SAND2017-12612PE

PCP Thermal Course: Photometrics / Measurements

November 13-17, 2017

Sandia National Laboratories

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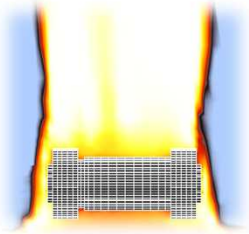

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Photometrics Multi Location

New Flame Facility

Old Flame Facility

Burn Site

XTF

Multi-Spectral Imaging Capabilities

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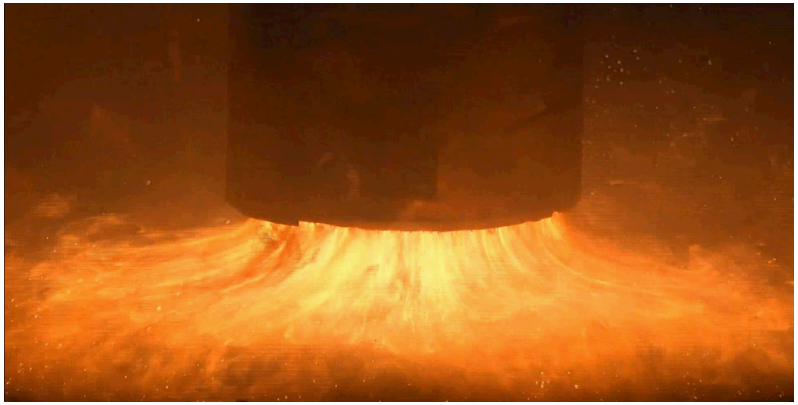
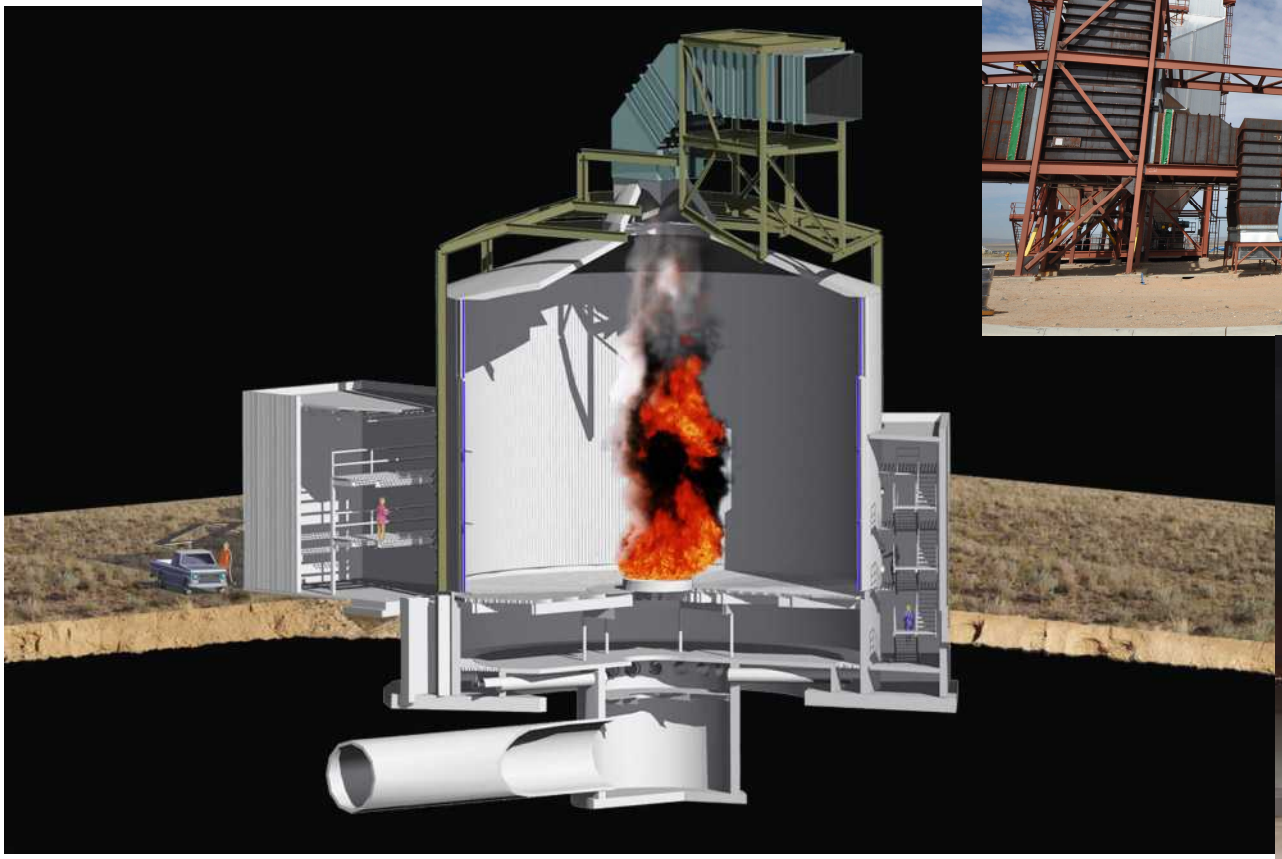
- Visual (0.4 to 0.75 µm) for external visualization
- Mid Wave IR (3-5 µm) for radiometric measurements
- Long Wave IR (7- 12 µm) for imaging inside the fire
- Spectral Detection as needed
  - Imaging at specific bands
  - Spectrometer detection (broad band)



