



ECBC SBIR/STTR Projects



TECHNOLOGY DRIVEN. *WARFIGHTER FOCUSED.*

ECBC SBIR/STTR MSCoE STRF Conference

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Optical Polymer

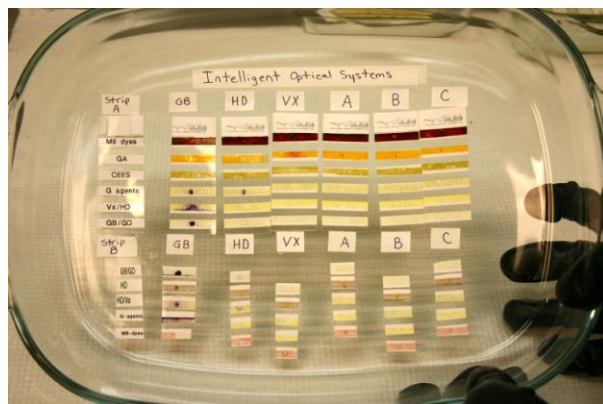
Intelligent Optical Systems: Ms. Manal Beshay

W911SR-11-C-0048 June 2011 – Dec 2011

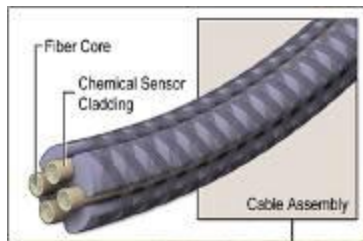
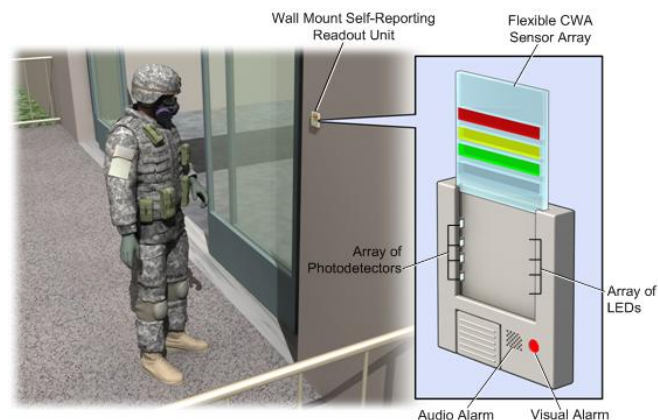
W911SR-12-C-0052 August 2012 - July 2014

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ECBC Phase I Live Agent Exploratory Challenge



Concept for Autonomous Monitor-Alarm



industrial/urban/agro environments



**Polymer Coat enables
Liquid and Vapor
Detection**

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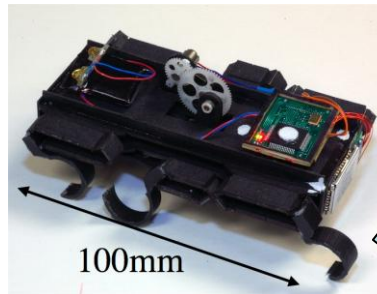
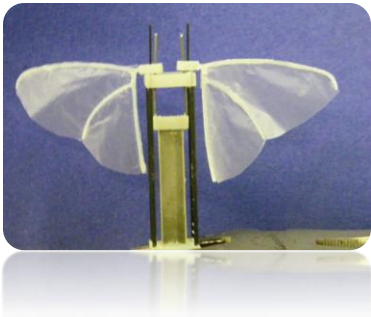
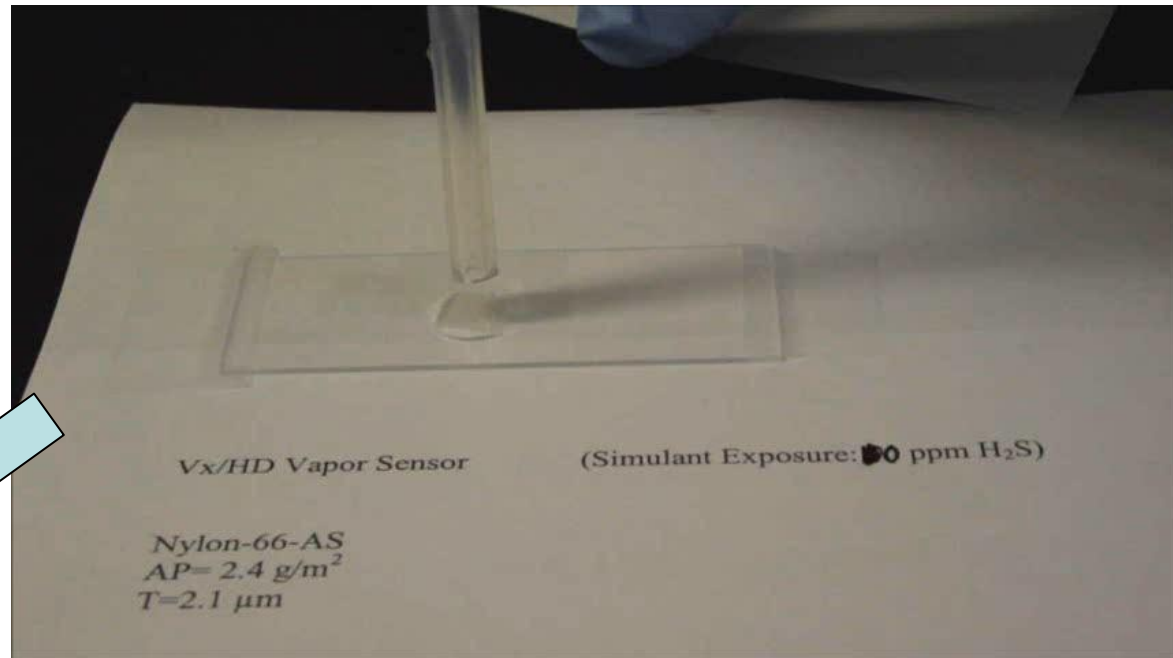
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Optical Polymer - Concept Leverage with ARL CTA MAST

