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Development of a side-impact pulse-shaping torsional Kolsky bar

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ABSTRACT

This study advances our effort of establishing a novel torsion Kolsky bar technique using a side impact mechanism to achieve controllable torsional loading. Because of the nature of a side loading mechanism, several new issues arise: bending wave propagation because of unbalanced transverse forces, multiple loadings because of stress wave reverberation in the striking mechanism, and varying contact conditions. As such, the fundamental understanding derived from the conventional compression, tension, and torsion Kolsky bar techniques are not adequate for the design of this new torsion bar technique. Unlike tension or compression Kolsky bars, the relative motion of the torsion bar provides a means to study both dynamic shear and friction responses of a specimen. With a functional pulse-shaping technique in hand, the potential for this novel torsion Kolsky bar toward studying dynamic friction and shear of various materials is comparable to state-of-the-art compression and tension Kolsky bar techniques.