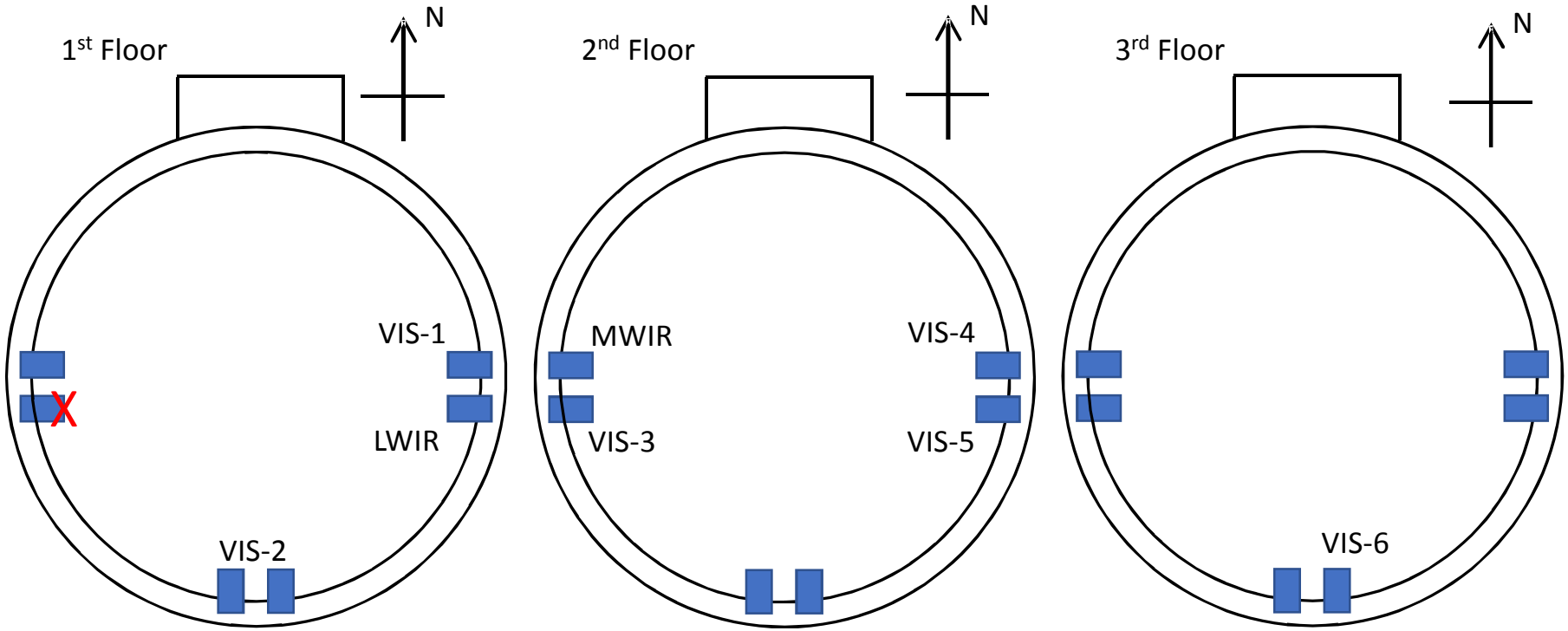
Flame Facility

Calm Wind Fire Experiments



Flame Facility

Optional Photometric Locations



LWIR: IR Counts / Imaging through flames
MWIR: Radiometric IR
VIS-1: Close Drum View
VIS-2: Wide View / Floor Level / Audio / Inside Flame / IP Camera
VIS-3: Internal Survey / IP Camera / Mid View
VIS-4: Wide View