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micro robotic autonomous surveillance and recon

coated wing fabric



coated feet

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Passive Standoff Surface Detection

W911SR-12-C-0004, detect surface
contamination,
PSI Dr. Chris Gittins; subcontractor
Rochester Institute of Technology, Dr.
John Kereckes

Passive Standoff- Detect Contamination on Surfaces

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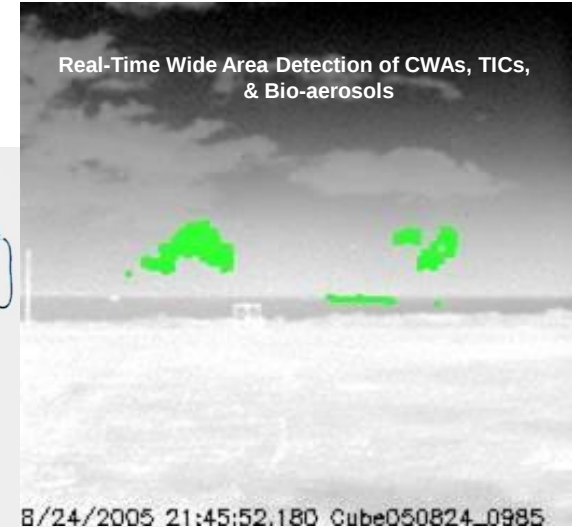
- Silicone oil applied to vehicle roof
- Spectral imagery collected with ***passive standoff sensor*** (AIRIS).
- Red pixels identified by applying an adaptive subspace detector matched to the silicone oil reference spectrum

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Passive Standoff Wide Area Detection

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Dugway Simulant Release



Ground



Airborne



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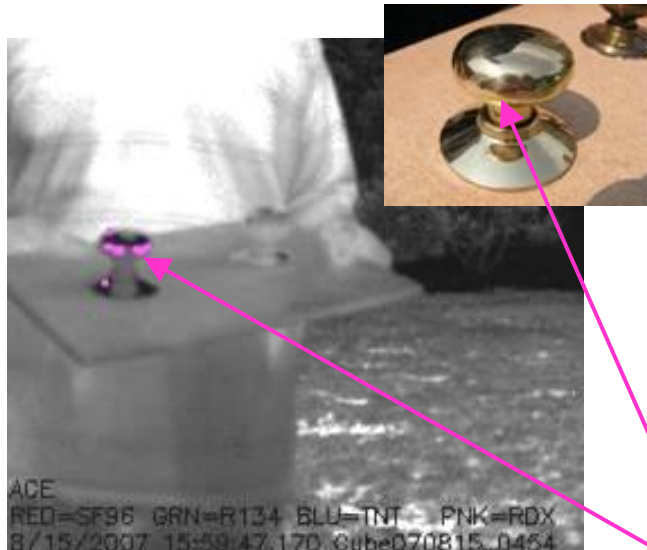
Passive Standoff Detection Non-Porous Real World Surfaces Feasibility Assessment

