Tektronix

KEITHLEY
A Tektronix Company

Battery Testing

From portable embedded to electrified mobility

Andrea Vinci – Senior Technical Marketing EMEA

Silverstone UK, Battery Test Expo 2023

Accelerate Progress Together

COMPANY AND PRESENTER

Tektronix®

MDL TECHNOLOGIES

APC TECHNOLOGY GROUP

Hall 2
B40-41

- Test & Measurement company committed to performance and compelled by possibilities
- Design and manufacture solutions to break through the walls of complexity, and accelerate global innovation

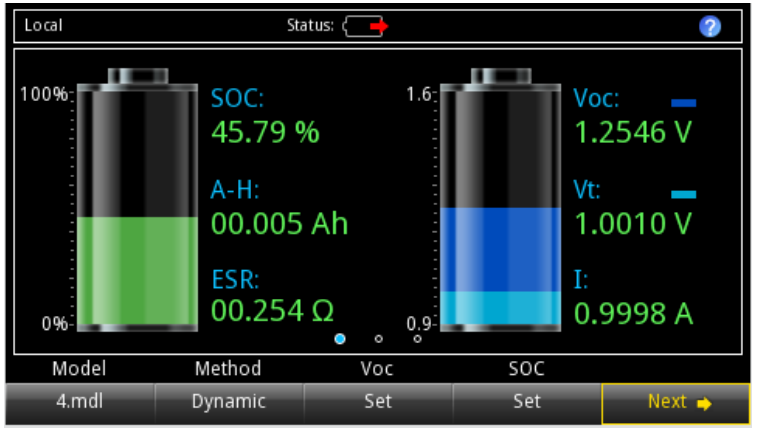
- Andrea Vinci - Technical Marketing Tektronix
- “Battery MBA” from Battery Associates

Agenda

FEW TEST PROBLEMS WE'LL DISCUSS ABOUT

1) Predicting key battery **characteristics** and potential degradation, accurately and reliably

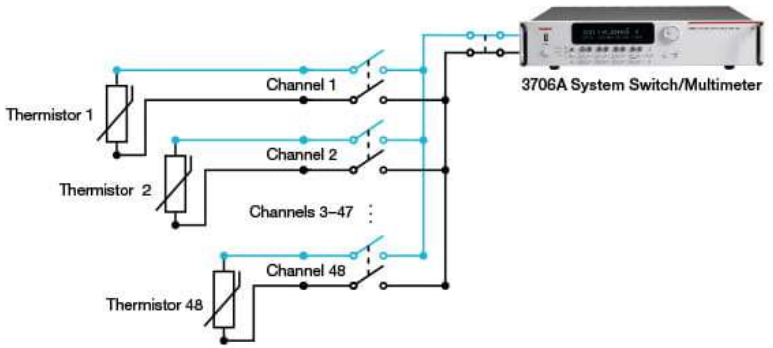
2) Modeling and **Simulating** batteries in a fast and simple way

