Dust Detection on SDC
(Student Dust Counter)

Chelsey Bryant
SDC Detector Design and Constraints
December 9, 2003
“The New Horizons Pluto-Kuiper Belt mission is designed to help us understand worlds at the edge of our solar system by making the first reconnaissance of Pluto and Charon”

Student Dust counter will fly on the New Horizon’s mission to Pluto and its moon, Charon
Launch – January 2006
Will reach Pluto July 2015
Student Dust Counter (SDC) of the New Horizons Mission

EPO project: providing a unique opportunity for students to design, build, test, calibrate, operate a deep space instrument and harvest its science!

SDC Temperature Range
-120 C to 75 C
SDC PVDF Detector Design

Frame Cover

PVDF Film

Top Frame

Bottom Frame

Kapton Tape

PicoCoax

Copper Bus Wire

Outer Dimensions: 5.6 in. x 2.563 in.
Detector Area: 14.3528 in^2
Detector Capacitance: ~30 nF (25 °C)
Mass = 10.25 g
Detector Materials

- **PVDF (Polyvinylidene Fluoride Film)**
  - 28 µm thick with 850 Å Aluminum and 150 Å Nickel on top and bottom surfaces

- **Kapton Tape**
  - Temperature increase of PVDF material during third stage burn
  - Electrically isolates Detector from Honeycomb panel the detectors are mounted to

- **Wire around inner perimeter of frame**
  - Longevity of conductive epoxy
  - Mitigates dependence on conductive epoxy effectiveness

- **Aluminum Frame Cover**
  - Space Charging
  - Thermal Constraints
Detector Materials and Verification

**Electrical Connection**

**36 Gauge Pico Coax** - electrical connection from detector frame to electronics
- Outgassing
  - CVCM (wt%) = .027
  - Total Mass Loss (wt%) = .022

**Conductive Epoxy** - electrical connection from PVDF material to detector frame
- **Masterbond EP21TDCS** – MED Conductive Epoxy
  - Temperature Range: -270 °C to 121 °C
  - Outgassing
    - CVCM (wt%) = .044
    - Total Mass Loss (wt%) = .456

**Nonconductive Epoxy**
- **Scotchweld 2216**
  - Temperature Range: -250 °C to 82 °C
References

