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Preliminary results on the construction and instrumentation of a Hopkinson pressure bar

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Resumo:
In recent years we have identified the need for the testing of ultra-high strength steels used in the automotive industry as a resource for the enhancement of passenger car passive safety. The design of parts used in the mechanical systems subjected to high strain rates demands stress x strain data dynamically evaluated. Compressive tests are usually performed in a quasi-static condition using a compressive strain rate up to units/s. The Hopkinson's pressure bar applies strain rates of hundreds/s to even thousands/s. To achieve such high strain rates the split Hopkinson pressure bar uses longitudinal trapezoidal mechanical waves traveling along a bar and striking the sample at the speed of sound of the bar material. The shape of the wavefront indicates the strain rate imposed on the specimen. This work aims to present the preliminary results of the design and construction of a split Hopkinson pressure bar testing device. A split Hopkinson pressure bar testing device was built, using a pneumatic cannon to drive a striker and generate the trapezoidal-like compressive mechanical wave. It was instrumented to experimentally determine the striker speed and special strain gauges were used to record the local and instantaneous strain on the bar at a high strain rate. To allow the planning of experiments and control of the energy delivered by the striker, a map of the pressure in the pneumatic cannon against striker speeds. After that, the signals recorded from the strain

gauges were processed and presented. The results were promising. The striking bar speeds were plotted and compared to the analytically predicted and wave signals were recorded in digital recording and analysis systems.