

MEASUREMENT TECHNIQUES FOR HIGH EXPLOSIVE TESTING AND HIGH TEMPERATURE DATA ACQUISITION

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The Defense Threat Reduction Agency (DTRA) performs a wide variety of High Explosive (HE) blast events, supporting the War Fighter, Weapons of Mass Destruction (WMD) mitigation, characterization, international anti-terrorism mitigation, force protection, and agent defeat. United States Government agencies rely on these tests to gather useful data in the field and for laboratory use. The paper presented here addresses: (1) Instrumentation design and, (2) High temperature data acquisition.

The Instrumentation design includes cable planning and layout, sensor selection (pressure, thermal response, motion, strain, force), sensor calibration and fielding, data acquisition, long range transmission and storage of data signals, and high speed optical data. DTRA has also internally developed two fast response high temperature measurement systems that can sustain a harsh environment of up to 500 PSI, and both with the capability of measuring temperatures in excess of 3000K with a response time of 300 MicroSec. The first system is a Near Infra Red (NIR) Ratio Pyrometry Four Color System which is completely self contained (Detectors, conditioning electronics in same unit), and the second system is also a NIR low cost Ratio Pyrometry system that uses an expendable front end mounting configuration that secures Fiber Optic cables (each of which are assigned a specific Narrowband IR center wavelength) in a specific measurement location. These Fiber Optic cables convey the Infrared data produced by the Fireball or other thermal event to a separate array of physically protected NIR photo detectors whose data signals are then conditioned, recorded, and processed to provide Fireball or other Thermal event temperatures.