

Maximizing hot-climate durability and brake energy recuperation: an automotive workshop on battery technology and standards

DCA and Heat: Testing Charge Acceptance and High Temperature Durability for Advanced Lead 12 V Batteries

The Consortium for Battery Innovation (CBI, formerly ALABC), in collaboration with European Committee for electrotechnical standardization (CENELEC), is holding a workshop bringing together global technical experts from the advanced lead battery and automotive industries to discuss testing methods and research challenges. This follows meetings in Kloster Eberbach (2017), Alcalá de Henares (2018), and Bruges (2019). Following travel restrictions due to the Covid19 pandemic, the 2020 edition will be organized as fully virtual event. After 3 short web sessions in May that covered some aspects of the original agenda, **3 full days with highly interactive sessions will be offered in November.**

The “DCA and Heat” Workshop will trigger discussion and establish co-operation between battery experts working in all parts of the value-added chain, emphasizing:

- ◆ Battery durability in hot climate vehicle applications and validation of the new 75°C life test
- ◆ Improved understanding of reaction mechanisms and electrode structure effects
- ◆ Measurement and optimization of dynamic charge acceptance (DCA)
- ◆ From small test cells to real batteries: how to evaluate performance and durability through R&D
- ◆ New requirements for automotive 12V batteries: small sizes, functional safety

Compact plenary talks will expose up-to-date material on each of the following 6 topics to all participants. In subsequent break-out sessions, each participant will have the opportunity to discuss in depth 3 of the topics and plan collaborative work streams associated with them.

17-19 November 2020
Virtual Workshop

Wrap-up & Intro Talks
Video-streaming 1 week before live Q&A



Topic	Plenary and Breakout topics
1. New Key Life Test (nKLT) for battery durability in hot climate	<ul style="list-style-type: none"> • Can nKLT predict water consumption in the field? • Can nKLT predict corrosion-limited high-temperature battery life? • Charge balance – weight loss – gas emissions: Quantifying EFB side reactions • Taxi fleet evaluation of EFB with high DCA • Introduction scenario for a new standard test?
2. Dynamic Charge Acceptance (DCA): Definitions and test methods	<ul style="list-style-type: none"> • OEM perspective: DCA motivation and observations • Comparing battery bench simulations of vehicle CO₂ homologation (WLTP) • Run-in vs. fresh battery: Which test predicts which use case? • Elements and sequences for a new global DCA test
3. Sharing insights for high-temperature durability cell testing	<ul style="list-style-type: none"> • nKLT results for test cells in comparison to 12V batteries • Discussing a 5Ah test-cell construction for NAM evaluation in nKLT • Reality check of CBI proposed best practices – invitation for a compact round-robin test • Exchange about common lab implementation topics
4. Positive electrodes under high-temperature microcycling duty	<ul style="list-style-type: none"> • Compare morphology & material parameters of positive vs. negative active mass • Can PAM additives reduce water consumption? • Analytical Techniques for PAM and positive grid • Corrosion under microcycling conditions: Do we need new evaluation methods? • Can impedance spectra (EIS) track corrosion layer growth in-situ? • In-situ information about grid corrosion from gassing and half-cell measurements
5. Structure – function relationship behind the DCA Memory Effect	<ul style="list-style-type: none"> • The physical attributes of the DCA “memory effect”: A rapid shared experiment • Voltage effect on DCA: new experimental data for 12 battery types • A simple impedance spectroscopy experiment: in-situ DCA tracking? • Origin of the DCA Memory Effect: The Pb²⁺/organic buffering theory • Origin of the DCA Memory Effect: Role of Ostwald ripening & recrystallization • Alternative hypotheses and experimental ideas to verify or falsify them
6. New requirements and standards: Auxiliary batteries and functional safety	<ul style="list-style-type: none"> • Market trends for “auxiliary” 12V batteries • DKE/IEC draft for standardizing new small AUX battery sizes • Do we need a norm for “FIT batteries” assuring ASIL compliance? • Power tests for 12V batteries beyond CCA • Example of a tier-1 solution: Breakdown of Functional Safety requirements to battery, pole-niche sensor and other power supply system components • A generic approach to state-of-function (SoF) verification
In additional plenary talks, representatives of OEMs and battery suppliers will report <ul style="list-style-type: none"> • new battery requirements and ongoing standardization activities, • validation results of the new Micro-Hybrid Test (MHT) at 40 °C – is it mature to be published in EN 50342-6 ? 	