VIS-5: Down View / Zoom
VIS-6: Hi- Angle lookdown zoom
: Port
X: Port occluded by obstruction inside Flame

Visible Imaging

Seeing Effects Outside the Enveloping Flame

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Long Wave Infrared

Seeing Through The Flames

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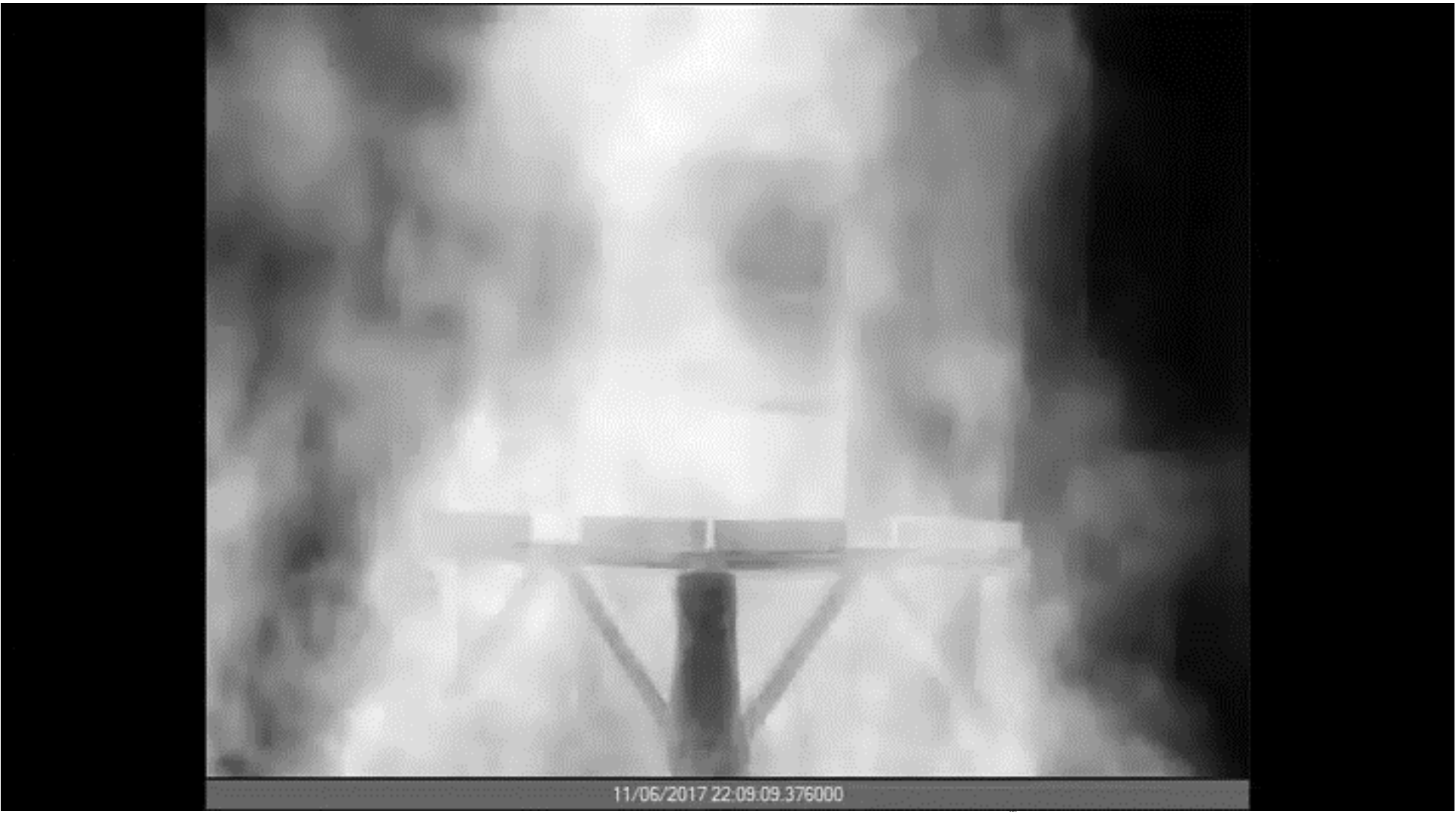

