

FTSS FEA Dummy Models update: SID-IIs Small Side Impact Dummy Model and others

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ABSTRACT

SID-IIs, the small side impact dummy, is the smallest side impact crash test dummy currently available in the market, representing the anthropometry of a small female or a thirteen-year-old child. It is designed specifically to evaluate the performance of advanced occupant protection systems, such as side air bags, in automotive side impact situations.

This paper presents the development and validation of new FTSS SID-IIs dummy model for LS-Dyna solver. FTSS started the SID-IIs model development in early 2001, and accelerated the developing process in September due to the increasing demand for this crash test dummy in both physical and FEA versions. Now a fully validated SID-IIs FEA model is available in version 1.0.

The SID-IIs model faithfully represents the physical dummy hardware from head to toe. It includes all the hardware components, accelerometers, load cells and linear potentiometers to measure rib deflections. Pro-Engineer CAD model was used in the model geometry creation. Nine common materials were used in the model, and their performance has been proved stable in the other FTSS dummy models. Totally the SID-IIs model consists of about 47,000 nodes and over 65,000 elements. The minimum time step has been controlled as 1.03 μ s.

Validation of the model has been done on various levels, which includes material and component tests, such as standard SID-IIs head drop test, lateral neck flexion test, Rib drop test, arm drop test, shoulder plug drop test and pelvis plug drop test, and full body calibration tests on different areas, such as shoulder, thorax, abdomen and pelvis. The model was finally validated against sled test data. The criteria for model validation accuracy were controlled at less than 10% off for component level, and 15% for full body dummy level. The model showed stable and robust performance with reasonable accuracy in prediction. Details about model development and validation will be presented in this paper.

It is believed that the SID-IIs FEA model can serve as a useful tool in the early stage of vehicle design and safety simulation.

