Home Smoke Alarm Tests

Detector Response Tests (Calibration)

Overview

- **Analog Output Detectors**
- **Fire Emulator/Detector Evauator**
- **Calibration Protocols**

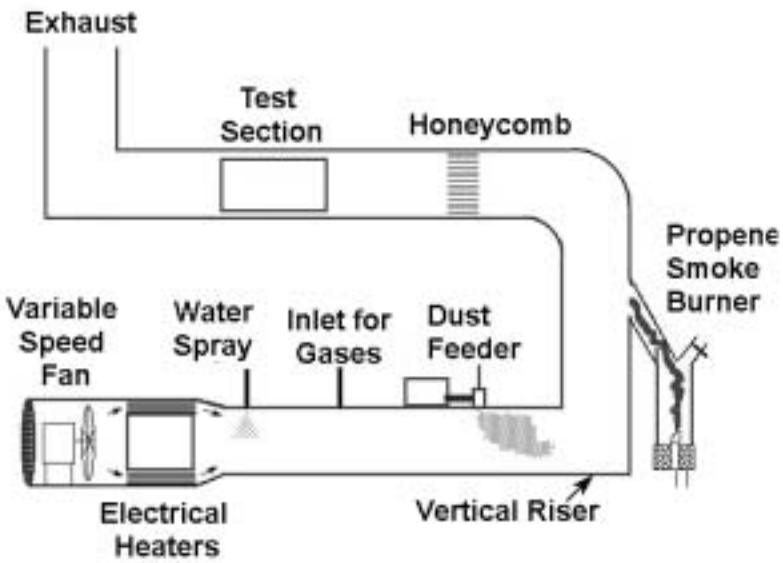
Modified Residential Detectors

- **“Continuous” analog output of the sensor response to environment**
  - **Photoelectric, Ionization, Carbon Monoxide (electrochemical and Tin Oxide semiconductor sensors)**
- **Binary output heat detectors**

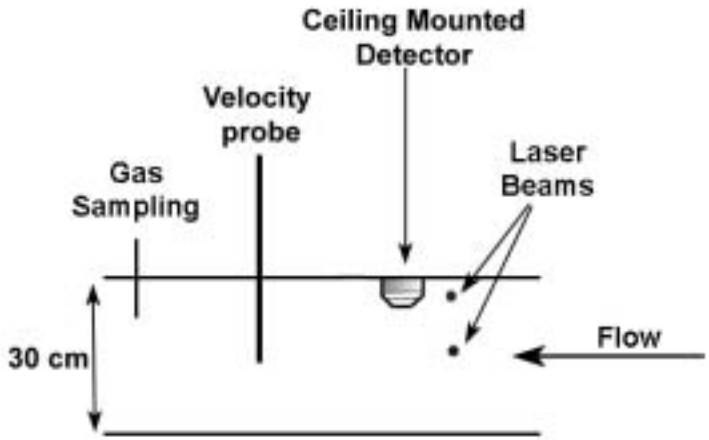
The Fire Emulator/Detector Evaluator

- **The Fire Emulator/Detector Evaluator is a single-pass flow tunnel with a 0.3 m x 0.6 m cross section.**
- **Designed for evaluating fire detector response to fire and non-fire stimuli.**
- **Experimental or modeled phenomena programmed into FE/DE.**

