

LG Electronics Performs Smartphone Drop-Test Simulation in Less than 24 Hours with New Automated Approach



Key Highlights

Industry
Electronics

Challenge
Sharply reduce simulation time to meet short design cycle

Altair Solution
HyperWorks automation capabilities and Altair engineering expertise

- Benefits**
- Significantly speed up and standardize routine simulation processes
 - Increase reliability and repeatability
 - Capture knowledge and practices

Customer Profile

LG Electronics Inc. is a global leader and technology innovator in consumer electronics, mobile communications and home appliances. With 2012 annual worldwide sales of \$45.22 billion, LG is one of the industry's leading producers of flat panel TVs, mobile devices, air conditioners, washing machines and refrigerators.

The Challenge: Sharply reduce simulation time

The fastest-selling, most rapidly evolving and most competitive product in the electronics industry is the smartphone. New versions of smartphones are developed every few months, and any steps that can be taken to reduce the time to market for new

models can have a tremendous impact on the manufacturer's profitability, positioning and reputation among consumers.

Yet, some aspects of the development process have remained time consuming and have not yielded to attempts to accelerate those steps. One such process has been drop-test simulation, a crucial element in ensuring the quality and robustness and thereby the marketability of a smartphone. Although LGE, like its competitors, has used computer simulation to conduct virtual drop testing, its attempts to shorten the simulation time have met some difficult barriers. Smartphones contain a large number of parts and assemblies with many

LGE Success Story



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Hyong-Won Seo
Senior Research Engineer
MC R&D Center, LG Electronics

miniaturized features, making the geometry cleanup, simplification, and meshing very time consuming. Adding to this, the multitude of contact definitions that are required have many manual steps. Thorough testing involves a variety of drop and bending conditions, where analysis setup is time-intensive. Lastly, post processing and generating reports is also laborious, contributing to the overall time to achieve results. As a result, drop-test simulation on

average in the industry has taken one to two weeks to set up, conduct and analyze. The most laborious portions have been modeling and post-processing, which represent 60 to 80 percent of the time invested.

Nonetheless, working together, LGE and Altair sought to create a seamlessly integrated drop-test simulation automation system that would enable LGE engineers to conduct virtual smartphone drop tests within just 24 hours. Such a methodology,

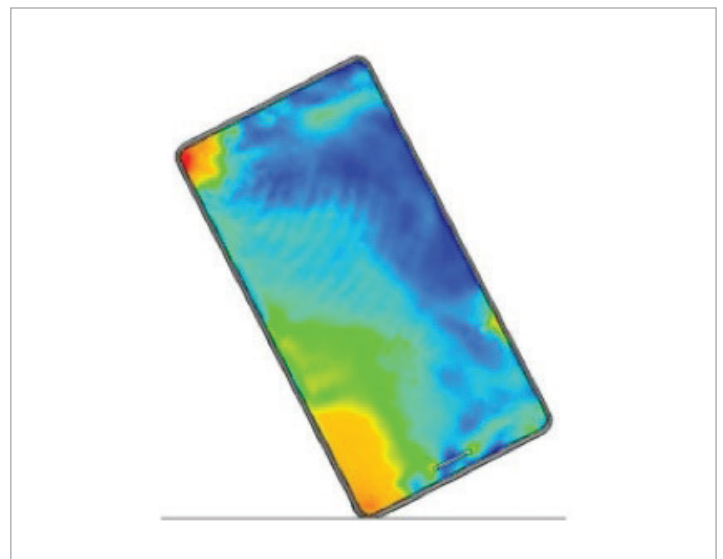
incorporating modeling and drop and bending analysis, would significantly speed the development process and could provide a substantial competitive advantage for LGE.

The Solution: HyperWorks automation capabilities

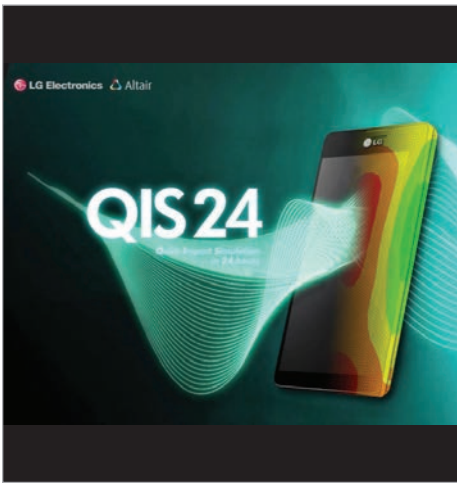
Employing software tools in Altair’s HyperWorks computer-aided engineering suite, including HyperMesh for pre-processing, the RADIOSS solver, HyperView for post-processing, and its embedded automation framework,