Mid Wave Infrared

Radiometric Data

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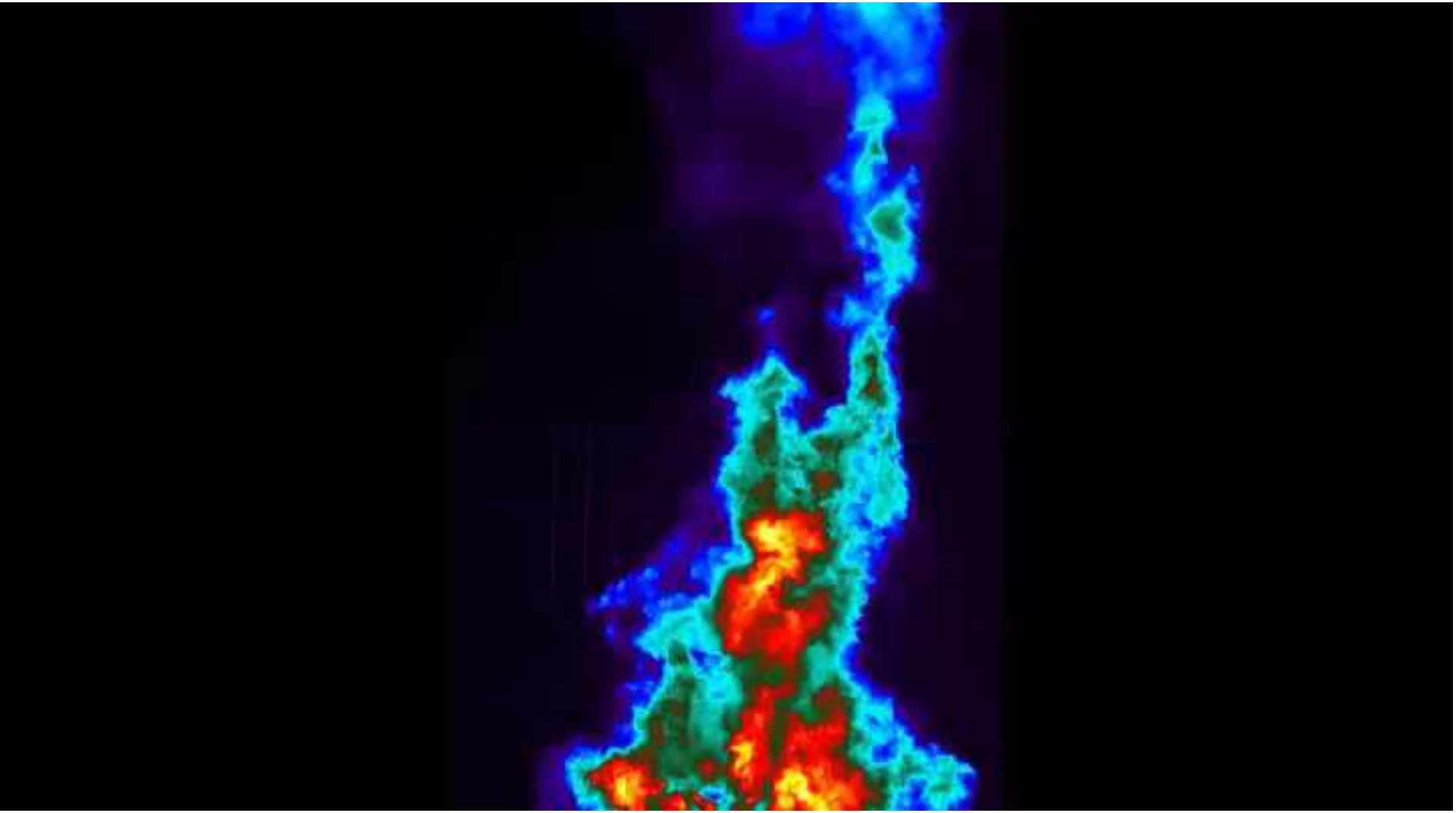
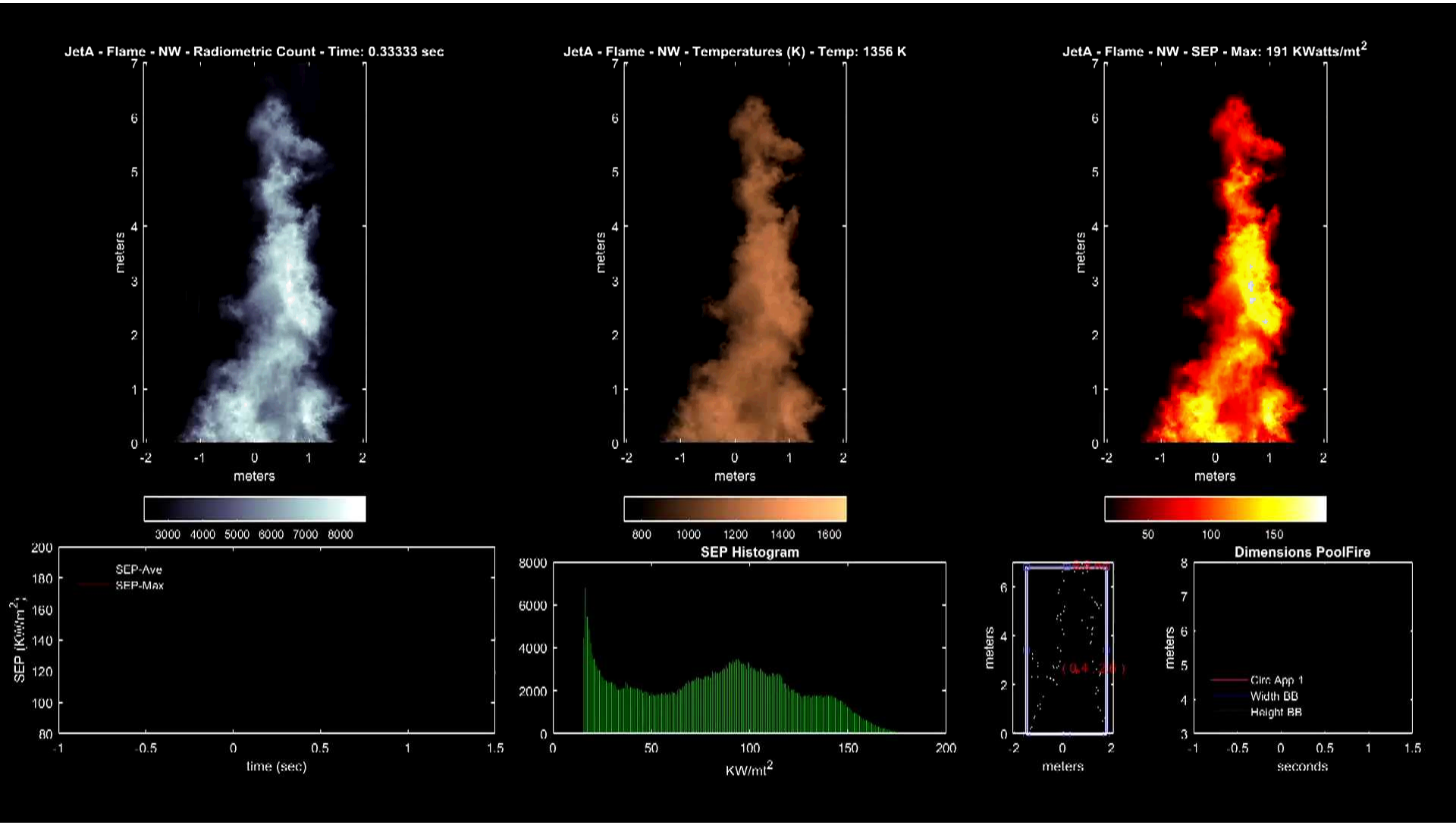


