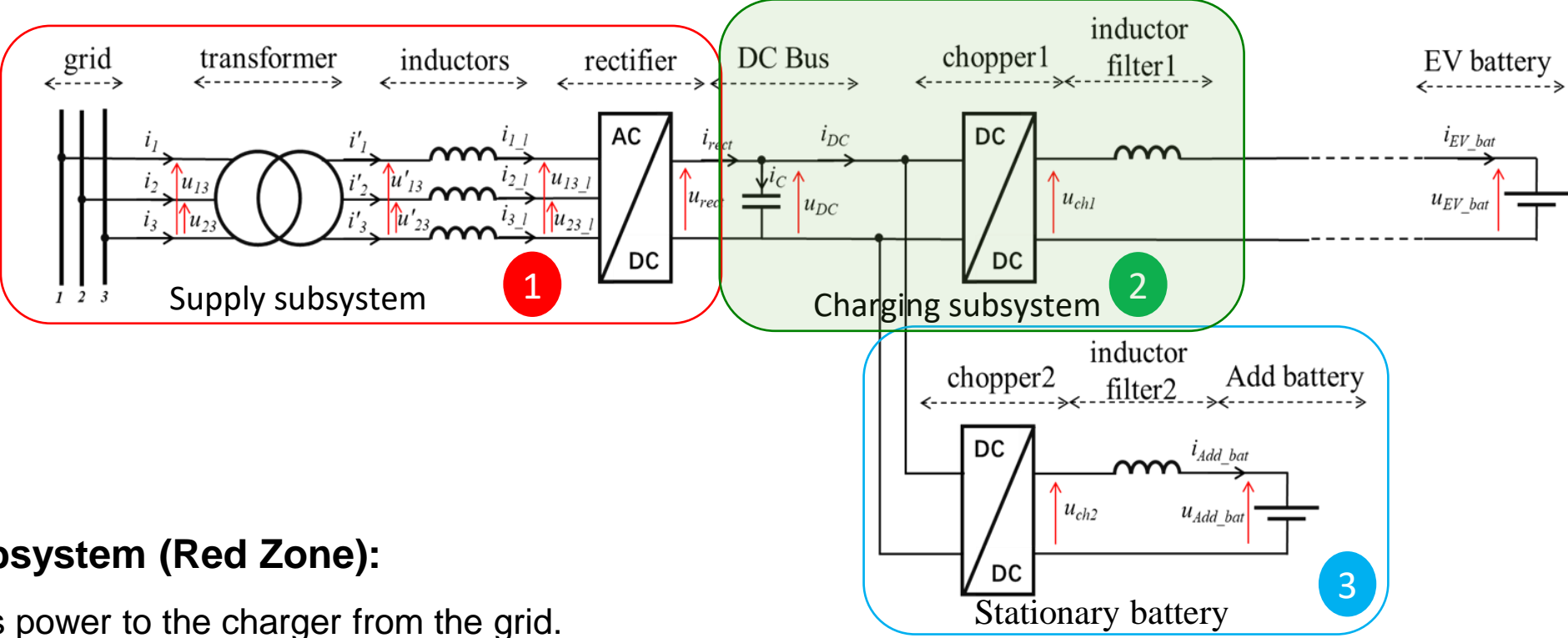




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## Modeling of the system

# Structural scheme



## Supply Subsystem (Red Zone):

- Supplies power to the charger from the grid.

## Charging Subsystem (Green Zone):

- Converts the power according to the battery demand.