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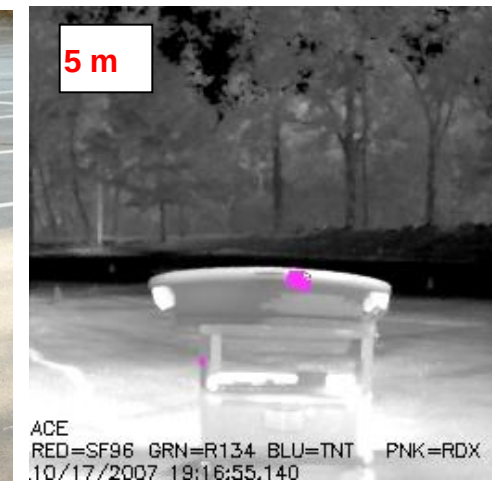
- Detection of explosives on a variety of non-porous metal surfaces demonstrated
- Work recently expanded to HME precursors



RD_X at ~100 - 350 $\mu\text{g}/\text{cm}^2$



SF-96	Red
R134a	Green
TNT	Blue
RD _X	Pink



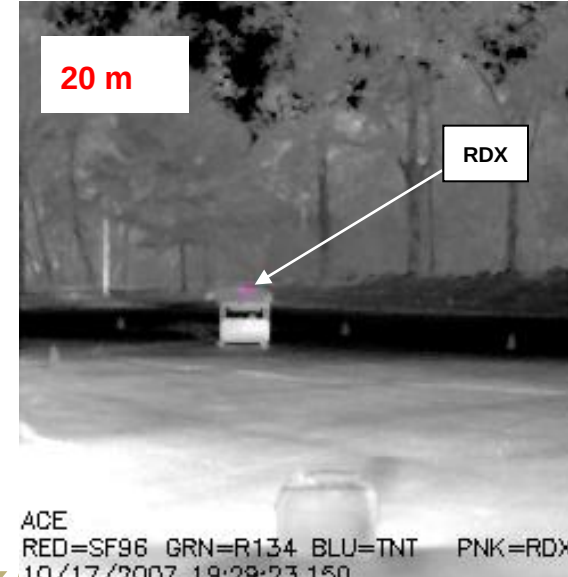
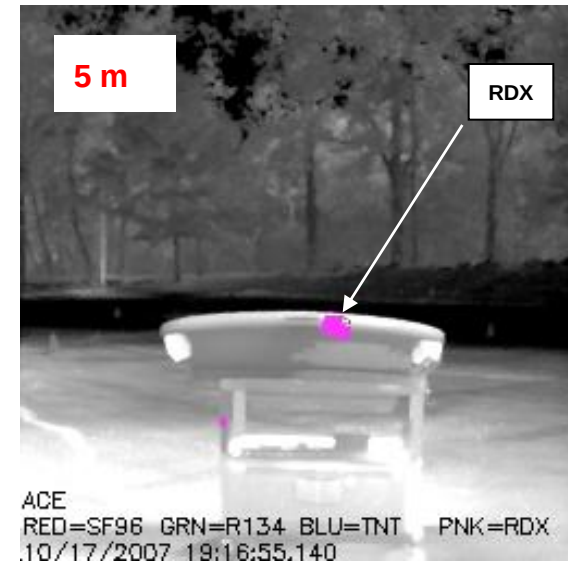
Thumb Smudge of Comp B

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Detection Capability as a Function of Range

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- Detection demonstrated to 20 meters using RDX
 - 2x2 pixels
 - 200 $\mu\text{g}/\text{cm}^2$
- Ranges to 100 meters possible depending on humidity and concentration levels
- Detected levels consistent with expected residues from IED fabrication



SF-96	Red
R134a	Green
TNT	Blue
RDX	Pink

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Real Time Threat Tracking Cooperative Deployment Mobile Platforms

