KEYSIGHT

Editorial Backgrounder

Accelerating the Automotive Revolution

Introduction

The automotive revolution is actively re-shaping our world, with innovations spanning both electric vehicles (EVs) and autonomous vehicles (AVs) continuing at a feverous pace. But challenges remain in large-scale charging, charging infrastructure, and in the battery technology advances needed to drive range and cost improvements. Likewise, in the area of AVs, better engineering requirements are needed for safer roads, along with optimized autonomous vehicle performance, and development of standardized approaches for manufacturers and suppliers alike.

Industry & Customer Challenges

1. Building better EV batteries faster with extended range: Technology has reduced the cost of an average lithium-ion (Li-ion) EV battery by 80% over the past decade, yet the battery remains the most expensive part of the electric car. Reducing the cost of this component while extending battery capacity and longevity will help EVs win over more drivers in the coming years. The objective is to develop EV batteries that improve durability, power density, and operational safety using a fast, cost-effective, and energy-efficient process. At the same time, all EV batteries entering the open market must satisfy the highest quality requirements for safety and operational performance.
2. Quick and readily available EV charging: Rapidly evolving standards and applications in the electromobility market presents several challenges for EV and EVSE manufacturers. Besides meeting safety standards, ensuring interoperability for all plug-and-charge services and conformance to emerging vehicle-to-grid standards are important considerations for a successful shift to e-mobility.
3. Extensive road testing for complex real-world AV scenarios: Autonomous driving system refers to any self-driving vehicle that is able to sense and navigate through its surrounding environment without human intervention. Autonomous vehicles are usually equipped with sensing technologies like cameras, GPS, radar sensors, and lidar sensors. They are classified from Level 0 to Level 5 based on features and capabilities. Today, original equipment manufacturers (OEMs) use simulated environments with software-in-the-loop systems to test sensors and control modules. Software simulation is valuable, but it cannot fully replicate the real world.

Keysight Solutions

1. **Scienlab Battery Cell/Module/Pack Test Systems** (SL1002A/SL1001A/SL1710A) and **Charging Discovery System – High-Power Series** (SL1047A) Keysight Scienlab e-mobility test systems and software offer customized environments for developing electronic components according to hybrid and electric vehicle standards. Our test solutions help you to accelerate your e-mobility applications for the electric vehicle (EV) battery, battery management system (BMS), inverter, charging interfaces of EV and electric vehicle supply equipment (EVSE), and grid edge.
2. **Radar Scene Emulator (AD1012A)** - The Radar Scene Emulator sharpens your ADAS radar vision with full-scene emulation by allowing you to: test with a wide field-of-view (FOV) of + / -70° to view both near and far targets; apply test scenarios with variable environmental

conditions, traffic density, speed, distance, and total number of targets; and accelerate ADAS / AV algorithm training, and test scenarios earlier with complex repeatable scenes.

3. **Cellular Vehicle-to-Everything (C-V2X) Test Solution (SA8700A)** - The Keysight SA8700A C-V2X test solution is a comprehensive test solution enabling functional, protocol, and RF measurements on R14 C-V2X devices. The solution is based on Keysight's new UXM 5G platform and the MXG for GNSS emulation.
4. **In-Vehicle Networking – Automotive Ethernet/SerDes (AE6900T/AE6900R/AE6900L/AE2000T/AE2000L)** - The automotive Ethernet standard demands rigorous compliance verification using test cases that cover transmitters (Tx), receivers (Rx), and harness/connector assemblies. To help you save time and effort, Keysight offers solutions that automate the testing and validation across Transmitter (Tx), Receiver (Rx), and the connections between automotive Ethernet devices. Our engineers have invested thousands of hours in learning the standards and creating automated, repeatable compliance tests.
   Many new AV and ADAS features are delivered through a mix of sensors, cameras, and networks and require more and faster data with each iteration. Those in-vehicle cameras and displays are already connected to ECUs via a SerDes connection. With the introduction of MIPI A-PHY and Automotive SerDes Alliance (ASA), the chipsets can be utilized and supported by multiple silicon vendors and interoperability between those vendors.

Key Features and Customer Benefits

1. Comprehensive EV battery testing from cell chemistry to finished product – Keysight has designed purpose-built test environments that provide accurate, repeatable, and real-time insights to improve battery design. These environments accelerate innovation around the battery for improved range, performance, and ultimately, reduced cost. They can be used to optimize the performance of cells, modules, and packs, or even analyze behavior in emulated real-world scenarios.
2. Assured EV charging interoperability - Electric vehicles (EVs) and electric vehicle supply equipment (EVSE) must conform to different global standards for operational safety and performance. Testing each new EV model for conformance to charging standards and ensuring interoperability is vital. But it is impractical to test EV models against every real-life charging station. Our test solutions cover virtually every type of adapter, protocol, and standard globally.
3. Bring the road into the lab with Autonomous Drive Emulation (ADE)/Radar Scene Emulator (RSE) - In the AV space, engineers can test the proper behavior of the autonomous vehicle with our ADE platform, including the Radar Scene Emulator solution, and lidar, as well as network communications and cybersecurity. Keysight offers complete test solutions from design and emulation to research, development, production, and support services to help our customer be first to market with confidence and speed.
4. High-speed connected car communications - The connected car combines the vehicle, communications, and the Internet of Things. Given the mission-critical safety requirements of modern vehicles and the need for interchangeable multi-vendor components to work together reliably, designers face more challenges than ever before. We partner with leaders in wireless technologies for cellular, LTE, LTE-Advanced, WLAN (802.11p), Bluetooth, and near-field communication (NFC) to ensure that vehicle communications systems deliver flawless communications. Designers can even bring their 5G C-V2X designs to our state-of-the-art test lab, where our experts can help with test setups and accelerate time to market while meeting test conformance standards.

Additional Information

Link to press relevant press releases, case studies and/or product areas on Keysight.com.

2022-09-12
Keysight Delivers New Automotive Test Solution for MIPI

2022-04-21
Keysight Enables Engineers to Verify, Debug CAN XL and Other Automotive Protocols

2022-03-16
Keysight Enhances Test Case Portfolio for e-Mobility Charging with New Scienlab Software

2021-12-15
Keysight Introduces Radar Scene Emulator Solution to Accelerate Path to Full Vehicle Autonomy

2021-12-13
Keysight First to Gain GCF Approval for Test Case Verifying IP Multimedia Subsystem (IMS) Based eCall Functionality

2021-11-03
Keysight Introduces Automotive Software Applications to Test Advanced Infotainment and Driver Assistance Systems

Keysight.com Links:

- E-Mobility Testing
- EV Charging Test
- Autonomous Drive Emulation
- Radar Scene Emulator