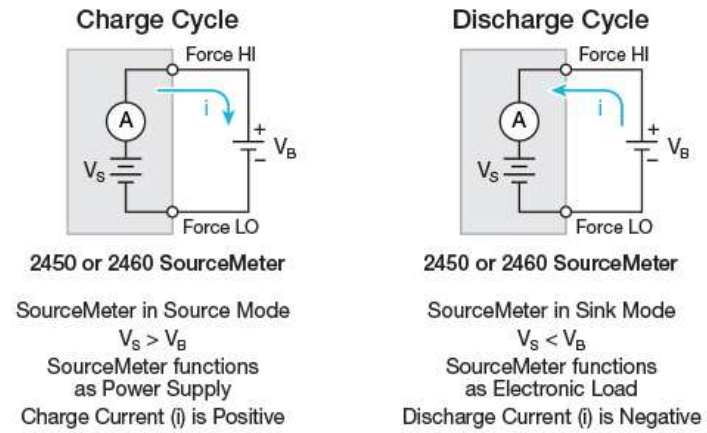


EV Battery Production Use Cases

A SHORT SUMMARY OF ADDRESSED PAIN POINTS

- Battery Grading with Open Circuit Voltage Testing
- Quantifying Battery Self-Discharge with Open Circuit Voltage Testing
- Ensuring Battery Quality with DC Internal Resistance
- Battery Tab and Busbar Weld Checking with Resistance Measurements
- Check Electrode Contact Quality with Low Resistance Measurements
- Environmental and Safety Testing using Temperature Keep Batteries Isolated by Measuring Insulation Resistance
- Datalogging
- Formation, Aging and Battery Cycling





Solution Example: Industry Leading 7.5 digits DMM/DAQs

Pain Points	Solution Value
Testing takes a long time	•High density solutions mean you can test more devices at once •High precision solutions like 7.5 digit DMMs and SMUs can detect smaller changes and are more accurate
Errors during testing cause tests to have to be redone	•Automating the test setup using software like Kickstart or custom scripts using TSP reduce errors
Batteries can be hazardous	•Automated testing reduces possibility of dangerous errors and human contact
Battery testing requires a lot of equipment	•Flexible solutions such as the 3706A DMM and switching means that you can take different kinds of measurements with 1 box, and measure more devices with 1 box
Data collection, analysis and management is time consuming	•Software like Kickstart can help collect and visualize data

Cell-to-Pack Testing Solutions

Test:	Cell-Tab Welding	Open-Circuit Voltage	Bus-Bar Welding	Temperature / Environmental
Problem:	An incorrect weld can generate excessive heat and result in battery underperformance and failure. The weld imperfection cannot be visually seen.	An incorrect weld can generate excessive heat and result in battery underperformance and failure. The weld imperfection cannot be visually seen.	An incorrect weld can generate excessive heat and result in battery underperformance and failure. The weld imperfection cannot be visually seen.	Battery packs are exposed to a wide range of environmental conditions and need to be tested for performance. Defective cells can also overheat and cause thermal runaway
Solution:	4-Wire resistance measurement of weld joint with Keithley SMU or SMU+DMM.	Measure the open-circuit voltage of the battery cell with a high accuracy Keithley 7.5 digit DMM to detect defects faster.	4-Wire resistance measurement of weld joint with Keithley SMU or SMU+DMM.	Temperature measurements (thermocouples or thermistors) using a multichannel DMM to monitor every cells.
Recommended Products[1]:	Keithley 2460 Source and Measure Unit (SMU) and 3706 Digital Multimeter	Keithley 7510 or 3706 Digital Multimeter	Keithley 2460 Source and Measure Unit (SMU) and 3706 Digital Multimeter	Keithley 3706A System Switch and DMM7510 multimeter
Resources:	APPLICATION NOTE	APPLICATION NOTE	APPLICATION NOTE	APPLICATION NOTE

[1] - Keithley solutions are highly configurable for the voltage, current, and overall needs of the testing application. Please consult with your sales representative to determine the best product fit for your needs.

IoT Design Use Case: Flexible Modeling and Simulation

- Dynamic Battery Simulator

  and Precision DC Bench Power Supply
- Upload and run battery models
- Retrieve consumption profiles
- Simulate/vary SOC over time, represent visually VOC, Vt, SOC, ESR, current, capacity