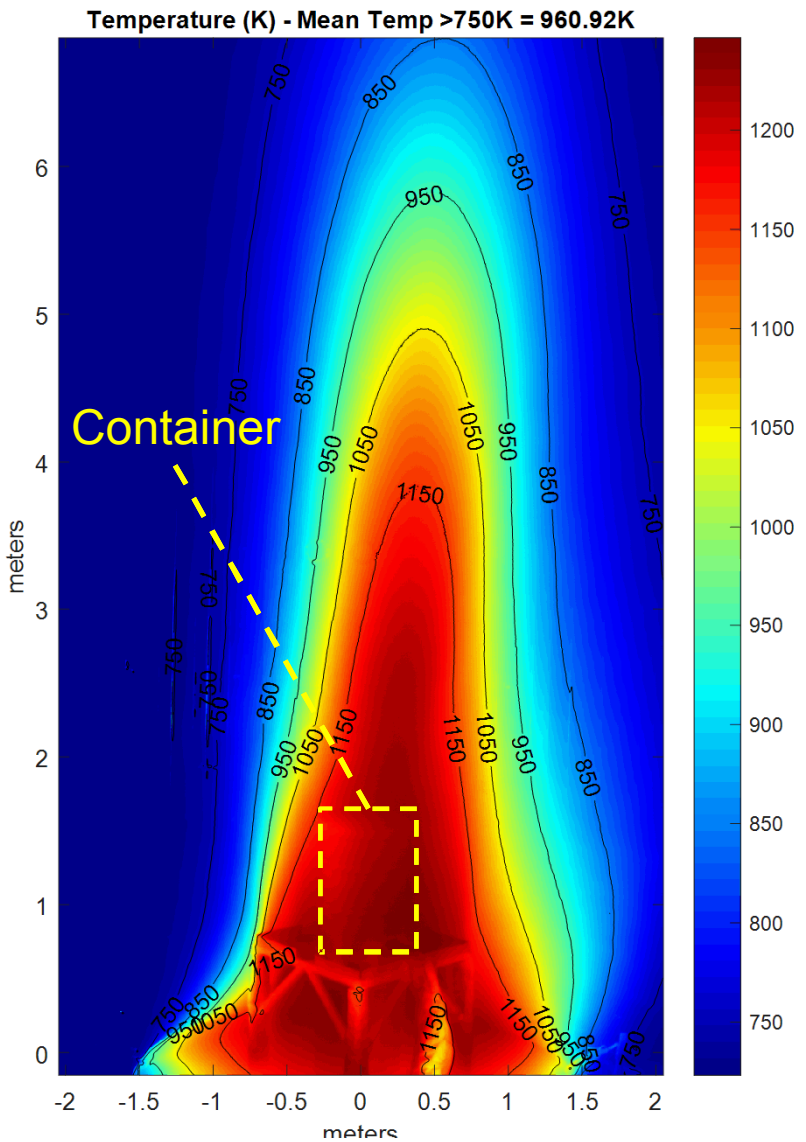
Mid Wave Infrared

