



# Quick Multi- Platform Tests

The scope of testing is growing, the number of platforms to be tested is rising, but time and resources remain scarce. Can this conflict be solved? According to Chinese automobile manufacturer Brilliance, it's all a matter of efficiency, so they rely on a fully equipped simulator system from dSPACE.



Setting up a flexible, automated test environment for multiple vehicle platforms

Source: © Brilliance

When complex electronic control unit (ECU) networks are validated under time-critical conditions, efficient tests are an important key to success. The electrics/electronics (E/E) department at Brilliance even needs to deal with the daunting challenge of testing multiple vehicle platforms (cars, minivans, SUVs) at the same time. And even if just a single platform is involved, there are many different configurations, which increases the testing effort enormously. To master this test task successfully despite limited human resources, it was planned to set up a flexible, automated test system that can handle especially E/E tests of different vehicle platforms and configurations and supports easy and quick switching between the platforms to be tested.

#### Requirements on the Test System

To obtain a test system with exactly the scope of performance necessary to implement the test tasks successfully, the test team detailed the requirements and formulated their expected benefits in comparison to the capabilities of the currently used test tools and methods. The functional requirements included function tests, diagnostic tests, test error injection, and integration tests. As for the expectations, improved test efficiency ranked number one. Accuracy, guaranteed test coverage, easy reproducibility and high flexibility were also >>



“dSPACE’s simulation system is highly flexible and easy to handle, so we can test the different vehicle platforms efficiently and reliably.”

Zhan Dekai, Brilliance Auto

crucial issues. On the other side, there was a limited budget and not so much experience in test automation yet.

### Choosing a Test System

A holistic approach was used to choose the appropriate test system. The issue was not just about the right hardware and software, but also about the engineering and on-site training. For the decision makers, the most important factor was long-term assistance and support in order to get direct help during ongoing test projects. In this respect, dSPACE made a very convincing all-inclusive offer. The offer included a turn-key simulator system that covers all the specific requirements, with test automation designed especially for the application and on-site service that can support the developers at Brilliance in their projects if necessary. dSPACE’s particularly flexible simulator concept promised to cover all platforms with one test system, so it was possible to fit the total costs within the planned bud-

get. Brilliance therefore decided on the solution proposed by dSPACE.

### Simulator Setup and Multi-Platform Features

The simulator set up by dSPACE is designed for week-long ‘round-the-clock’ operation (24/7 tests) and masters ‘lights-out tests’: i.e., repetitive, automated test processes that do not require supervision. The set-up consists of four networked simulators. The controlled systems for applications in powertrain, chassis and body are set up partially as real components and are also available as virtual simulation models from the Automotive Simulation Models (ASM) tool suite. To test the various platforms with a single system, a separate load board construction including a cable harness was developed for each platform and connected manually to the simulator. The pre-configured models for each platform make it easy and quick to switch between the platforms. All that needs

to be done is replug the cable harness and select the associated model configuration in ModelDesk, the parameterization software.

### Performance Range and Advantages

The test system is refined to meet Brilliance’s requirements and handles standard test tasks as well as special tests integrated through engineering solutions.

**Failure insertion:** Failure Insertion Units (FIUs) are used for automated implementation of short circuits and broken wires at low currents and high currents.

**Measuring the quiescent current:** The quiescent currents of individual ECUs or the entire ECU network can be measured accurately with the inserted DS285 Power Switch Module.

**Analyzing the instrument cluster:** Displays such as the speedometer, tachometer or warning lights are detected with an intelligent camera and analyzed to check the values during the test process.

**Checking the air conditioning system:** To test the regulation of the air conditioning system, it is used as a real component and all the control knobs are emulated by special hardware.

**Testing the power windows:** To test the control of the power windows (e.g., its anti-pinch system) an electric load (electronic load module, type B) that emulates the electric motor is used. The position of the window can be saved on a Compact-Flash.

**Switching between the real component and simulation:** A click of a button on the host PC is all that is needed to switch between the real loads and sensors, as well as between

*The test team works with programs such as ControlDesk, MotionDesk and ModelDesk on the simulator’s operator stations to adapt a vehicle dynamics simulation.*





Examples of the various vehicle platforms whose E/E systems are tested using the dSPACE Simulator (source: © Brilliance).

their modeled, virtual representations. This lets manual tests and automated tests be implemented simply and quickly.

**CAN manipulation:** The CAN manipulation gateway by dSPACE makes it possible to manipulate individual CAN signals in order to give the ECUs incorrect messages and thereby examine their behavior.

**Test automation (TA):** Together, Brilliance and dSPACE used AutomationDesk to set up a test framework, including all TA libraries. The developers use this framework as the basis for expanding the test scope by implementing new test cases via simple graphic methods.

### Conclusion and Outlook

Ever since its startup phase, the simulator is the central tool for all of Brilliance's test tasks. Thanks to the simulator's high flexibility and easy handling, all tests so far have been completed on time. Even unplanned platform switches, which often used to cause considerable delays, were handled with confident ease. The automation and informative test re-

ports gave the developers exact information about the quality of the software, so it was easy for them to check bug fixes. For the future, Brilliance plans to optimize the implemented processes and workflows even further. dSPACE's data management tool SYNECT is planned to play a decisive role in this. ■

Zhan Dekai, Mi Yanxin, Li Shunzhi, Zhang Jianxin, Brilliance Auto

### Tested ECUs

Body ECUs:

- Air Condition Module (AC)
  - Around View Monitor (AVM)
  - Body Control Module (BCM)
  - Tire Pressure Monitoring System (TPMS)
  - Driver Seat Module (DSTM)
  - Immobilizer (IMMO)
  - Passive Entry Passive Start (PEPS)
  - Electronic Steering Column Lock (ESCL)
  - Park Distance Control (PDC)
  - MultiMedia Unit
- Drivetrain and chassis ECUs:
- Engine Control Module (ECM)
  - Transmission Control Module (TCM)
  - Electronic Stability Control (ESC)
  - Airbag (ABAG)
  - Adaptive Front Light System (AFS)
  - Auto Park Assist (APA)

### dSPACE Tools in Use

- 4 dSPACE Simulators
- AutomationDesk
- ControlDesk Next Generation
- ASM Electric Components
- ASM Engine Gasoline Basic
- ASM Vehicle Dynamics
- ASM Traffic
- ASM Brake Hydraulics
- ModelDesk
- MotionDesk
- DCI-CAN interface
- Failure Insertion Units (FIU)

Members of the test team in Shenyang, China. From left to right: Mi Yanxin (developer), Li Shunzhi (developer), Zhang Jianxin (developer), Zhan Dekai (Section Manager), Sun Lizhu (Group Leader)

