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5P02 - Probability of PBX Detonation Due to Impact Forces and Surface Grit

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The response of PBX HE under varying impact forces and impact surface area grits is analyzed to form a probability of detonation function. Using an air ram and rotating disk, the forces exerted in the normal and transverse directions of the impact plane are controlled to emulate skidding of PBX. The employment of a hopper system feeds grit onto the impact area with the ability to vary the grit density and individual grit size. While confirmation of the desired surface grit density is done with a high-speed visible spectrum camera, the use of a high-speed IR camera viewing the contact of the PBX with the surface through an IR transparent window allows for the analysis of evolving thermal hotspots during impact. Overall, the setup enables varying normal force and surface speed independently with high accuracy in a small apparatus footprint. It will capture hotspots in PBX before they culminate into a chemical reaction that would then also be visible with a standard high-speed camera.

A microcontroller is used to automate the experiment where a desired normal and transverse impact force is translated to air ram firing pressure and impact disk rotation speed. Alignment of the air ram impact with the IR transparent window embedded into the impact disk and acquisition of the experienced forces are handled by the microcontroller and relayed to a PC for post processing of the data. The compression of metals braces is measured with strain gauges to back calculate the forces experienced during the emulated skidding to insure the proper forces were observed during impact

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