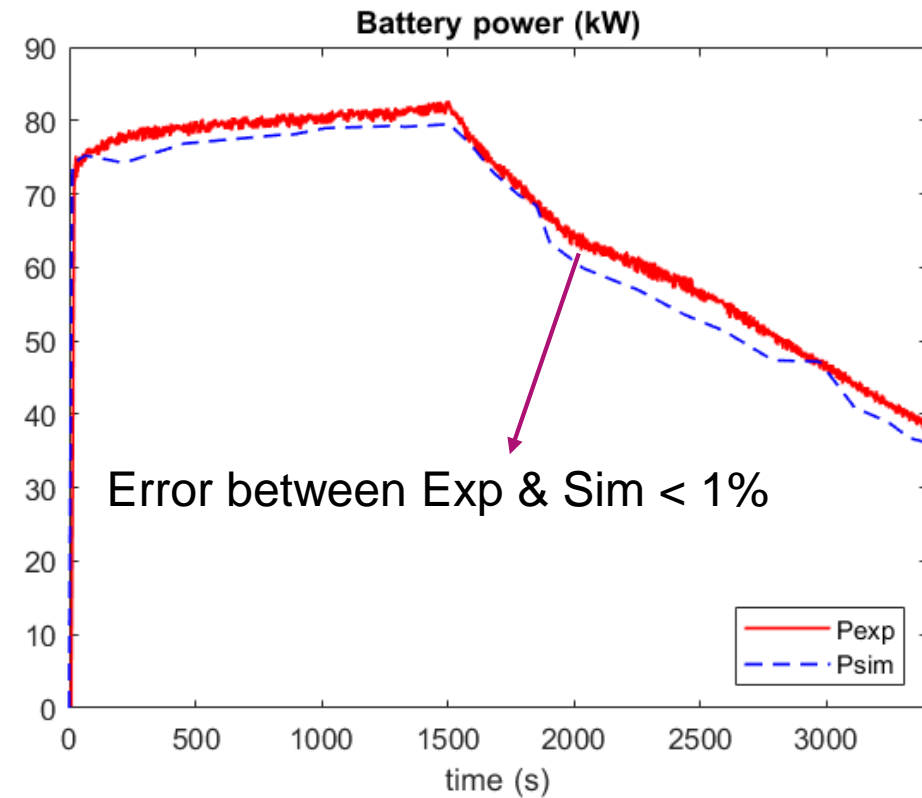
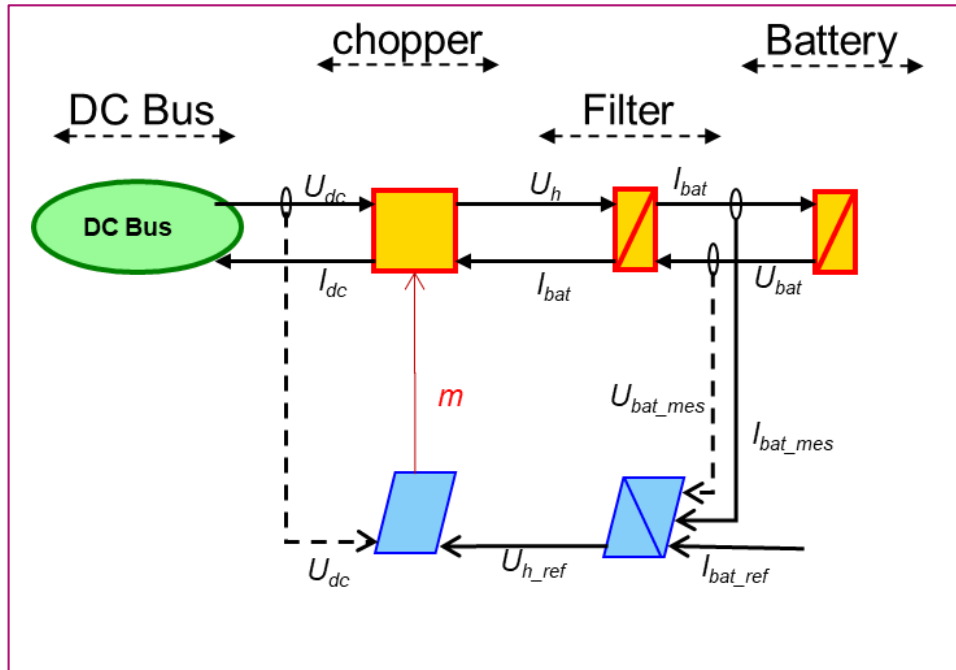
## Stationary Battery Subsystem (Blue Zone):

- Acts as a power supply support to the grid.

# Modeling of the system

Model organisation using the Energetic Macroscopic Representation formalism:

Objective: Jaguar I Pace battery model validation



Conclusion: The battery model is validated



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## Conclusion and perspectives



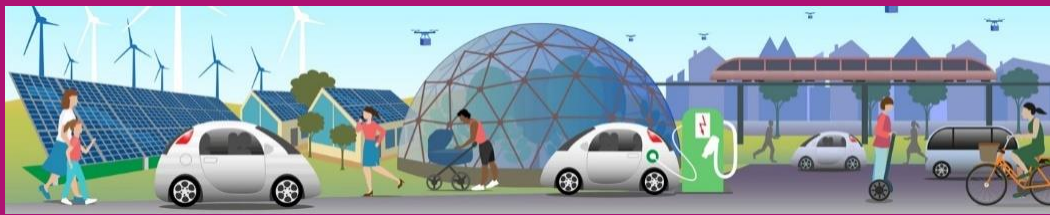
# Conclusion and perspectives

## Conclusion

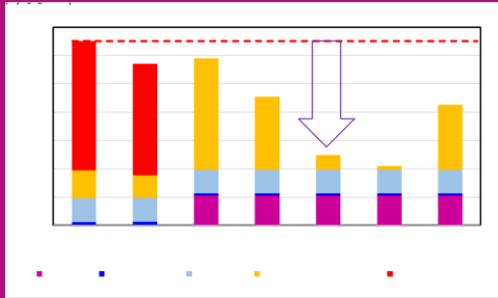
- Strategies used for the Jaguar I Pace charging
- Simulation of fast charging stations
- Validation of the battery model with an error of 1%

## Perspectives

- Include the Energy Management Strategy (EMS) in the simulation
- Study the EMS of other EVs
- Compare the strategies



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