The Fire Emulator/Detector Evaluator



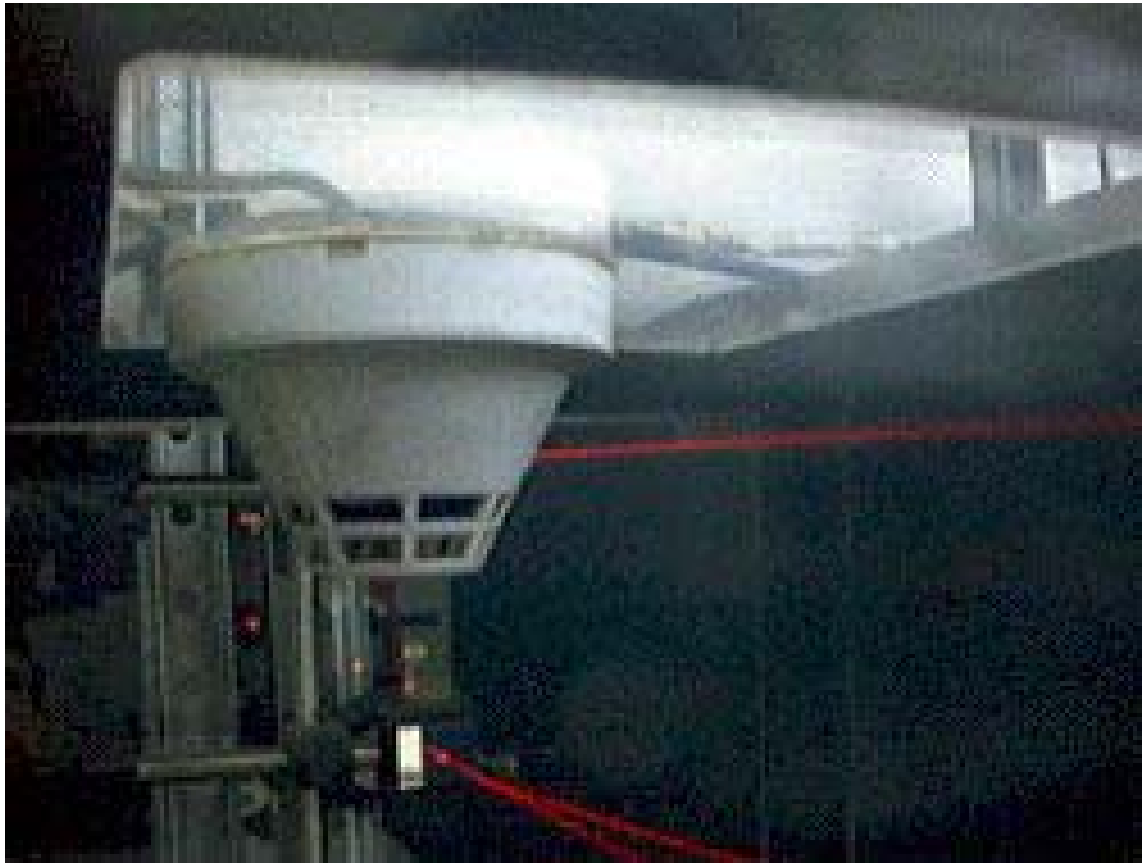
Fire Emulator Detector Evaluator



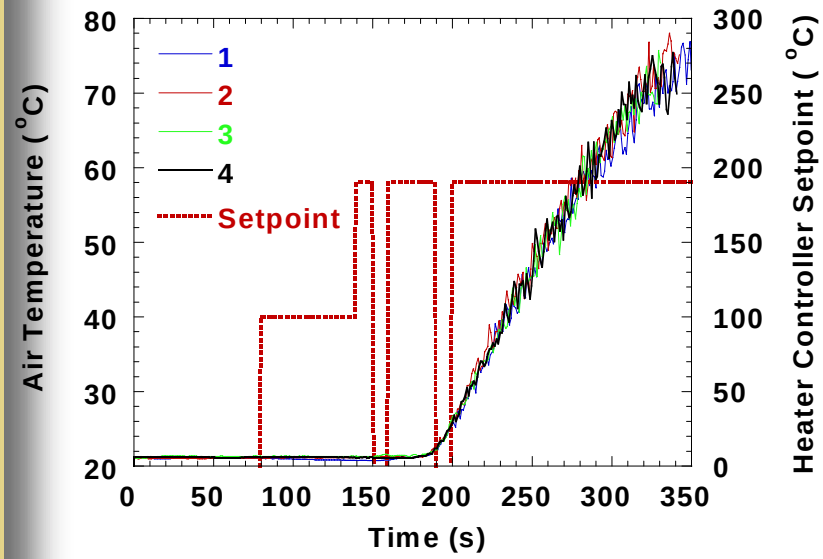
Test Section Side View

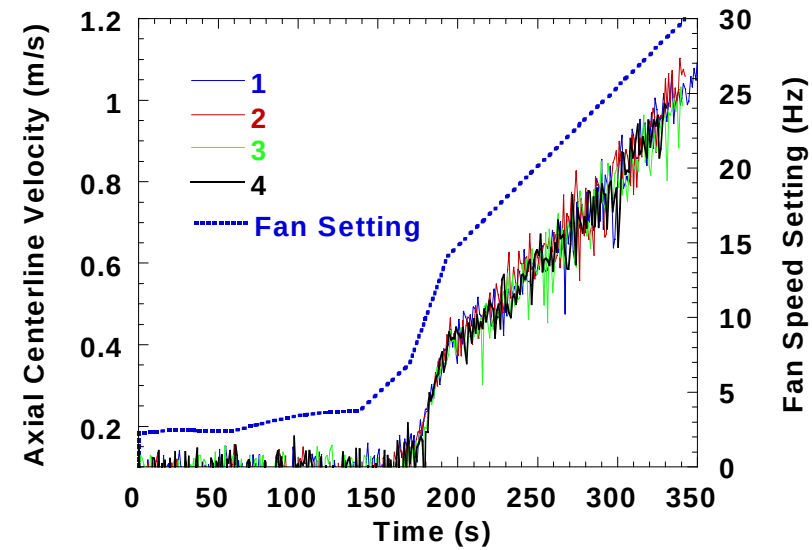
The FE/DE

Detector at the Test Section



Temperature and velocity at a detector location reproduced from a a modeled fire

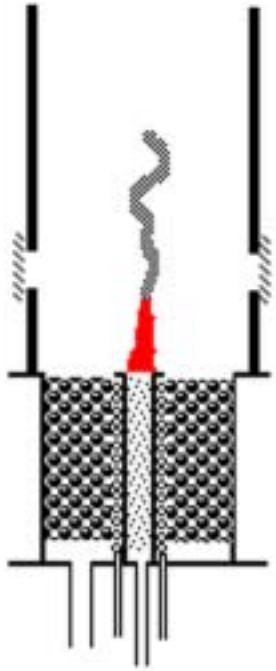




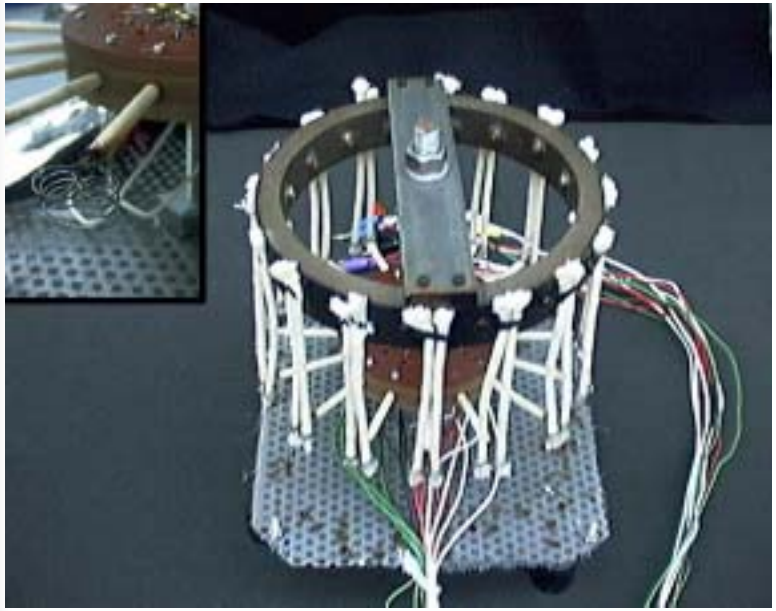
Calibration Smokes

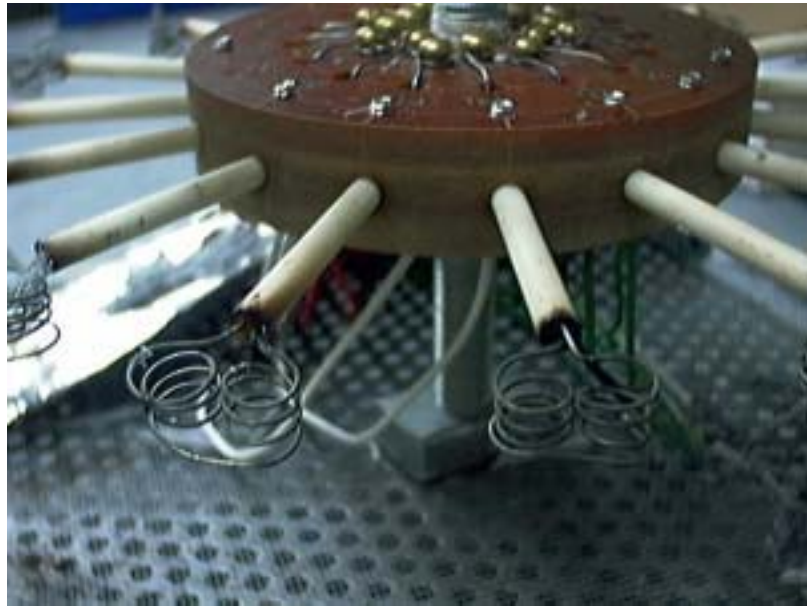
- **Black soot from propene flame**
- **Smolder smolder from cotton wicks**