Physical Sciences, Inc

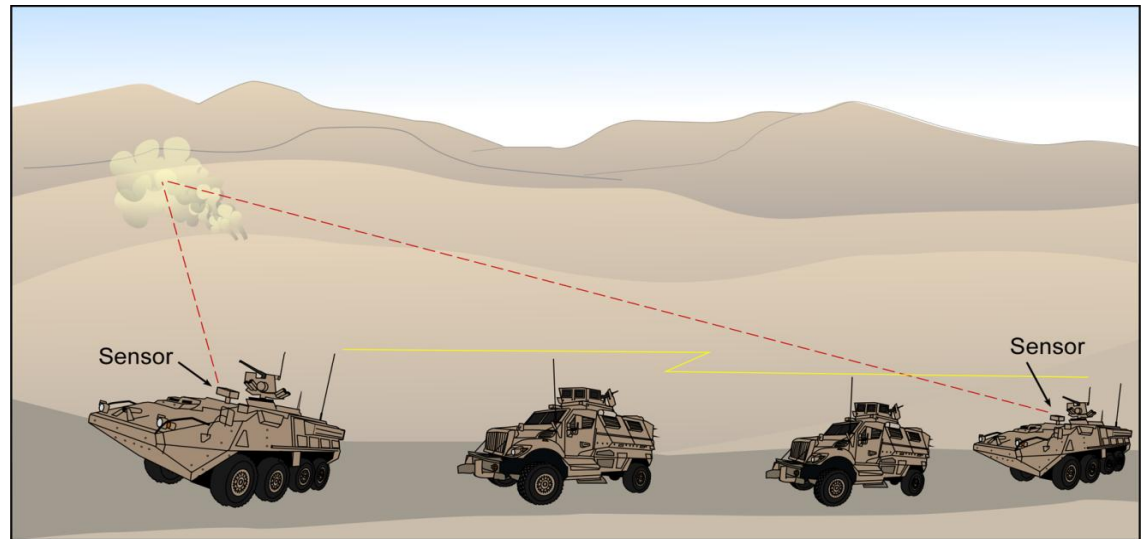
W911SR-11-C-0085, cooperative deployment,
Drs. Bill Marinelli, Bogdan Cosefret

Passive Standoff Real Time Threat Detect Track

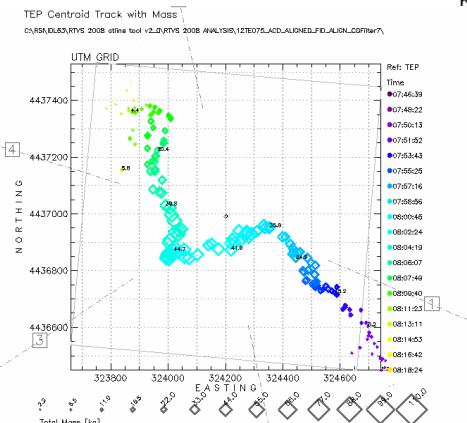
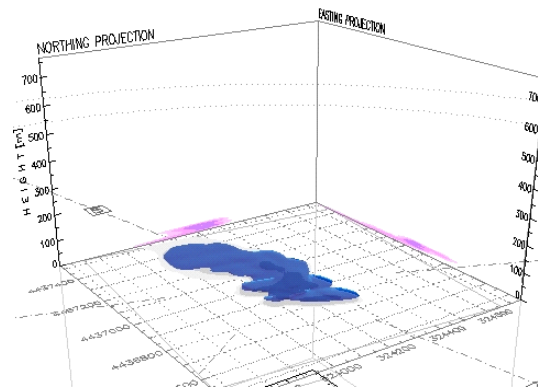
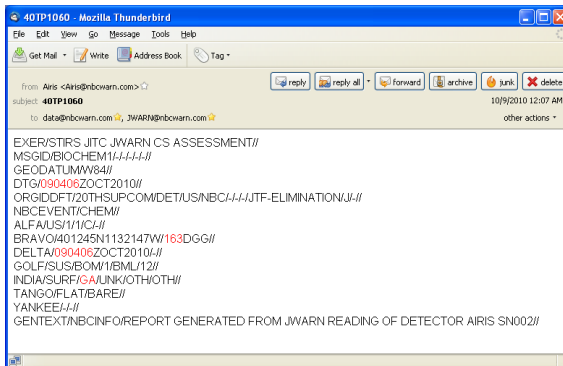
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Dynamic 3-D Threat Mapping Using a Sensor Constellation Deployed on Mobile Platforms

- **Real-time, on-the-move, tomographic reconstruction of threat clouds**
 - range to threat and geolocation
 - Total mass and spatial distribution
- **Passive sensors mounted on mobile sensor platforms determine column density**
- **Tomography workstation determines 3-D concentration and cloud track**