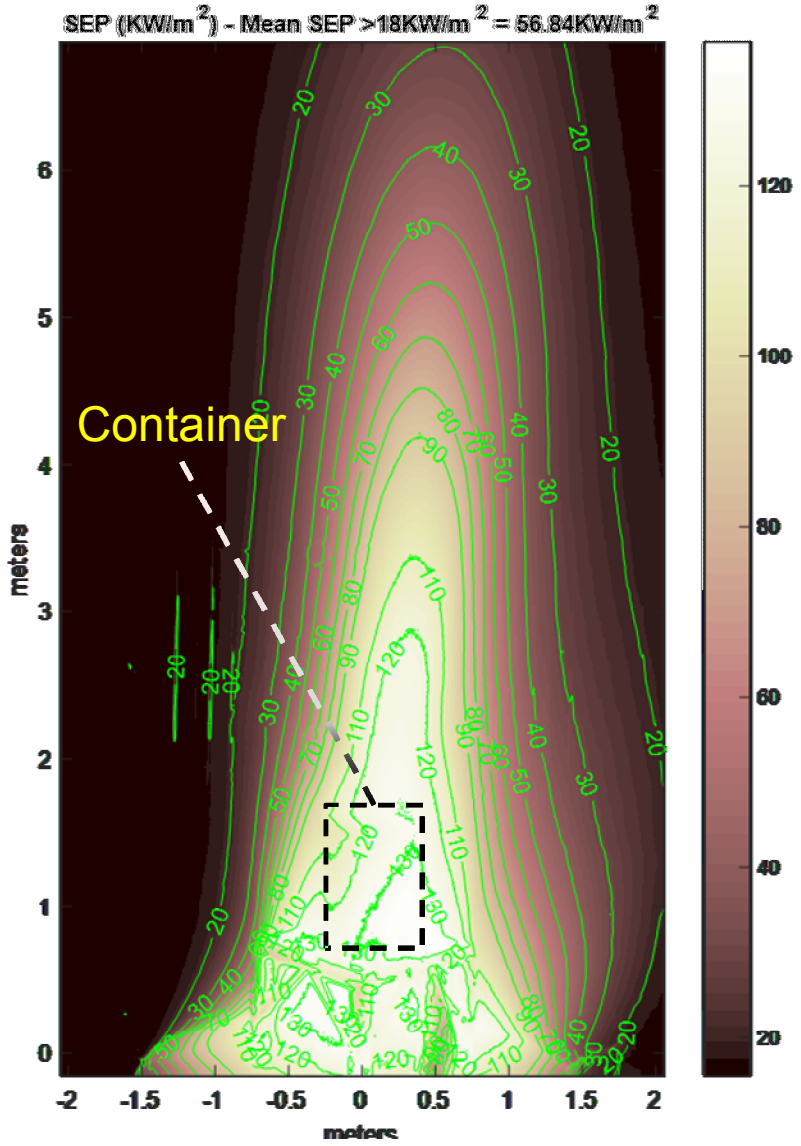
Actual Measurements (Temperature, SEP, Size)



