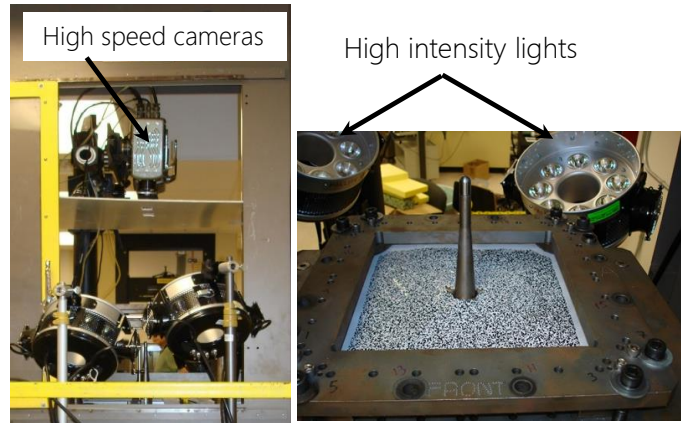


Problem overview

Studying high strain-rate response of textile based composites is critical to determine displacements and strains to improve FE models and their prediction of material and structural response for ballistic application. Experimental results on puncture test of plain woven fabric showing excellent correlation with a FE model prediction are presented in the notes in Figure 1 and 2.

Test setup



Notes

The current application showed that optical metrology has advanced capability for high strain-rate testing. ARAMIS was successfully able to capture and analyze in plane strain and out of plane displacement data from high strain rate puncture test and indicate structural impact damage.

The ARAMIS system shown in the test setup picture is comprised of high-speed cameras (taking 10,000 frames per second), used in high strain rate puncture test at 20,000in/min. The test was performed on a single ply of Kevlar® plain woven fabric which was patterned using a black spray paint. Both vertical displacements and major strain were computed. Three samples were tested and result were shown to match FE model prediction closely according to Figure 1.

Testing while sprayed pattern was still wet, showed to prevent shattering of the paint, which drastically improved DIC measurements.

Conclusion

Optical metrology solution, such as the ARAMIS digital image correlation technology, was proven to be effective for high strain rate impact application.

For more information on this application, please contact Trilion Quality Systems, world leader in custom optical metrology application development.

Keywords: *High strain rate, ballistics, woven fabric, FEM comparison, non-contact, DIC, ARAMIS,*

Figure 1

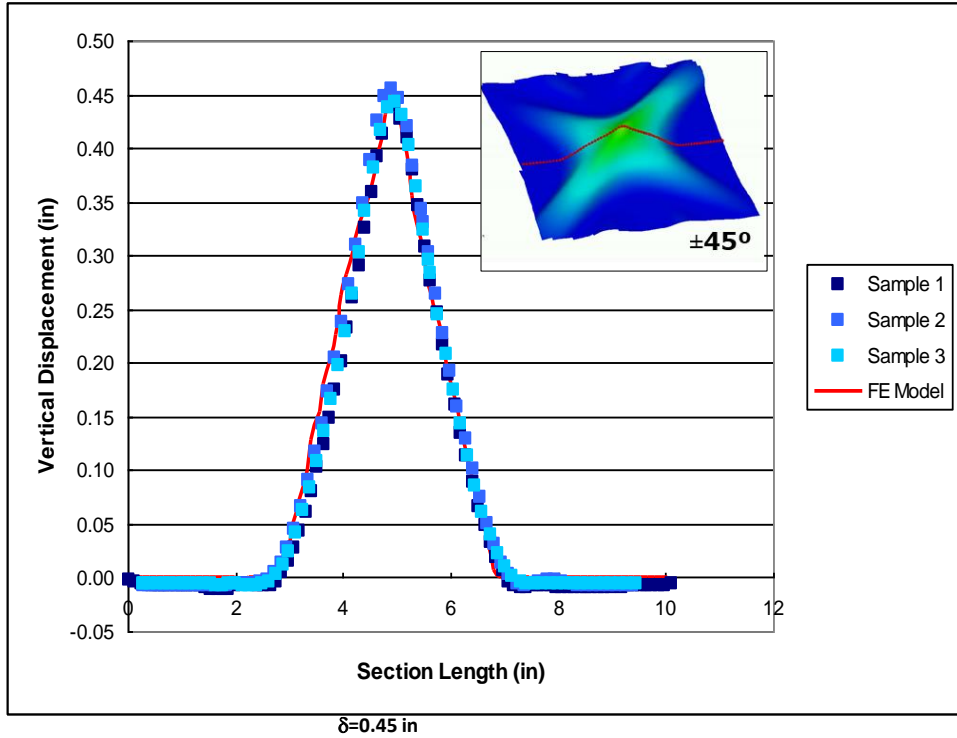


Figure 2