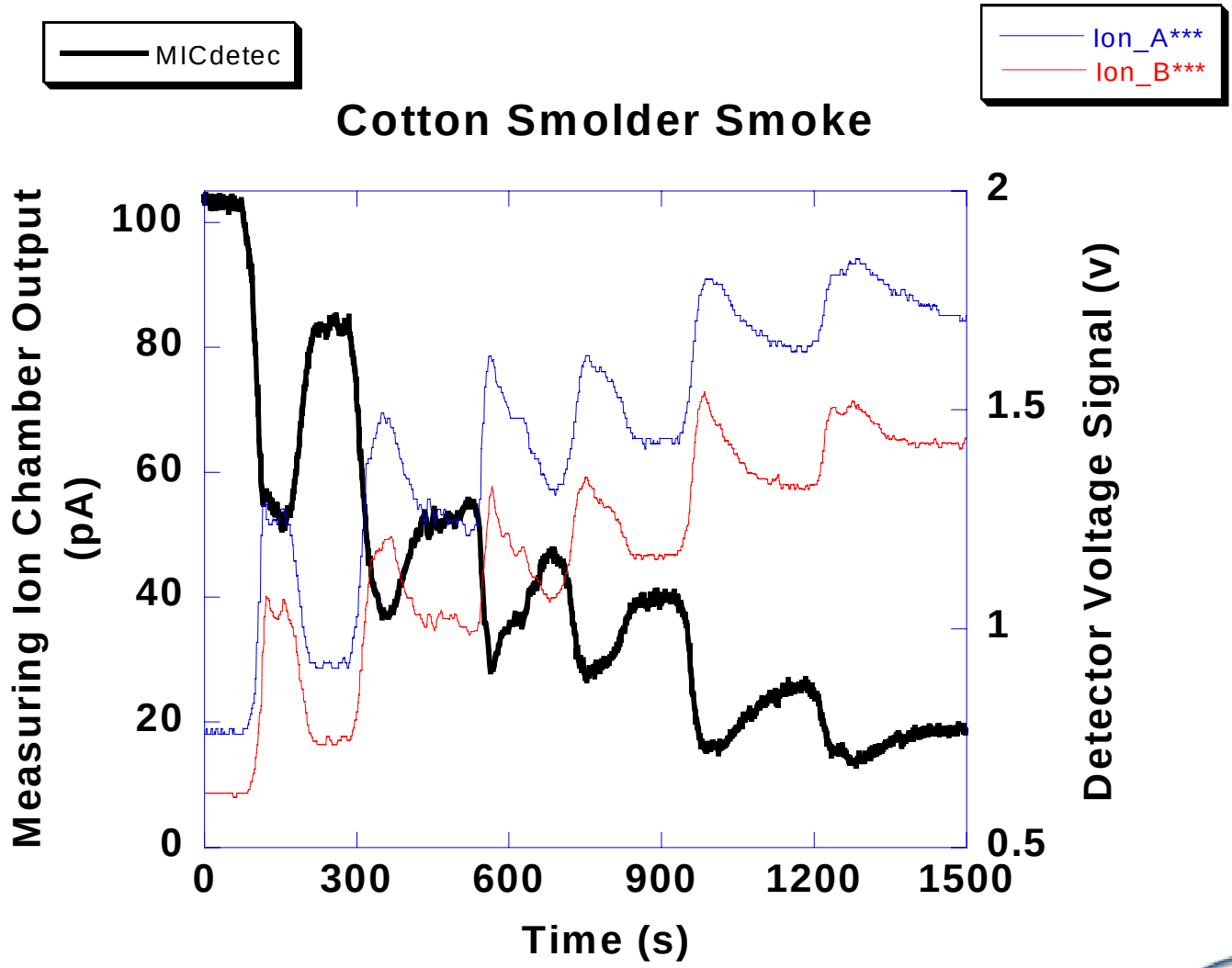
Propene Diffusion Flame Burner
Steady black smoke generator

