



ALBA 2026 CONFERENCE, MAINZ 19-20 MAY
CR21 / C. Mondoloni

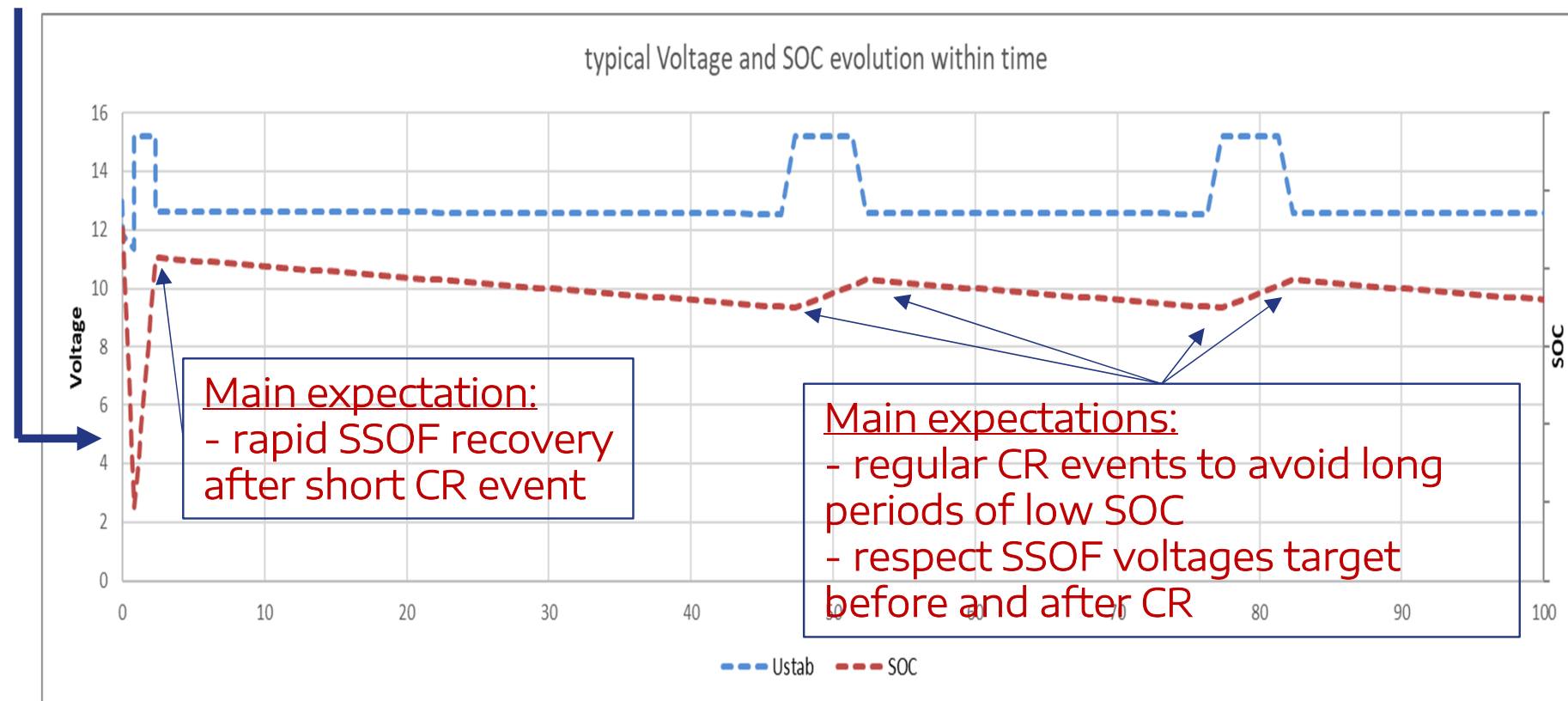
USE CASES FOR PSEUDO-CAPACITANCE AND POTENTIAL PLATEAU
BASED ON SSOF SIMULATION PREDICTIONS
STARTING FROM HARMONIZED SAFETY PROFILE