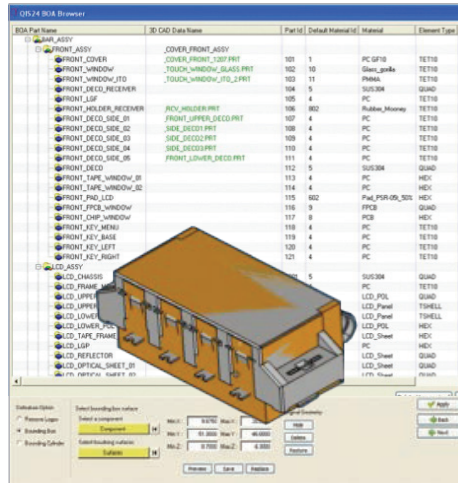
Smartphone CAD model



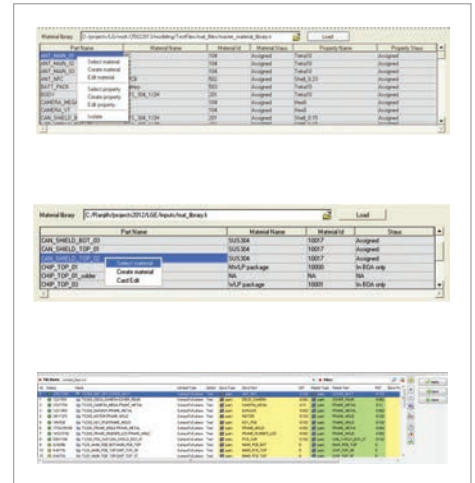
Smartphone drop simulation result



The automation system – Quick Impact Simulation in 24 hours (QIS24)



The automation system (QIS24) browser and step by step guides



the Altair-LGE team has developed a way to automatically simplify geometry, create solder joints, generate high-quality meshes and create contacts between parts, saving considerable time during pre-processing. Manually modeling and meshing more than a hundred parts in a smartphone and creating reports often consumed a week of an engineer’s time. The automated system developed by the Altair-LGE team requires only a few hours. It is a fully integrated, end-to-end and user-friendly system that can simulate drop and bending test scenarios. The organized mesh browser sets up more than a hundred parts with specific meshing criteria and automatically meshes each part accordingly using batch meshing methodology. On the post-processing side, this system allows users to load result files with multiple orientations and generate a report for each load condition. It also plots contours, charts and section cuts and finds hotspots and max values in batch or interactive mode.

In all, engineers on the team automated finite-element analysis modeling, analysis setup and post-processing—each of which traditionally had been done manually—using

the embedded automation framework within HyperWorks. The system also promotes standardization, reliability and repeatability of the drop and bending analyses.

The Results: From CAD to report in less than 24 hours

The Altair-LGE team succeeded in implementing a feasible toolset to perform a smartphone drop-test simulation from CAD to report in less than 24 hours. Further, as a result of implementing this automated system, meshing the printed circuit board (PCB) and the chips and creating solder joints between the PCB and the chips now takes less than 5 minutes, a task that manually used to take an engineer a full day. Complete modeling time totaled less than five hours, while configuring boundary conditions took just over half an hour and reporting required less than two minutes.

This automation system addresses a number of major challenges in the electronics industry including time to market, innovation and cost. With the decreased time spent on manual operations and the incidence of human error reduced, engineers can use the days freed up by the drop-test simulation

automation to explore more iterations of the smartphone’s design to develop a more robust and innovative version. Furthermore, LGE’s warranty costs are expected to be reduced, since its optimized smartphones will be more resistant to damage from dropping.

“One of the biggest challenges to the smartphone industry is time to market,” said Hyong-Won Seo, Senior Research Engineer, MC R&D Center, LG Electronics, “and many companies do not have enough time in the highly competitive product development cycle to consider as many designs as they would like to. The standard one to two weeks for drop-test simulation is too long. With Altair we are now able to slice the time required for drop-test simulation from a week to just hours.”

LGE is using the 24-hour drop test simulation system on its latest models, and Altair anticipates that this standardized automation process can produce similar results for the design of other types of consumer electronics as well, including laptop computers, home appliances, air conditioners and other products.

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Performance Simulation Technology

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