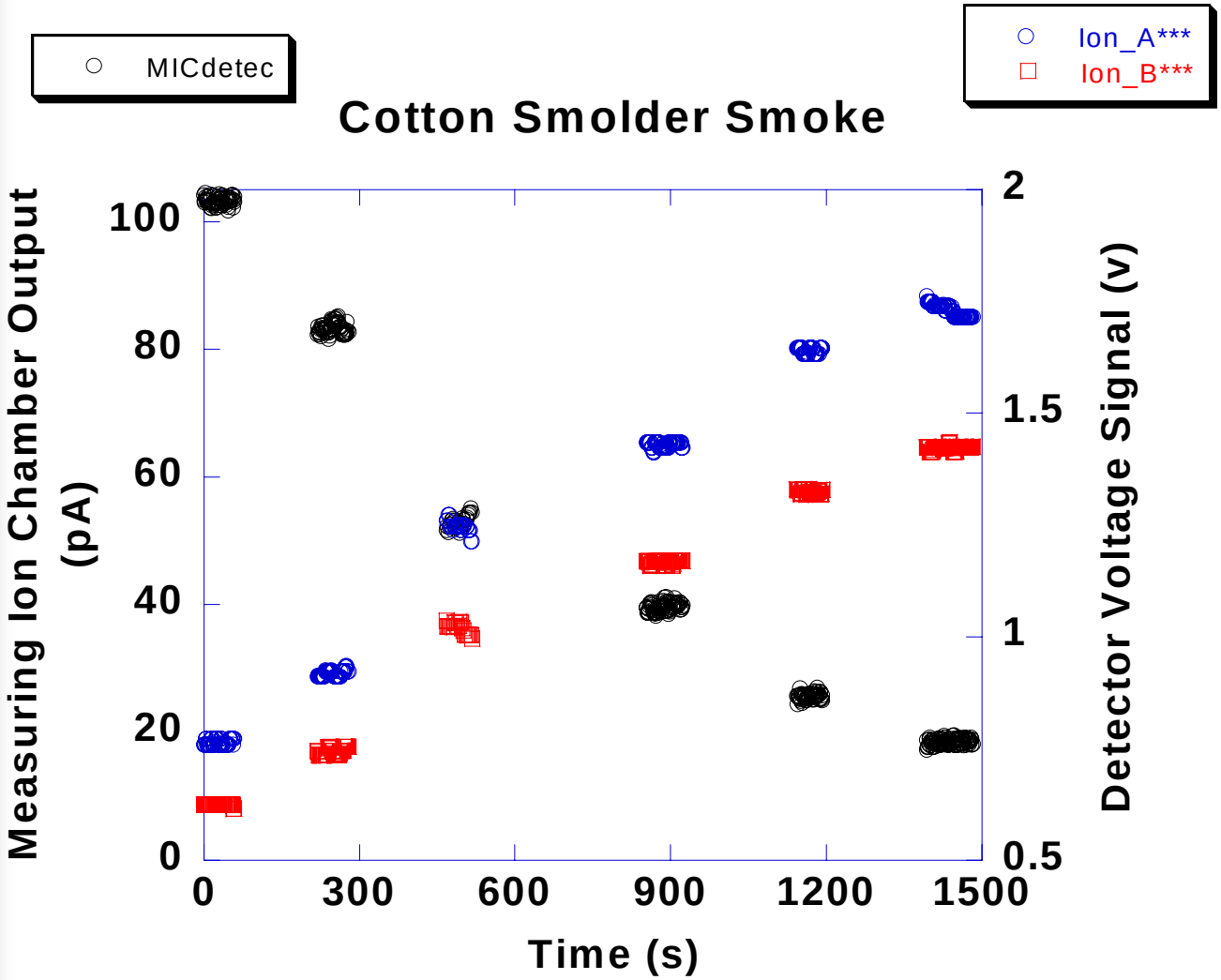


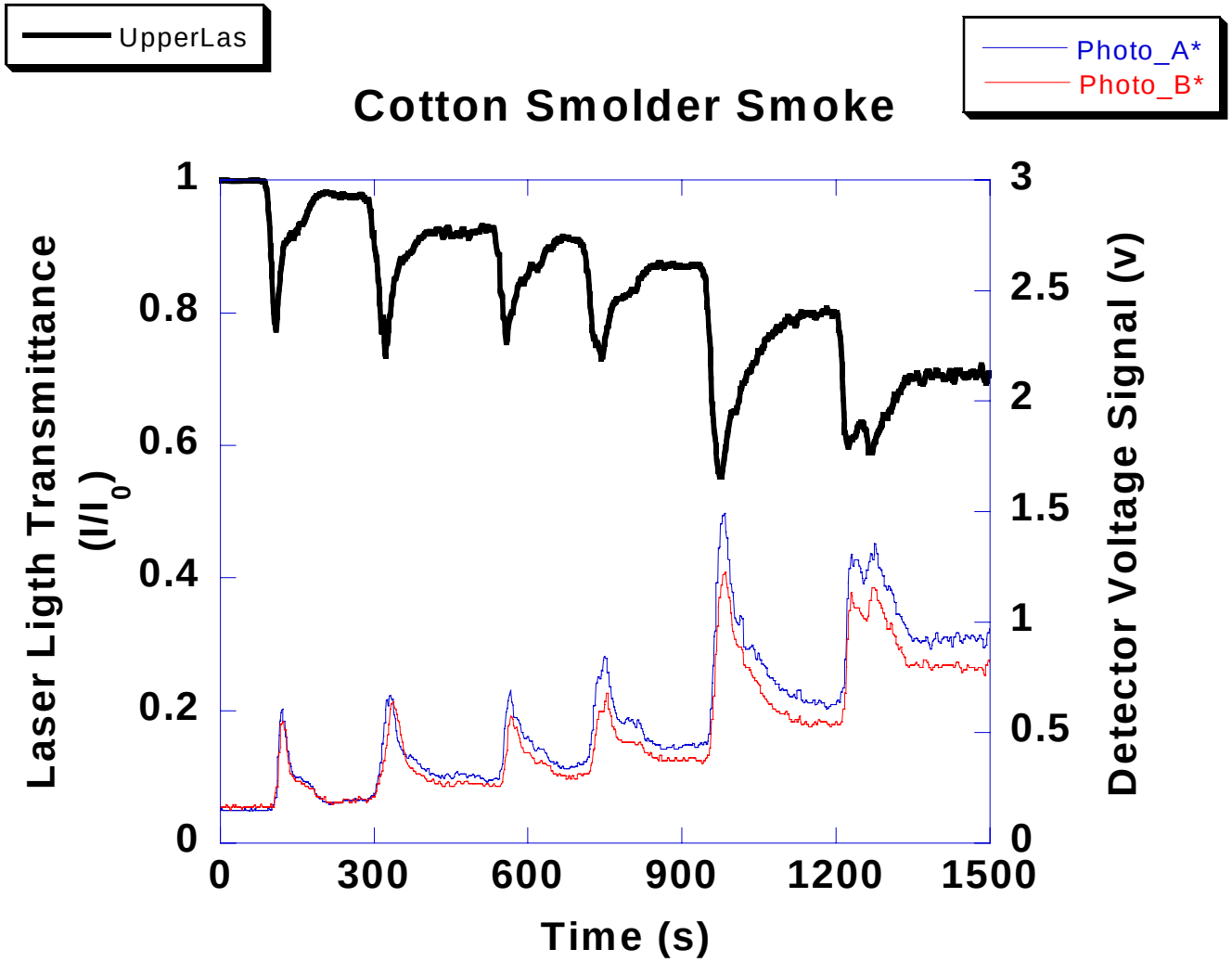
Staged Wick Ignition Device

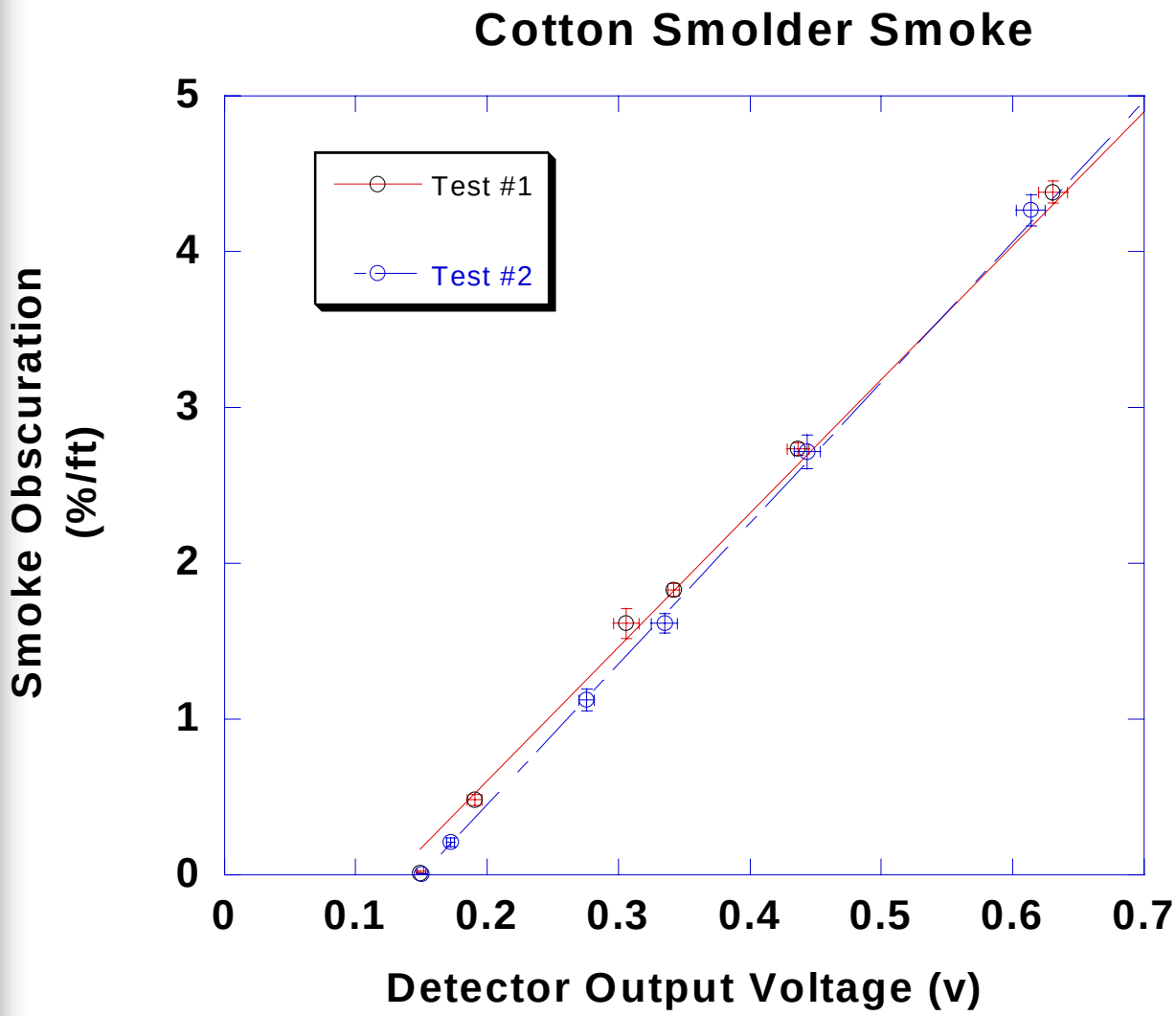