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Wide Area (AIRIS) Sensor Capability

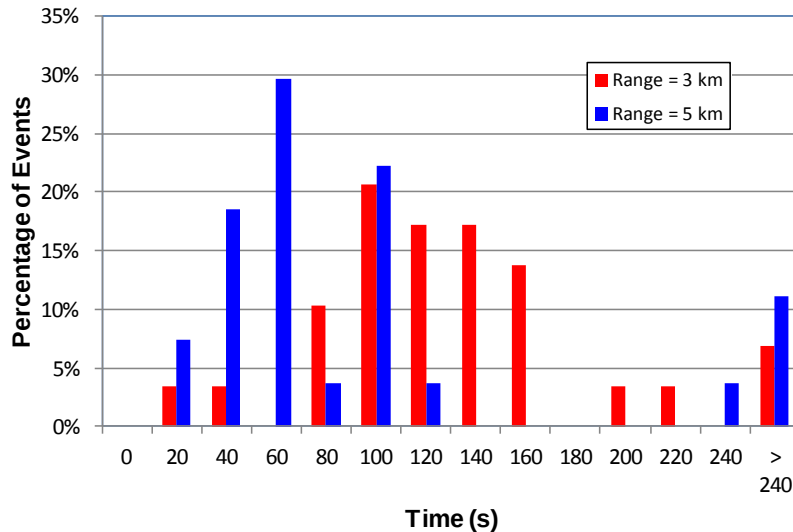
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- Dugway Proving Grounds (2010)
- Sensors at 3 km and 5 km range
- TEP (60 kg) and GAA (120 kg) releases

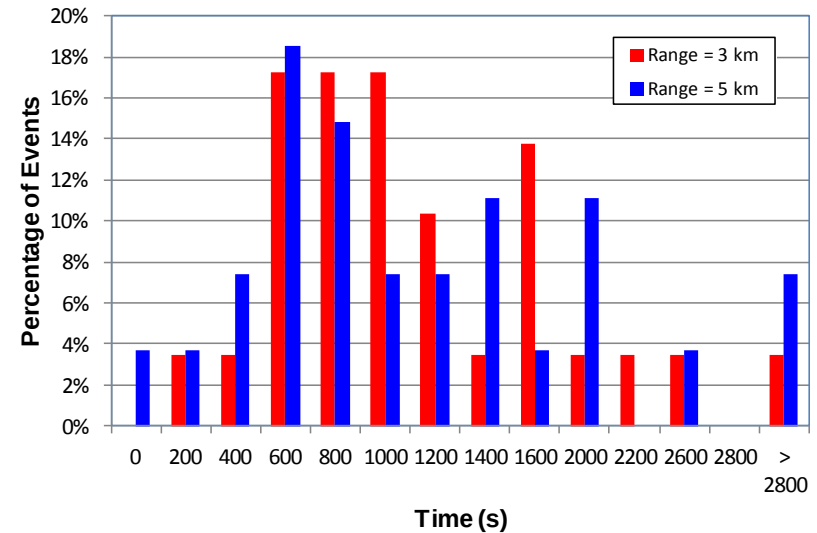


Parameter	Range to Release	
	3 km	5 km
Number of Releases Sampled	29	29
Probability of Alarm	100%	93%
Median Time to Alarm (s)	110	56
Median Track Time (s)	976	984
Sweep Time (s)	37	29

Release Alarm Time



Release Track Time



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Cooperative Sensor Deployment



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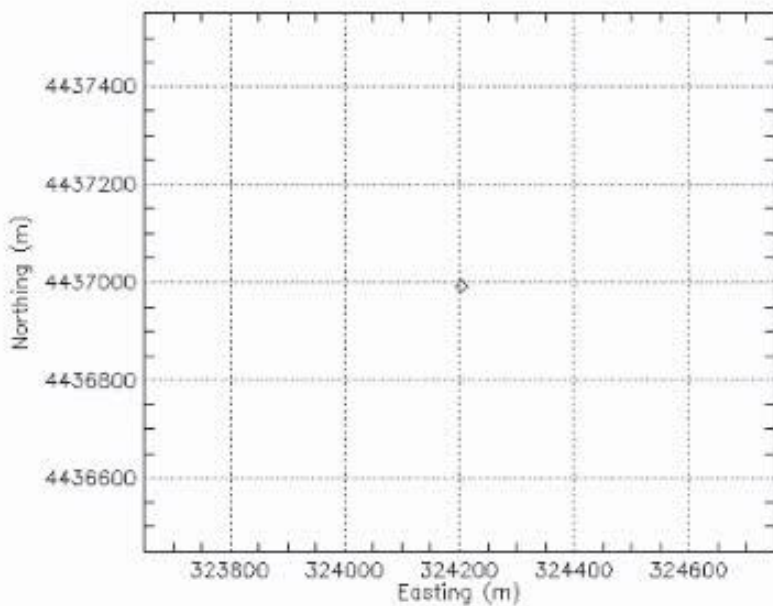
Dynamic 3-D Threat Mapping Using a Sensor Constellation Deployed on Mobile Platforms

