Electromagnetic Properties of Plumes and Plasma Jets for High-power Microwave Applications (08-1171)

LDRD
LABORATORY DIRECTED RESEARCH & DEVELOPMENT

Sandia National Laboratories

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Problem

Goal:

Identify and characterize any electromagnetic signals from devices that employ energetic materials.

Questions:

What is the origin of the phenomenon? Under what conditions is it enhanced or diminished? Can signals be discriminated?

Approach

RF Sensor System Design

- Limits on antenna bandwidth dictate three separate channels to cover desired band
- Low channel (monopole)
- Mid channel (bicone)
- High channel (log-periodic)
- All three channels have amplifiers and filters
- Each channel has high-speed ADC located in PXI chassis

Firearms testing

High Speed Video

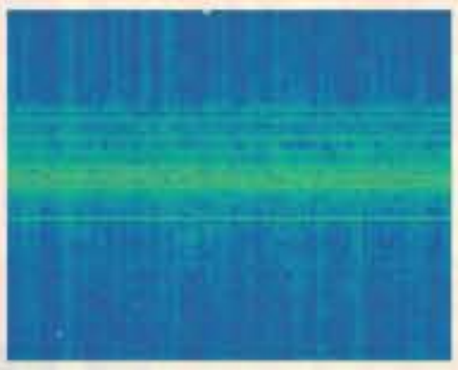
5" Rocket Static Test

Results

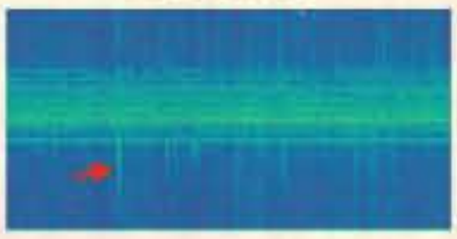
We have measured RF emissions during live fire tests of several rocket systems as well as small-caliber firearms. We have identified electromagnetic features in the live fire tests that are not found in control datasets.

Large Rocket Static Test

Rocket Data



Null-shot



Significance

This system offers new plasma and shock physics diagnostic capabilities with applications to inertial confinement fusion, pulsed power devices, and astrophysics.

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