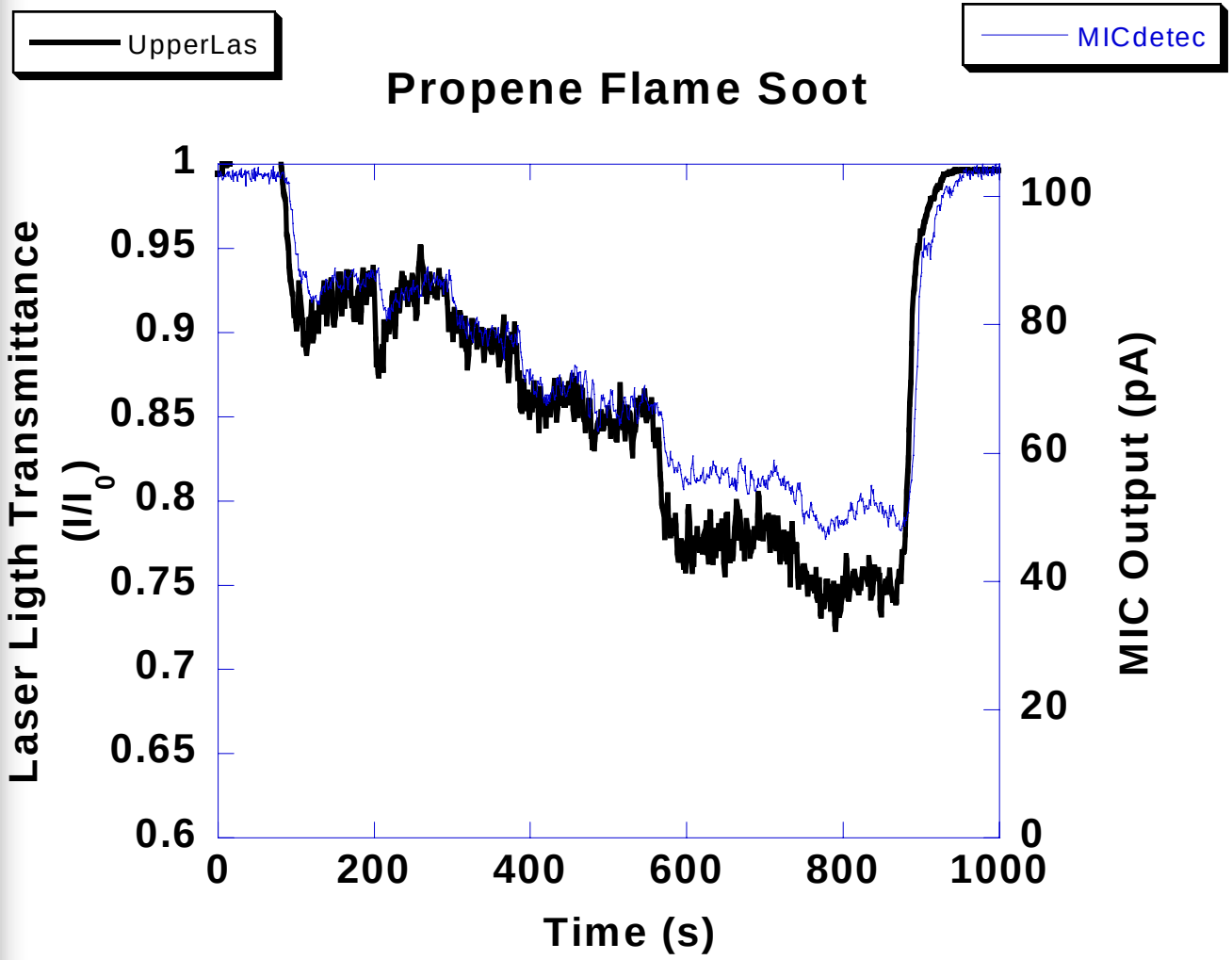


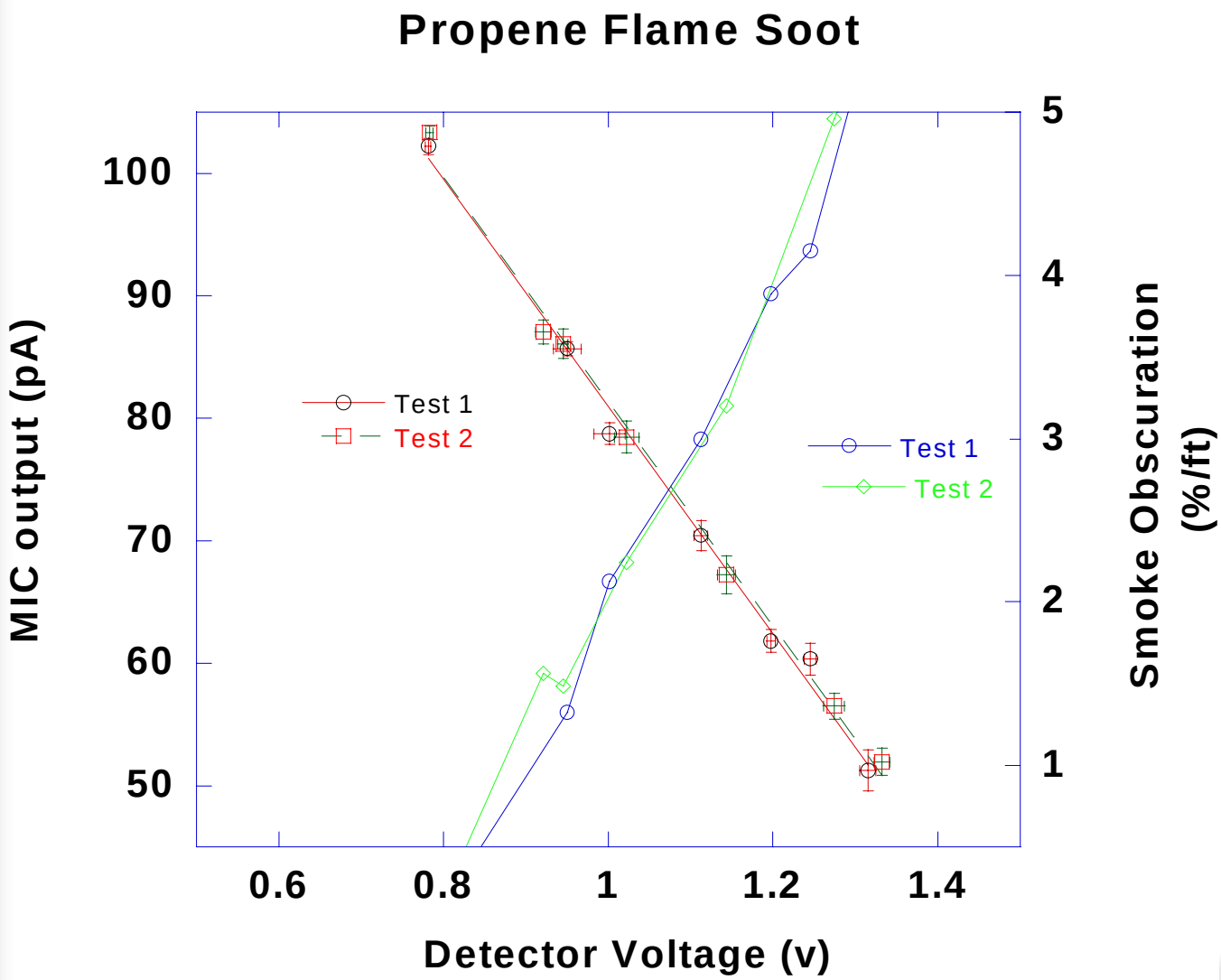

MICdetec
Ion_A***
Ion_B***
Cotton Smolder Smoke
Measuring Ion Chamber Output (pA)
Detector Voltage Signal (v)
Time (s)
0
20
40
60
80
100
0.5
1
1.5
2
0
300
600
900
1200
1500