Mid Wave IR

Temporal External Temperature & Surface Emissive Power Averages

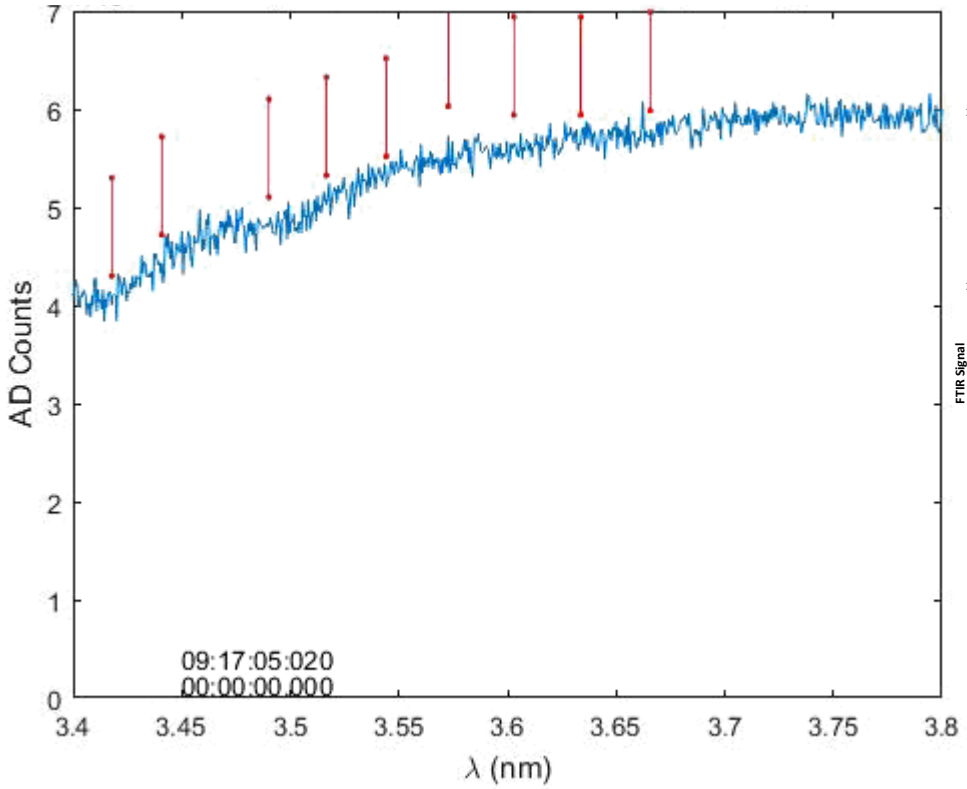




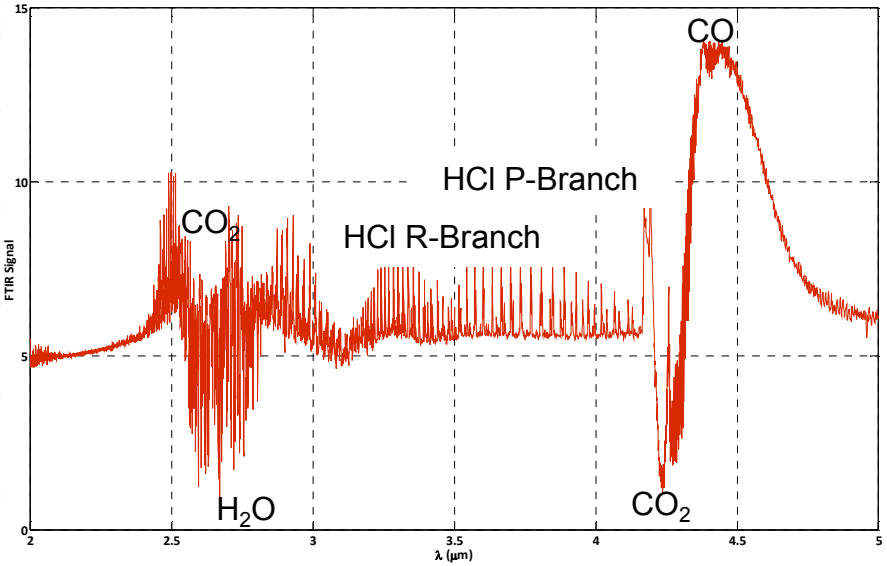
Detection of Some Chemical Species

In some cases, container will release gases and there is interest in determining the gas nature

Hydrogen Chloride Gas Detection



Spectral Data from FTIR



Summary

- Qualitative and quantitative data can be obtained from imaging:
  - Visible: to view outside of the flame and guarantee that the container is inside the flame
  - LWIR: to view the container
  - MWIR: for radiometric measurements of:
    - Temperature
    - Surface Emissive Power
- Spectral capabilities for some species detection