CONTEXT

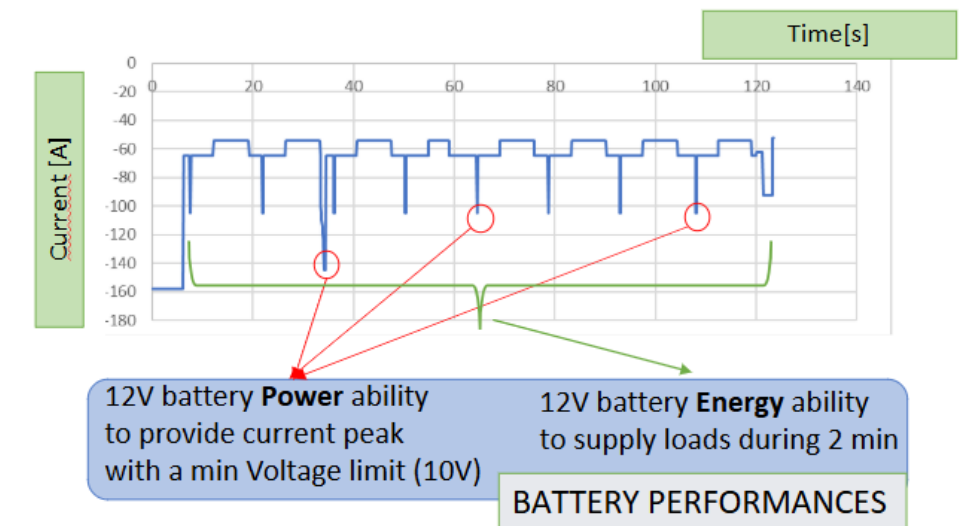


Particularities of PHEV and BEV cars

- Those powertrains offer the opportunity to conduct on 12V Lead acid battery some CR events during long period storage in parking by transferring energy from HV system to LV system.
 - If this balancing operation is helping to avoid battery sulfation and contributing to contain battery size and cost, **It remains mandatory battery to satisfy safety profiles starting from the beginning of any driving sessions.**
- Simulation of battery behaviour in this context was evaluated at Stellantis by a test profile combining impact of long period under low kol. current + regular Charge Recovery attempts (with or without FOTA SW installation demand with immediate Charge Recovery)



