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TEPC Results from ICCHIBAN-5, Proton ICCHIBAN-1, and the KC135 Flight Environment Characterization Experiments

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Outline

- Overview spatially restricted LET model
- ICCHIBAN-5 preliminary results
- Proton ICCHIBAN-1 preliminary results
- KC135 flight environment characterization
- Conclusions

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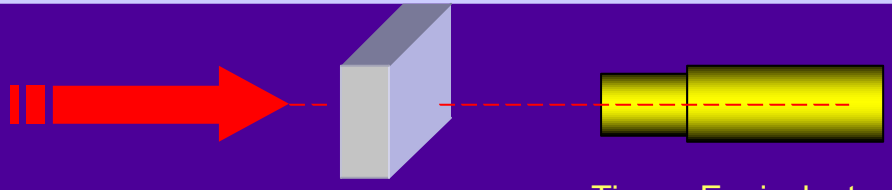
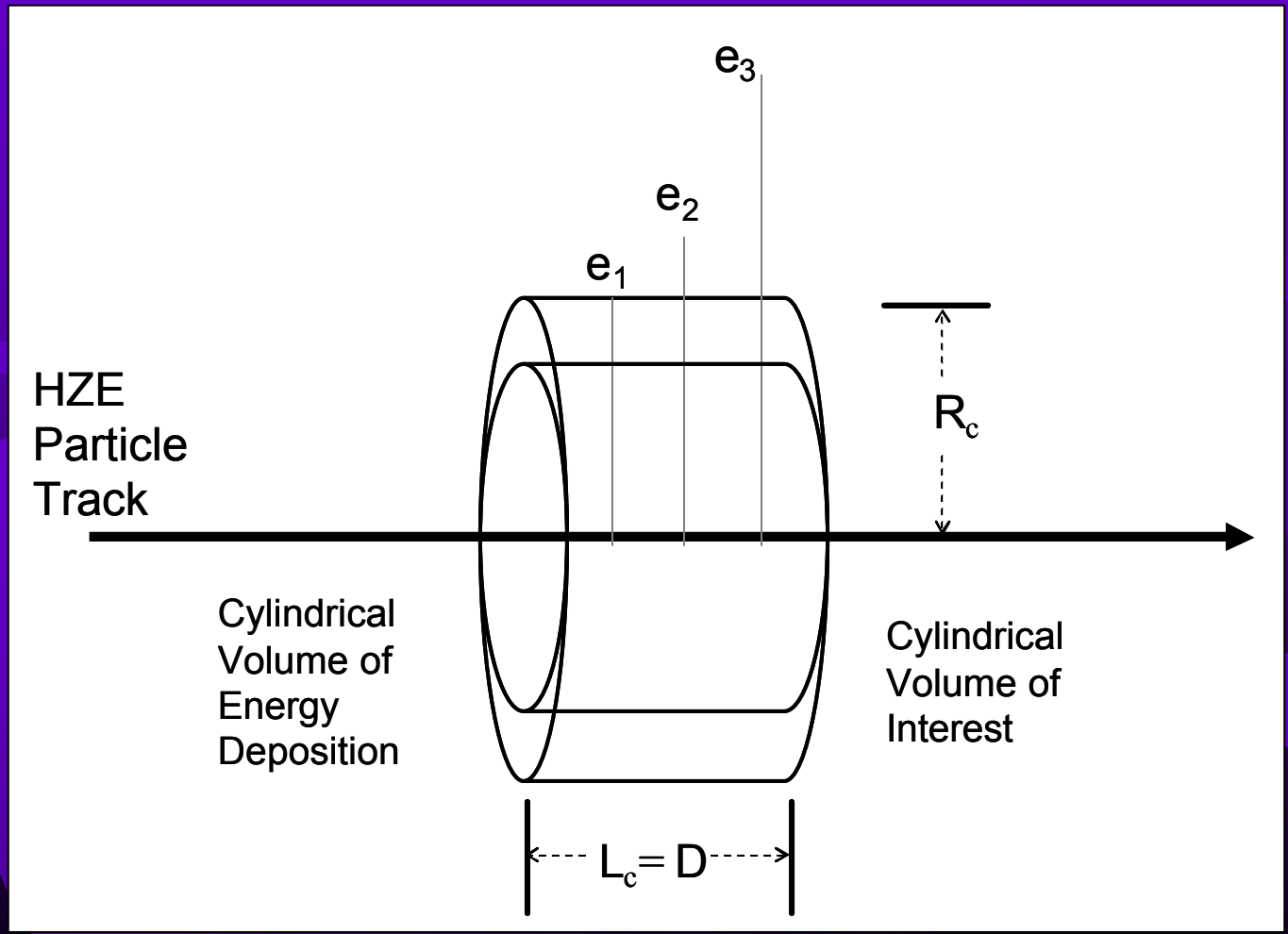
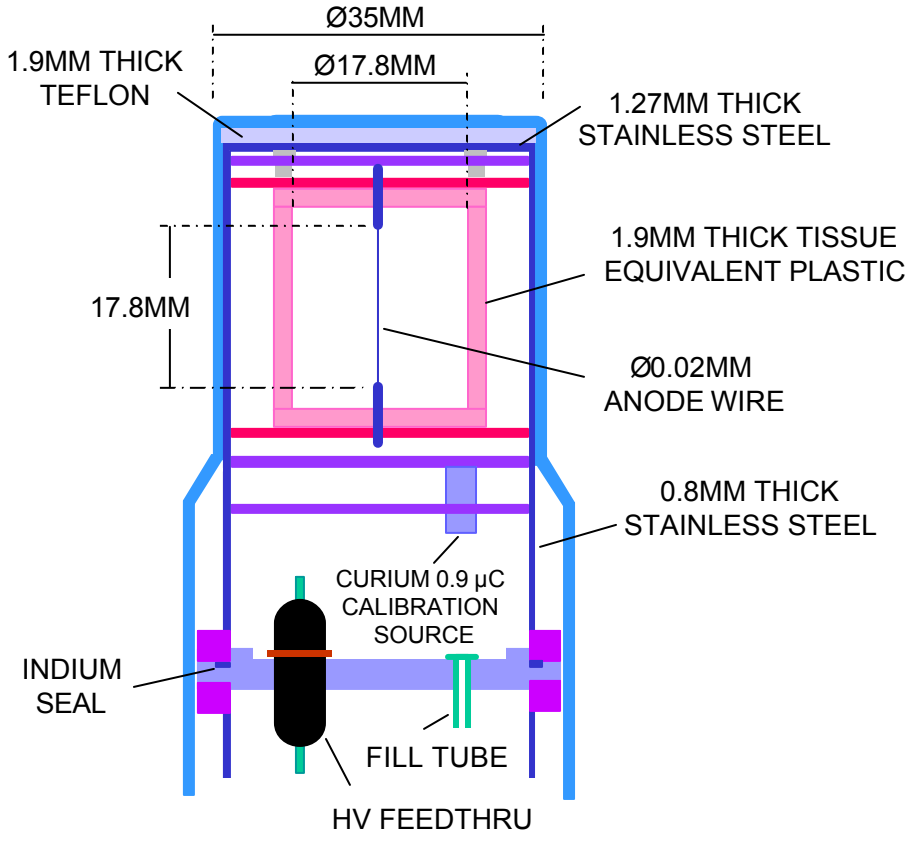
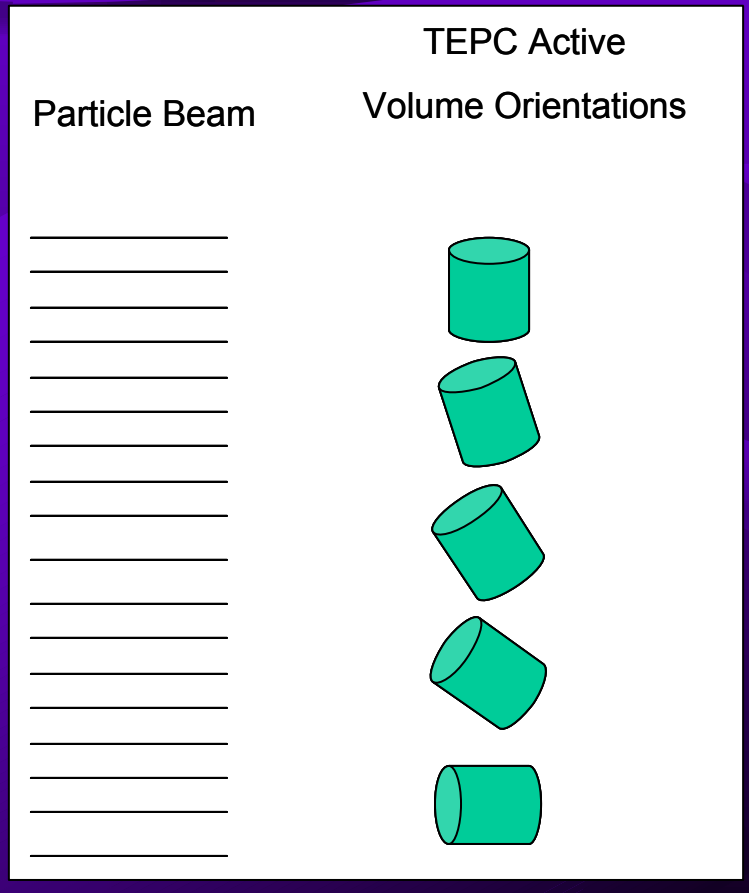
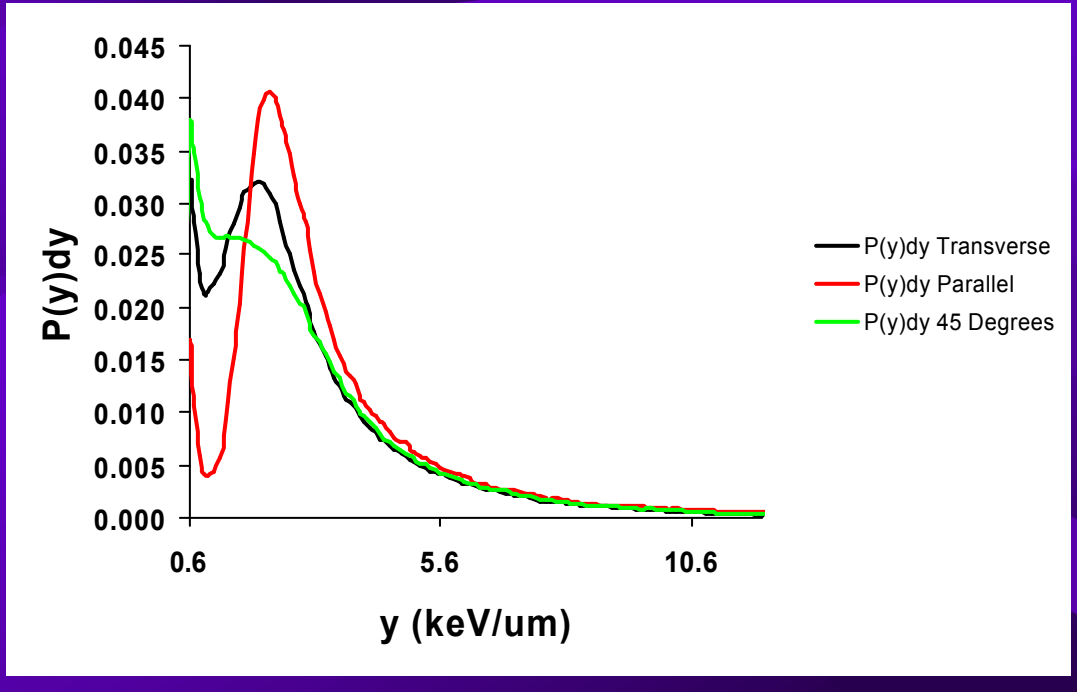