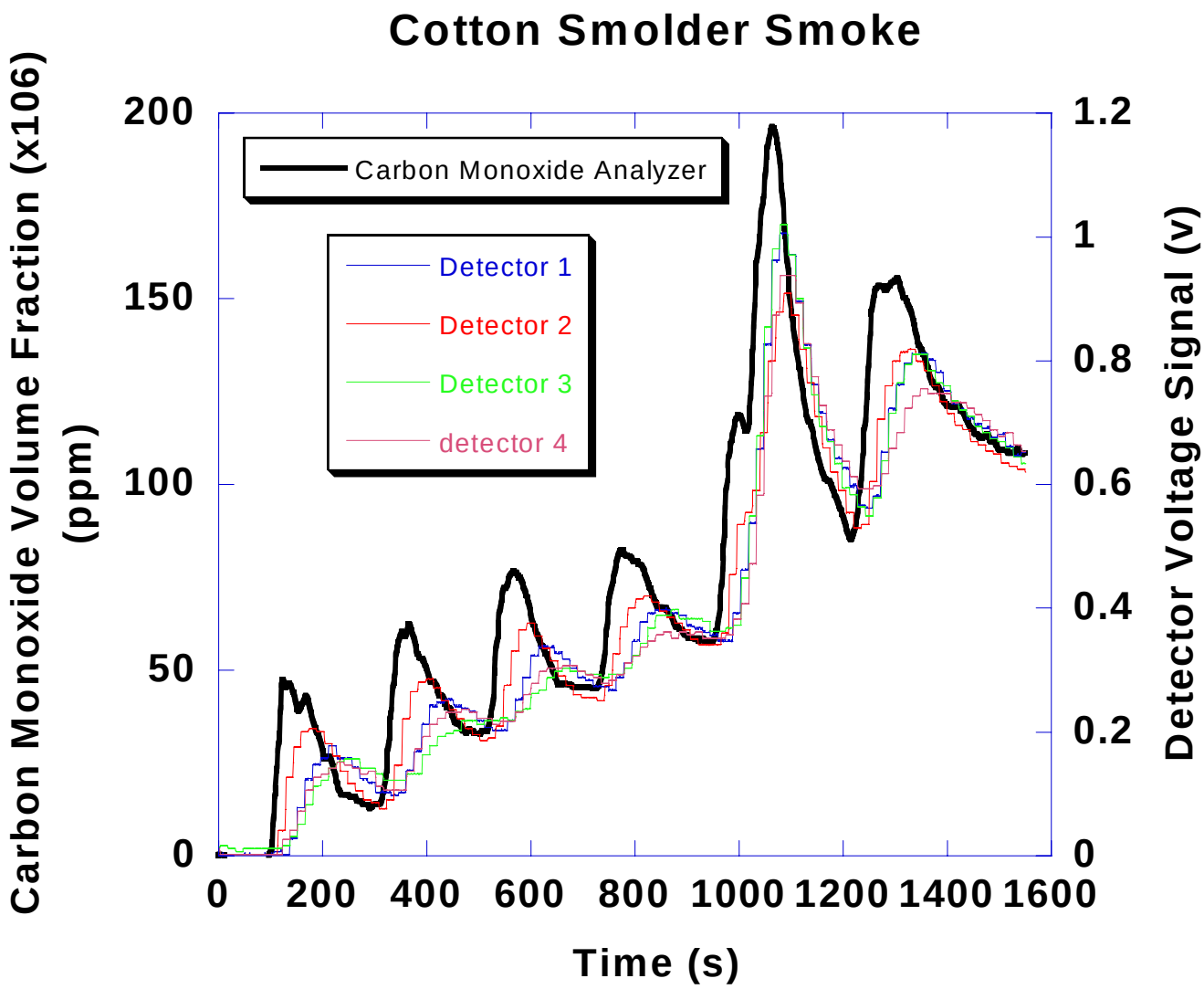

MICdetec
Ion_A***
Ion_B***
Cotton Smolder Smoke
Measuring Ion Chamber Output (pA)
Detector Voltage Signal (v)
Time (s)
0
20
40
60
80
100
0.5
1
1.5
2
0
300
600
900
1200
1500

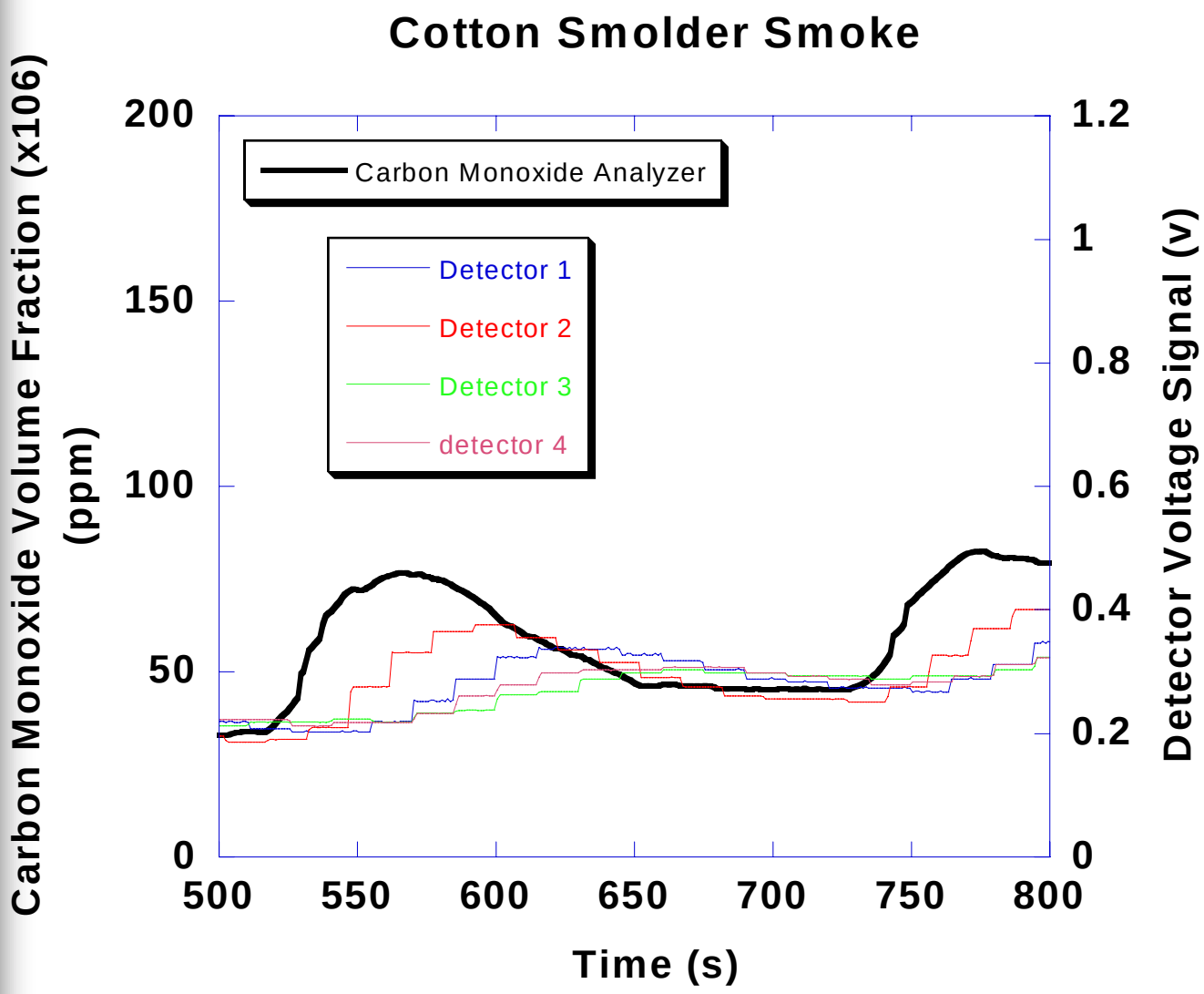

UpperLas
Photo_A*
Photo_B*
Cotton Smolder Smoke
Laser Ligth Transmittance
(I/I0)
Detector Voltage Signal (v)
Time (s)
0
0.2
0.4
0.6
0.8
1
0
0.5
1
1.5
2
2.5
3
0
300
600
900
1200
1500