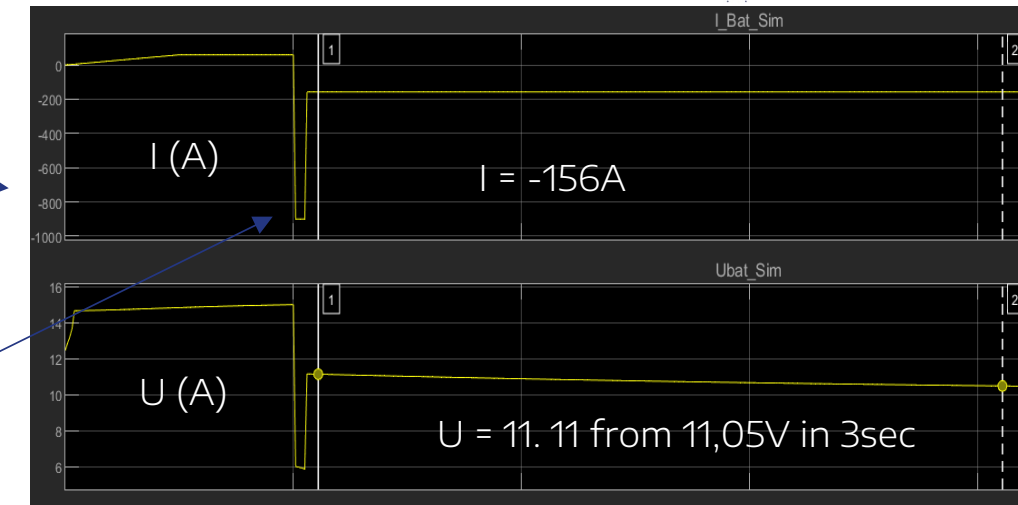
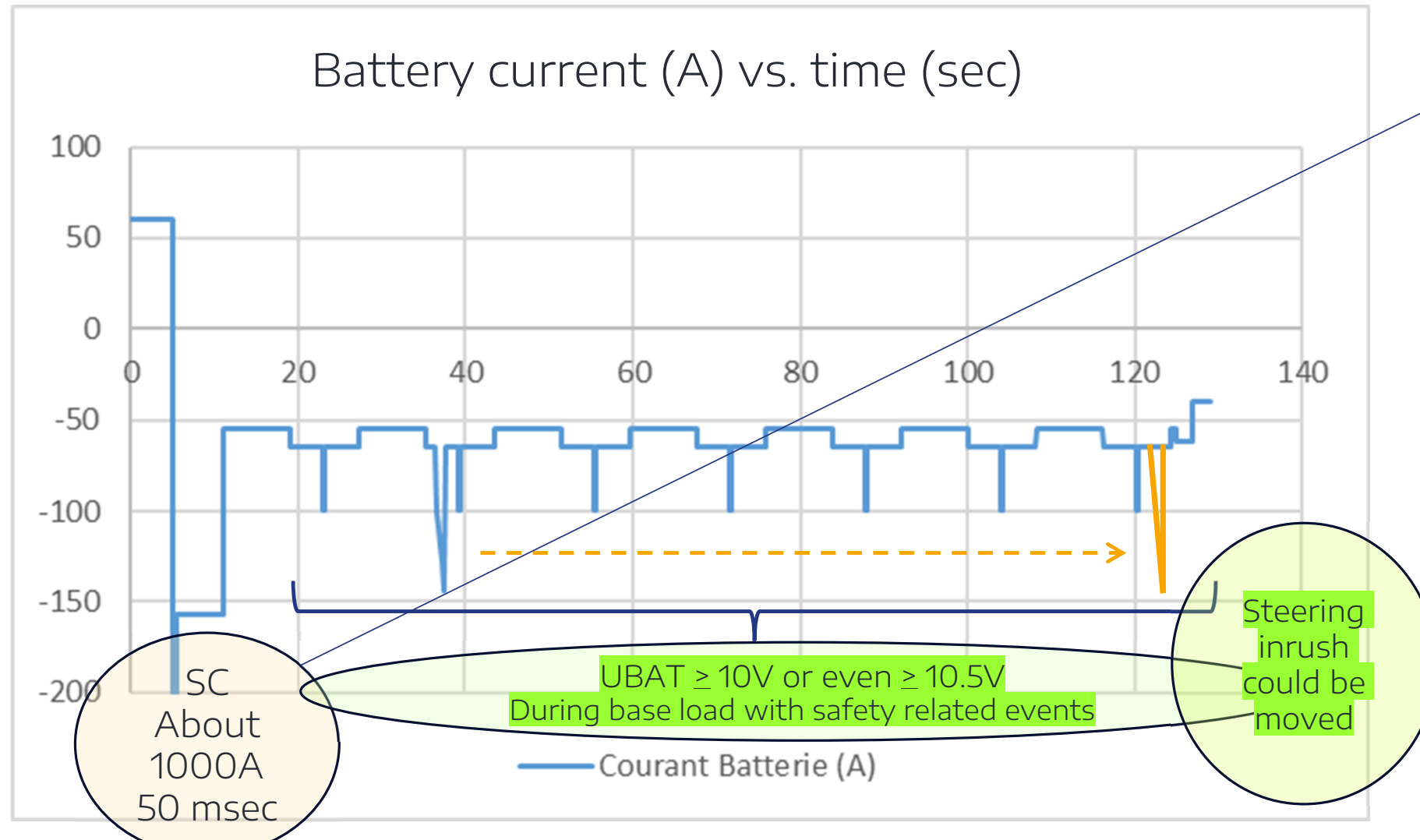
SSOF voltages prediction necessary to satisfy typical car safety profiles



