

# Alternate Explosives Signatures for Detection

## Opportunity

A major global security gap is the lack of stand-off explosives detection, to counter asymmetric threats at home and abroad. Current capability relies on trace sampling that does not confirm the presence of bulk explosives or uses ionizing energy or particles that potentially harm surrounding assets (people, things, electronics).

## Meso Challenge

What makes it meso? The energy absorption and localization occurs at defect and interface structures. The processes need new theory/modeling/ simulation capabilities to couple electromagnetic (EM) waves to models of tomography-based constitutive structures to determine resonances and magnitudes of the non-linear coefficients, photo- and electro-elastic coupling, charge and energy transfer between defects and traps, and unique EM emissions.

## Approach

Newly-discovered non-linear responses of bulk explosives under electromagnetic stimulation in the GHz to THz regime leads to energy localization, partial release of the metastable chemical energy, followed by characteristic emissions such as RF, thermal, or vapor.

D.S. Moore, US Patent 7,939,803

## Impact

The GHz to THz frequency regime is capable of penetrating packaging, clothing, or camouflage to interrogate bulk explosives using non-ionizing radiation. This approach allows to develop an area-scanning system that allows for detection of bulk explosives from safe (10s of meters) stand-off distances.