The “DCA & Heat” 2020 workshop will focus on the 6 topics listed above, offering for each one a plenary introduction, a breakout session for practical coordination of joint test-development and research activities, and a concluding panel discussion. In addition, 10 “DCA & Heat” wrap-up talks will summarize objectives, activities and results of the joint activity since Kloster Eberbach 2017.

Talks and session introductions will be available for streaming prior to the virtual event. Questions and answers, breakout sessions, panel discussions, and virtual coffee breaks will be presented as highly interactive live web sessions,

from 11⁰⁰ to 16⁰⁰ each of the three days. Additional discussion sessions, both on pre-defined and free topics, will be offered parallel to the breakout sessions for all participants not attending a specific breakout.

The “DCA & Heat” workshop will be preceded on 12 and 13 November by a Consortium for Battery Innovation (CBI) European Technical Workshop, to discuss the progress of the newly launched CBI technical program and new requests for proposals.

The agenda is outlined in more detail on the following page. Registration will be opened in October.

EFB & Heat 2020 agenda lay-out



“Virtual Workshop”

Wrap-up talks

will summarize the evolution of current automotive battery R&D topics since the “Kloster Eberbach” workshop 2017. For this virtual event, you will review hand-outs and video talks (20-30 min each) prior to the live Q&A session and have the opportunity to discuss papers in a chat already.

Plenary sessions

Based on your feedback during the week, speakers and experts will discuss research status and directions.

Break-out sessions

Short introductions on aspects of the session topic (approx. 5* 6min per session) will be available for all participants (streaming 1 week ahead). Each participant selects 3 of the 6 live sessions, where the topic is discussed in small groups with experienced peers. Following in-depth technical / scientific analysis, our priority is on advancing technology and test methods by joint pre-competitive activities.

Virtual lobby

Between breakout sessions, and during those you are not attending, join (by webcam) additional informal “topic tables” or meet your colleagues for “coffee break” talks.

Plenary discussions

Take-home messages, joint action plans.

Day 1 Automotive requirements

video talks streaming 1 week ahead:

Battery standards reflect industry trends

New micro-hybrid durability test: MHT 2019

Functional Safety requirements for automotive lead batteries

Tuesday, 17 Nov, 11:00 CET

live Q&A

12:00 - 15:00 CET

12:00
New Key Life Test (nKLT) for battery durability in hot climate



13:30
New requirements and standards: Auxiliary batteries and functional safety

The virtual lobby: topic tables, group meetings, 1:1 chats

15:00 - 16:00 CET

live panel discussion

Day 2 DCA toward 3 A/Ah

video talks streaming 1 week ahead:

DCA in cars: definition, tests, memory effects

DCA in labs: cell design effects, scalability

NAM classics: Is low DCA caused by Ostwald ripening?

NAM additives: types, effects, mechanisms

Wednesday, 18 Nov, 11:00 CET

live Q&A

12:00 - 15:00 CET

12:00
Structure – function relationship behind the DCA Memory Effect



13:30
Dynamic Charge Acceptance (DCA): Definitions and test methods

The virtual lobby: topic tables, group meetings, 1:1 chats

15:00 - 16:00 CET

live panel discussion

Day 3 High-temperature testing/ Positive electrodes

video talks streaming 1 week ahead:

New hot life test: Development and validation

Grid classics: What can metallurgy tell for modern batteries?

Corrosion layer growth: a literature review

Thursday, 19 Nov, 11:00 CET

live Q&A

12:00 - 15:00 CET

12:00
Positive electrodes under high-temperature microcycling duty



13:30
Sharing insights for high-temperature durability cell testing

The virtual lobby: topic tables, group meetings, 1:1 chats

15:00 - 16:00 CET

live panel discussion