Field Test, real-time, on-the-move, range, extent, tomographic threat cloud reconstruction, concentration distribution, COM geo-location

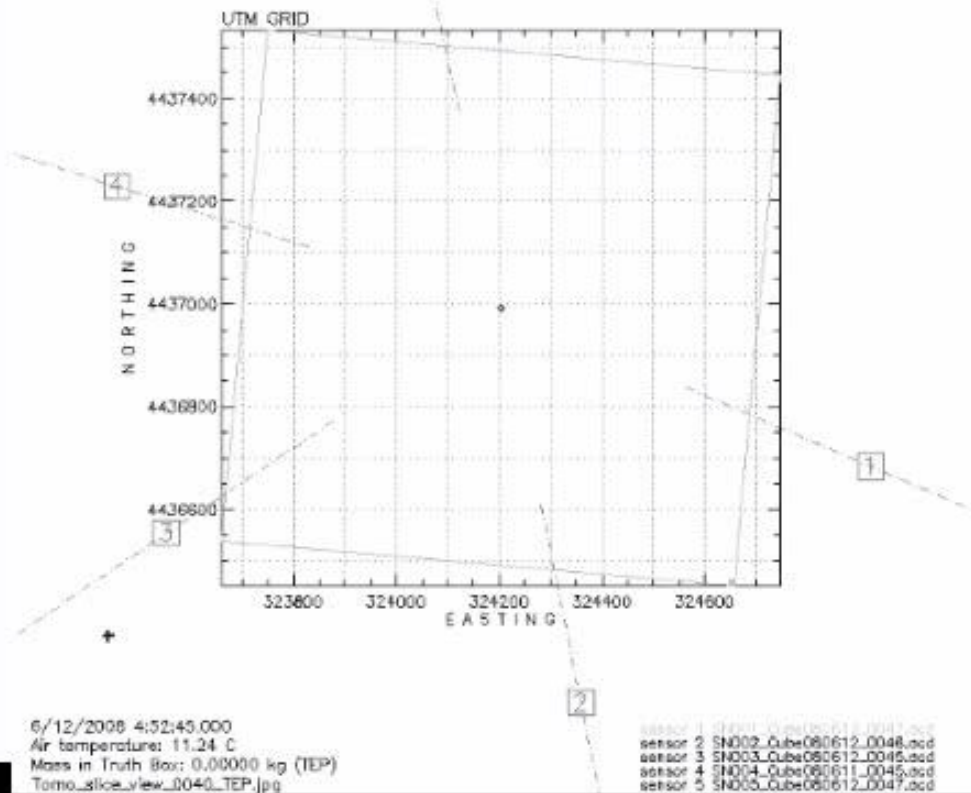
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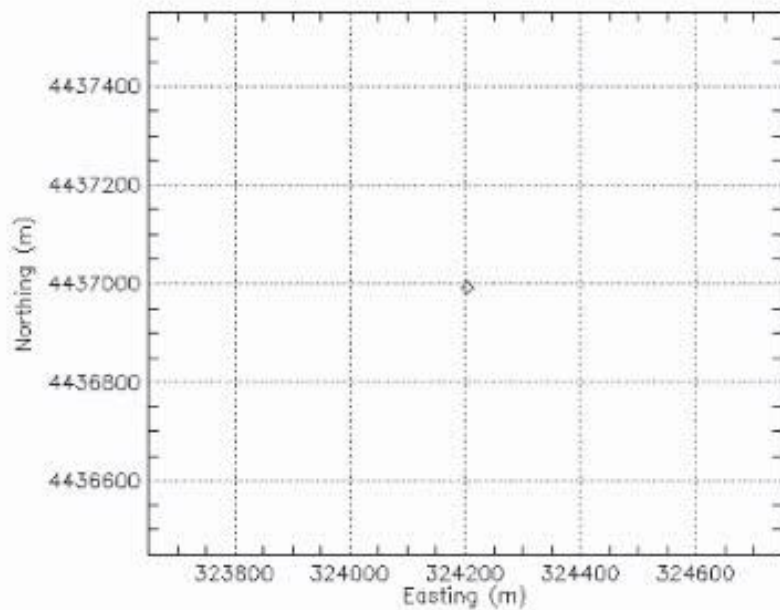
Slice ID (height): 127 (-5.98 m) 128 (0.00 m) 129 (5.98 m)
 Mass in Slice: 0.0000 kg 0.0000 kg 0.0000 kg
 ISOCOONTOUR
 Thresh= 0.5[mg/m³]
 + Centroid of mass in reconstruction (UTM)
 Easting: 323441.4 Northing: 4436352.8