EX. OF HARMONIZED SAFETY PROFILE FOR 12V POWERNET OF ELECTRIFIED CARS

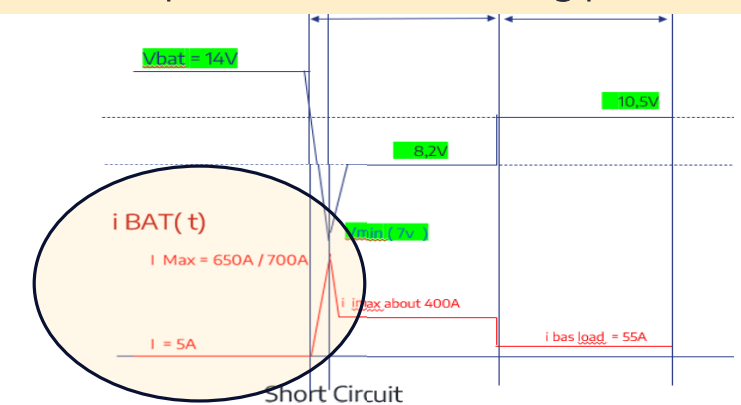


- Profile Merging Short Circuit to the ground & DCDC off use cases
- Should be satisfied down to 65% SOC / -18°C and with certain level of battery aging
- Voltage prediction by simulation very necessary for battery sizing (ex. fresh bat.)



1 - Pseudo-capacitance useful for short time (and sudden short) but it is more robust to rely on voltage plateau expected after powernet pre-discharge (as shown in next diapositive)

2 - To avoid undervoltage on powernet during the SC, OEM should develop some protection mechanism to avoid detrimental impact on DCDC / Braking power branch



Protection mechanisms in the 12V EE architecture are developed by OEM to secure safety loads from undesired under-voltages.

SSOF(V) prediction with polarised voltage effect from Pseudo-capacitance short term effect is then not so necessary

→ SSOF(V) should rather predict Steering voltage that could be obtained at the end of the safety profile to cover

SOME VOLTAGE SIMULATION RESULT BASED ON HARMONIZED SAFETY PROFILE



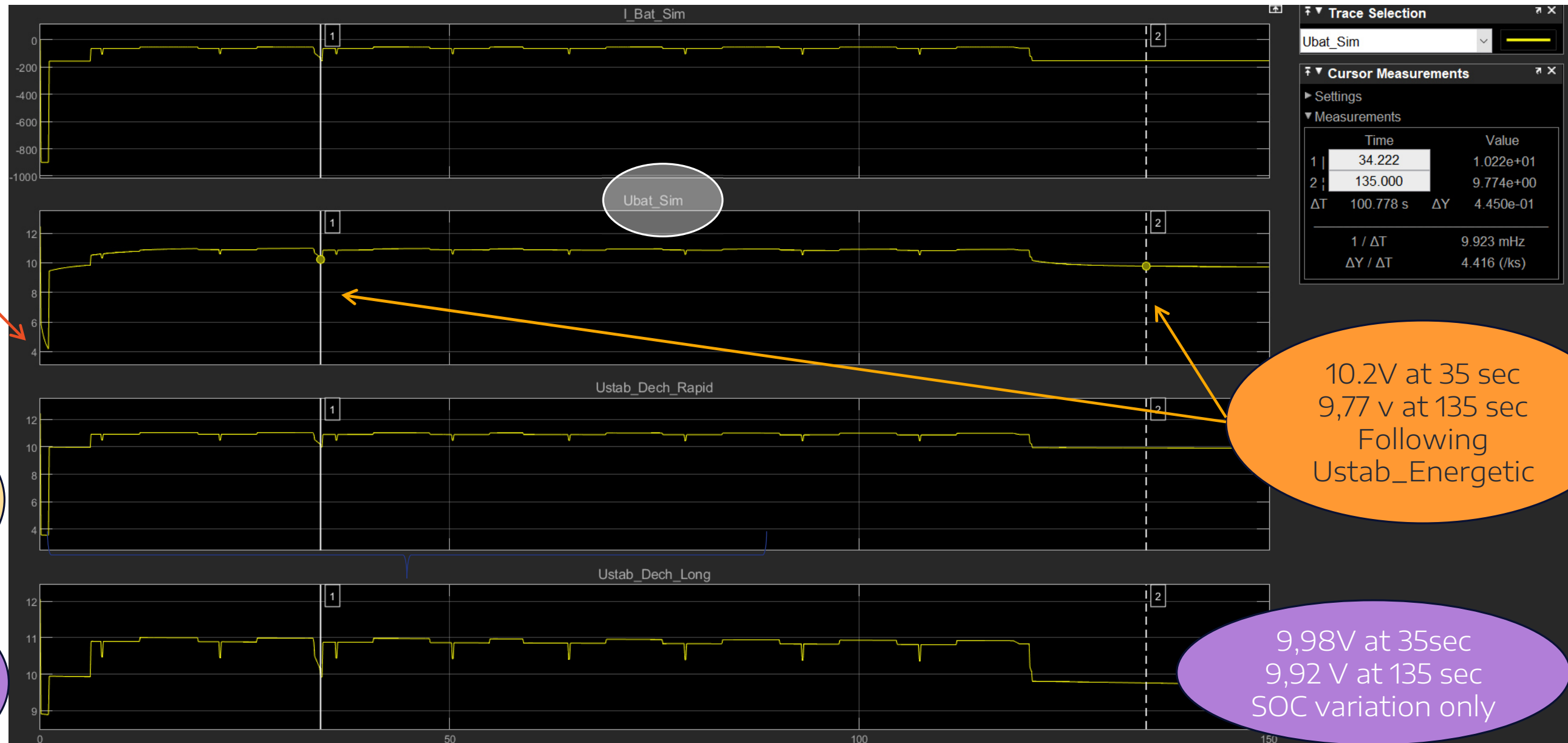
- Worse case simulation: Achieved at 65% SOC & -18°C on aged L2AGM battery without pre-charging polarisation