- Up to 60A DC Electronic Load to Run a battery discharge test

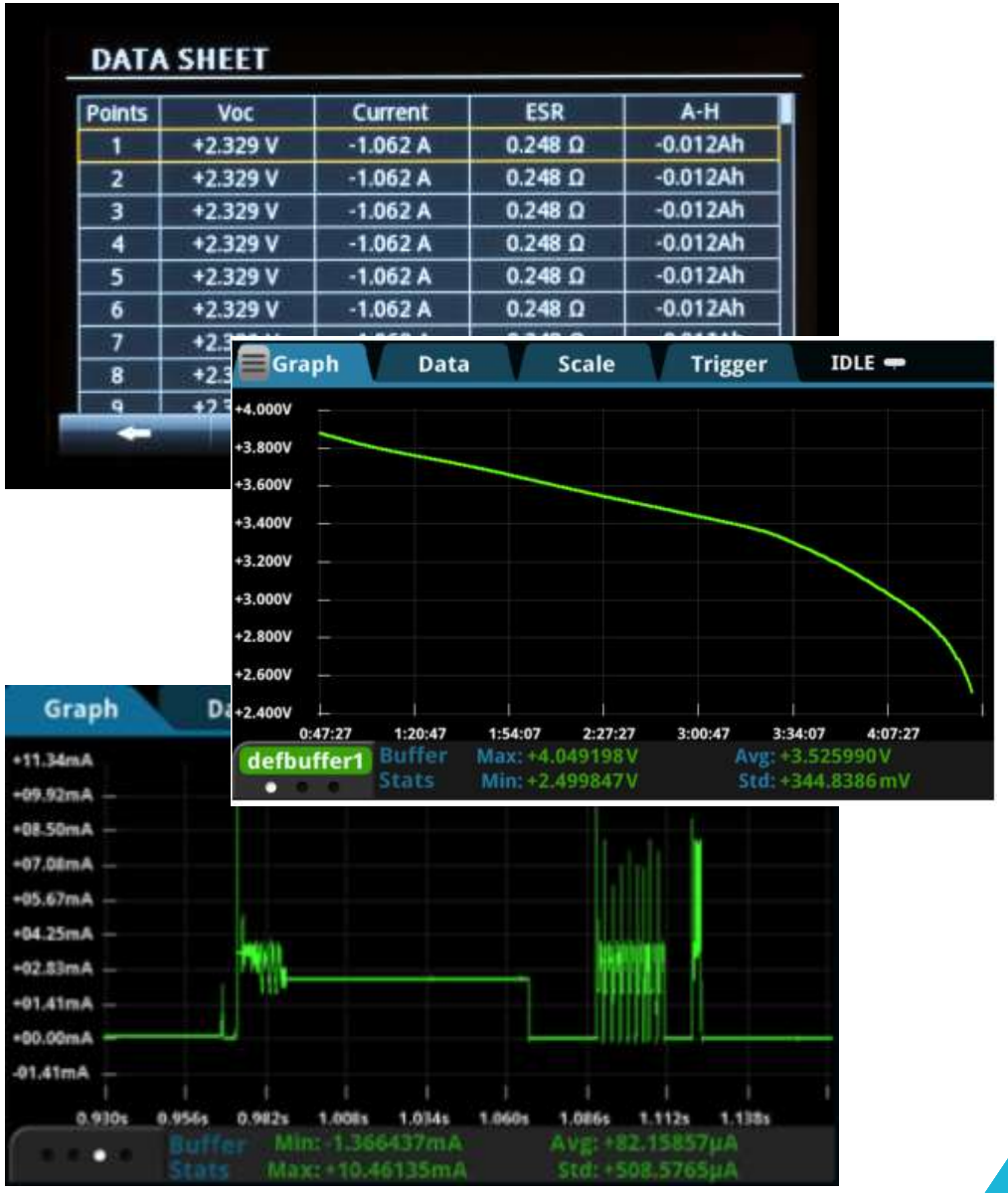
Keithley Battery Test Application

Summary

WRAP UP

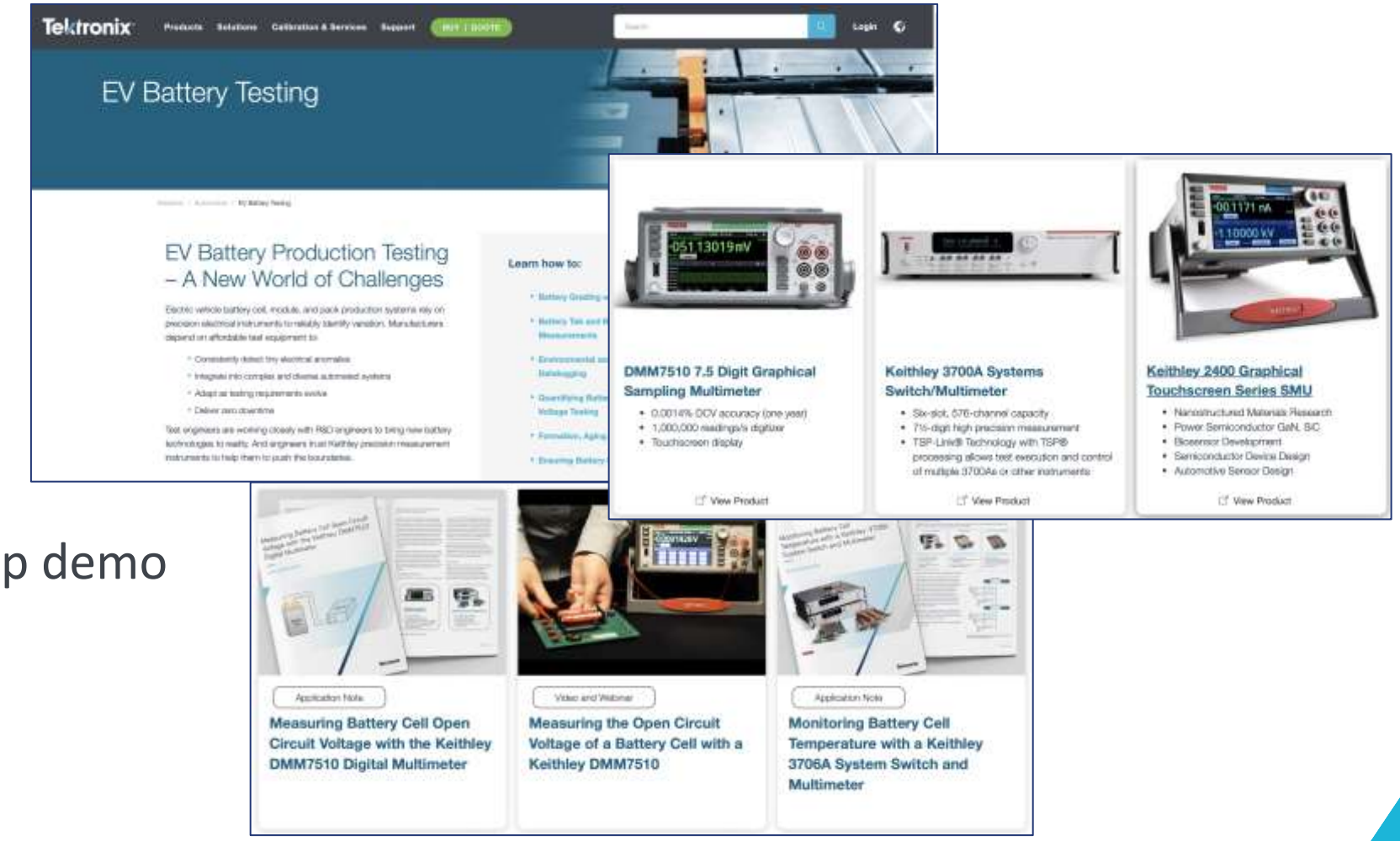
- Gigafactories, Battery Cell Design, System Integrators in EV OEMs Supply chain
- Scalable and reliable **signals logging on a modular setup** with sufficient resolution accuracy and stability. Remote control

- Semiconductor IC Design in IoT, PMICs (power managing systems) development , energy harvesting low energy devices. Optimize embedded design performance with regards to battery life, decrease test time, faster GTM.
- **Generate** and **run** battery models, short learning curve, ready to use scripts



Come visit us at MDL booth (HALL 2 B40/41)

- Check out our Web Site

- See all this LIVE
- Share your pain points
- Suggest improvements
- Request FREE on site setup demo

Thanks!