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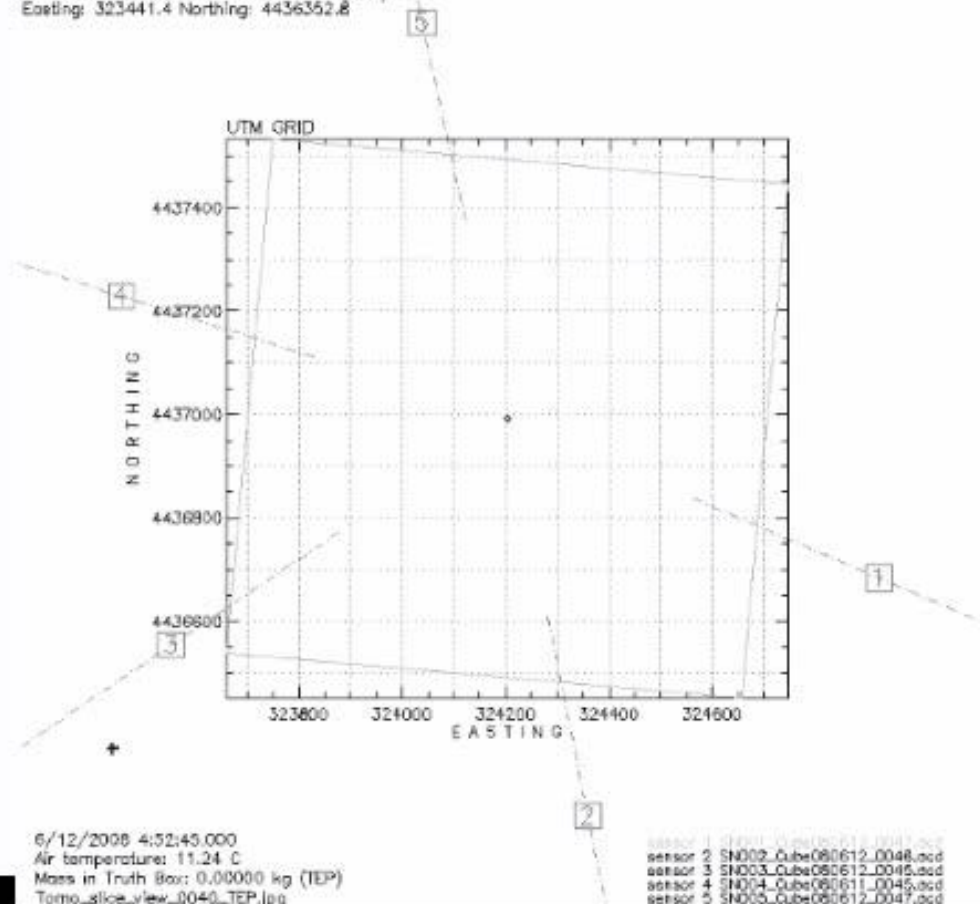
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Slice ID (height): 127 (-5.98 m) 128 (0.00 m) 129 (5.98 m)
 Mass in Slice: 0.0000 kg 0.0000 kg 0.0000 kg
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 Thresh = 0.5[mg/m³]

