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Detonation States without a Transition in the Super Large Scale Gap Test HAROLD SANDUSKY, SAMANTHA CHURCH, JOSHUA FELTS, NSWC IHEODTD, DETONATION SCIENCE COLLABORATION — At or above the critical pressure for shock-to-detonation transition (SDT), there is a run up in shock velocity before a distinct change to high-velocity detonation (HVD). If below that critical pressure a slower supersonic wave, referred to as low-velocity detonation (LVD), sometimes steadily propagates with enough energy to punch a witness plate. This was observed for sample diameters ranging from 36.5 mm in the large scale gap test to 177.8 mm in the super large scale gap test (SLSGT). Recent SLSGTs on an extremely insensitive explosive with a critical diameter >100 mm exhibited HVD without SDT for no gap and LVD with decreasing velocity for longer gaps. These reactive shocks commenced from the donor input and continued steadily. This unique response suggests behavior more like a mass-deflagrating propellant. It is speculated that the large SLSGT diameter in conjunction with the confinement of a steel tube permits more time for shock reaction to occur before quenching by lateral rarefactions. Traditional GO/NOGO determinations do not apply for shock insensitive materials that require evaluation with the largest of the standardized tests, which has implications for both hazard classification and booster requirements.

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