Current profile

« Crank » voltage in between 6 – 4V

Energetic Stabilised Voltage simulation

Cranking Stabilised voltage simulation



Voltage predictions on PLATEAU or at the end of the PLATEAU could be considered as robust
For battery sizing, it is the choice of the OEM to consider or not moderate (uplift) polarization of the plateau

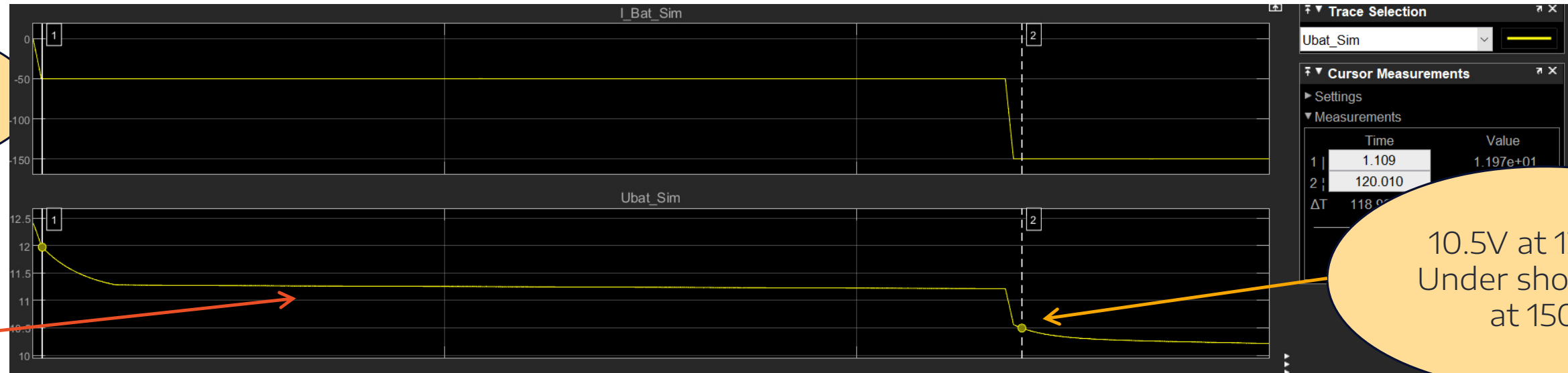
COMPARISON BETWEEN STLA MODEL AND PPC TOOL