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BACKUP SLIDES

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BACKUP SLIDES

M-8 Paper

Orono Spectra Solutions, Maine: Dr. Luke Doucette, Mr. Dean Smith

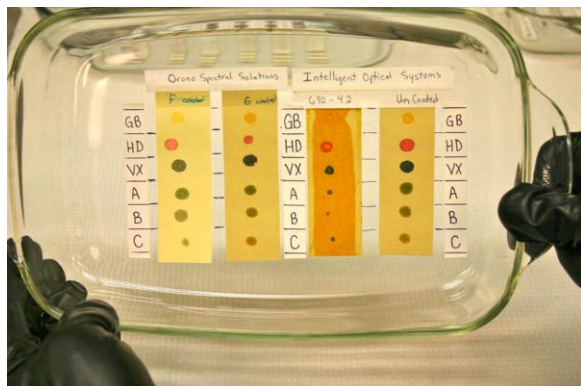
University of Maine and LASST (Laboratory for Surface Science and Technology): Dr. Carl Trip

W911SR-11-C-0051 June 2011 – December 2011

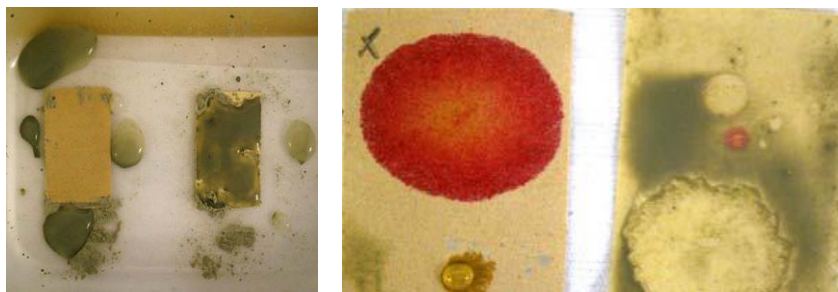
W911SR-12-C-0052 September 2012 – August 2014

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Phase I- exploratory CWA challenge



Self Cleaning Properties



7 Days fixed on side of building (snow melt)



Other Challenges to coated paper:

UV Testing: Simulated 240 hours of intense sunlight

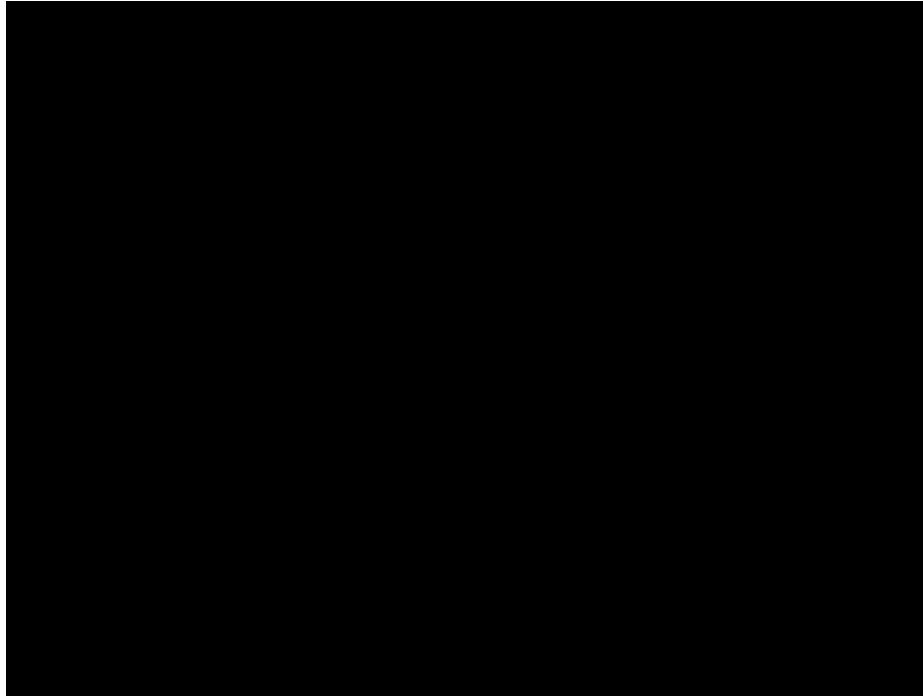
Shelf Life: Retested First films from 13 months ago

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NO LIVE AGENTS WERE USED TO MAKE THIS MOVIE CLIP



LIVE AGENT EXPLORATORY CHALLENGE CONDUCTED AT ECBC NOT
VALIDATED TESTING

MORE RIGOROUS TESTING PLANNED FOR PHASE II

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