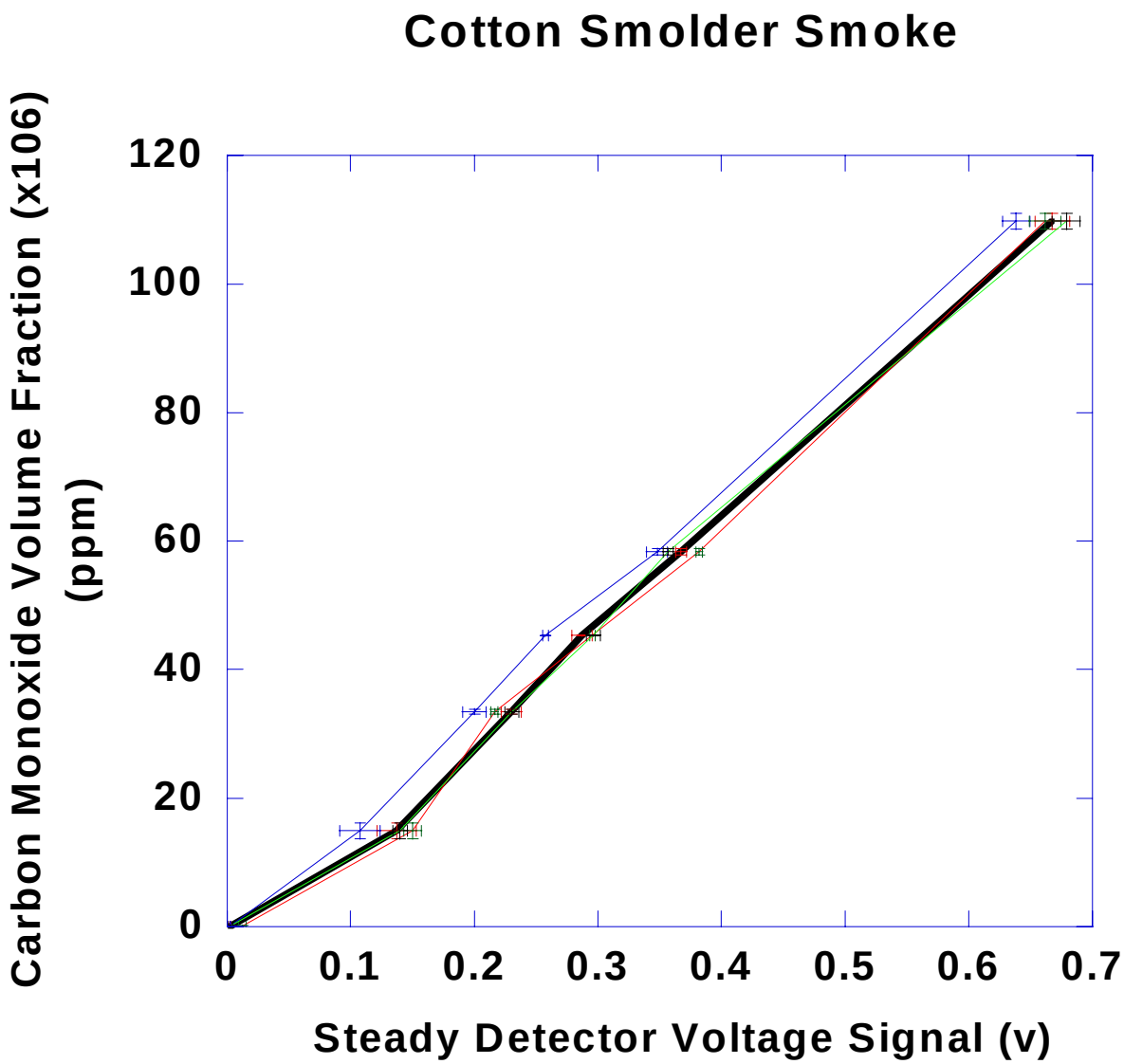

Cotton Smolder Smoke
Test #1
Test #2
Smoke Obscuration (%/ft)
Detector Output Voltage (v)
0
1
2
3
4
5
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7


UpperLas
MICdetec
Propene Flame Soot
Laser Ligth Transmittance
(I/I0)
MIC Output (pA)
Time (s)
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
100
80
60
40
20
0
0
200
400
600
800
1000


Propene Flame Soot
MIC output (pA)
100
90
80
70
60
50
Test 1
Test 2
Test 1
Test 2
5
4
3
2
1
Smoke Obscuration (%/ft)
0.6
0.8
1
1.2
1.4
Detector Voltage (v)


Cotton Smolder Smoke
Carbon Monoxide Analyzer
Detector 1
Detector 2
Detector 3
detector 4
Carbon Monoxide Volume Fraction (x106) (ppm)
Detector Voltage Signal (v)
Time (s)
0
50
100
150
200
0
0.2
0.4
0.6
0.8
1
1.2
0
200
400
600
800
1000
1200
1400
1600


Cotton Smolder Smoke
Carbon Monoxide Analyzer
Detector 1
Detector 2
Detector 3
detector 4
Carbon Monoxide Volume Fraction (x106) (ppm)
Detector Voltage Signal (v)
Time (s)
200
150
100
50
0
1.2
1
0.8
0.6
0.4
0.2
0
500
550
600
650
700
750
800


Cotton Smolder Smoke
Carbon Monoxide Volume Fraction (x106) (ppm)
120
100
80
60
40
20
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Steady Detector Voltage Signal (v)

Questions?