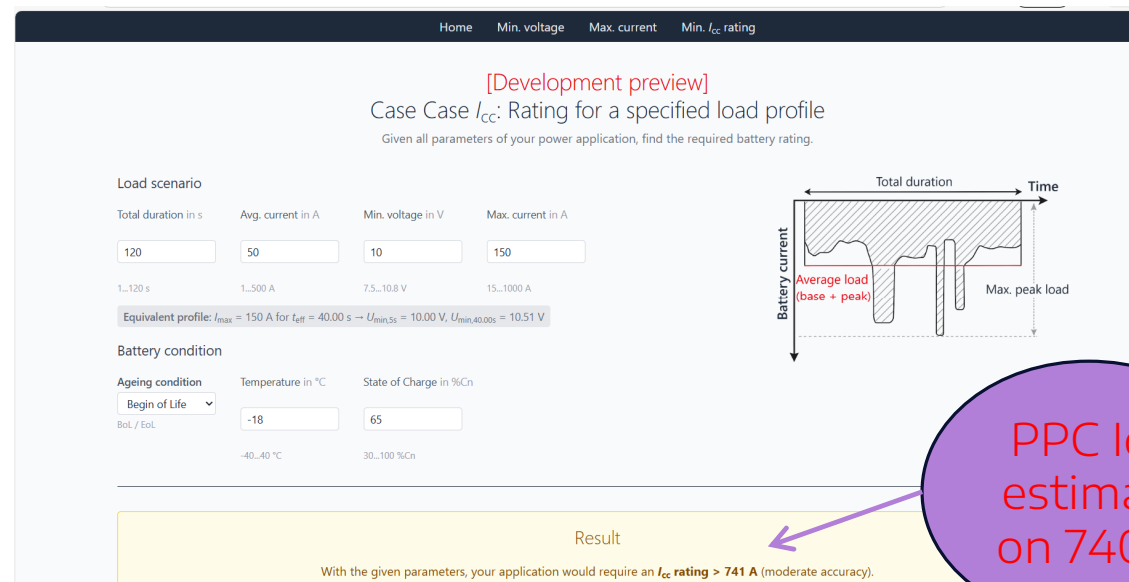
- Achieved at 65% SOC & -18°C on fresh L2EFB battery without pre-charging polarisation

Simplified
safety_profile
50A / 150A

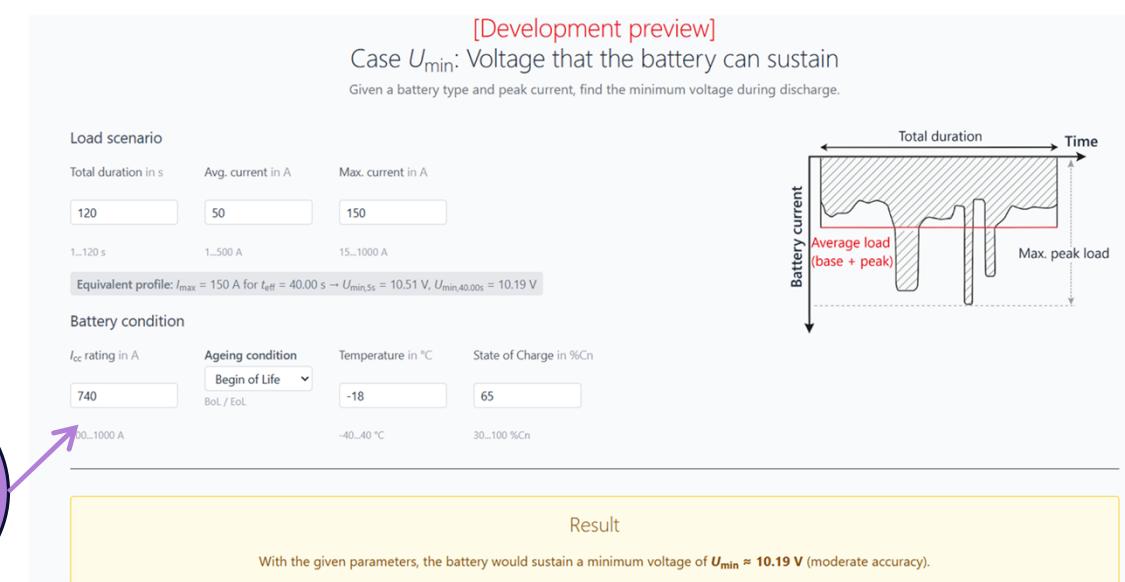
11,2V
under 50A



10.5V at 120 sec
Under short peak
at 150A



PPC Icc
estimation
on 740A



Considering a simplified safety profile to be satisfied with an L2 battery, STLA Model seems intrinsically more optimistic than PPC tool predicting a 740A EN battery