THE MEASUREMENT AND MODELING OF EARTH ELECTRIC POTENTIAL SIGNALS PRODUCED BY IMPACTS AND DETONATIONS

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The detonation of conventional explosives produces transient electric currents within the earth in and around the point of detonation. For the past decade or so, DTRA has been measuring these transients. To date measurements have been made on more than 50 munitions and bare charge tests. The measurement technique is quite simple as the sensor consists only of two ground rods connected to a spare channel on a digital recording system. Typical ground rod separations range between 30 and 150 m. Measurements have been made at ranges from ~ 10 m to ~150 m from the detonation point to the nearest ground rod. Test bed geologic media have ranged from dry alluvium to limestone to granite. Typical signal strengths range from a few millivolts to several volts. Signals are also often observed from impacts into rock and concrete. We have developed a preliminary electro-mechanical model for the generation of these signals. This preliminary model has been validated by a set of laboratory tests. We are now extending the modeling effort to field tests with the goal of inverting the observed electrical fields to obtain information about near-source material behavior.