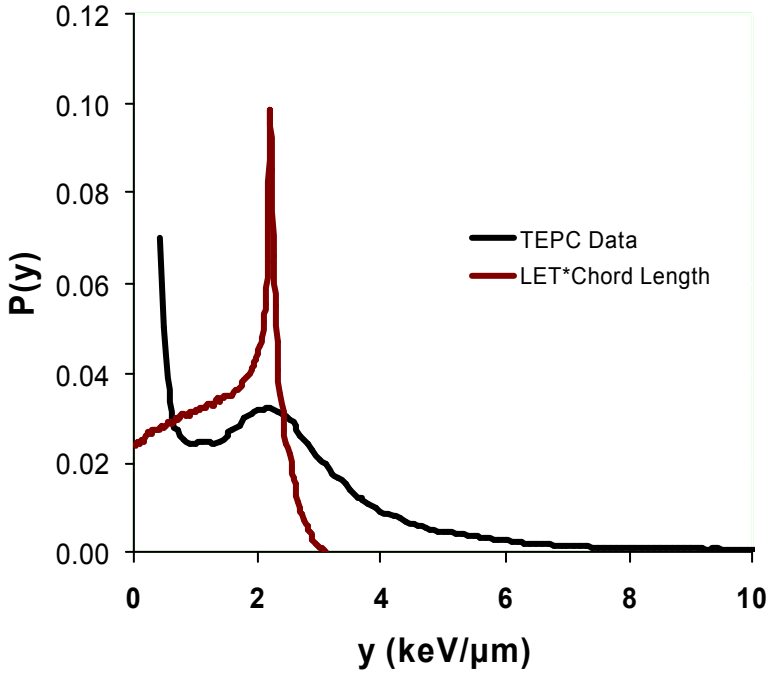

e3
e2
e1
HZE
Particle
Track
Rc
Cylindrical
Volume of
Energy
Deposition
Cylindrical
Volume of
Interest
Lc= D

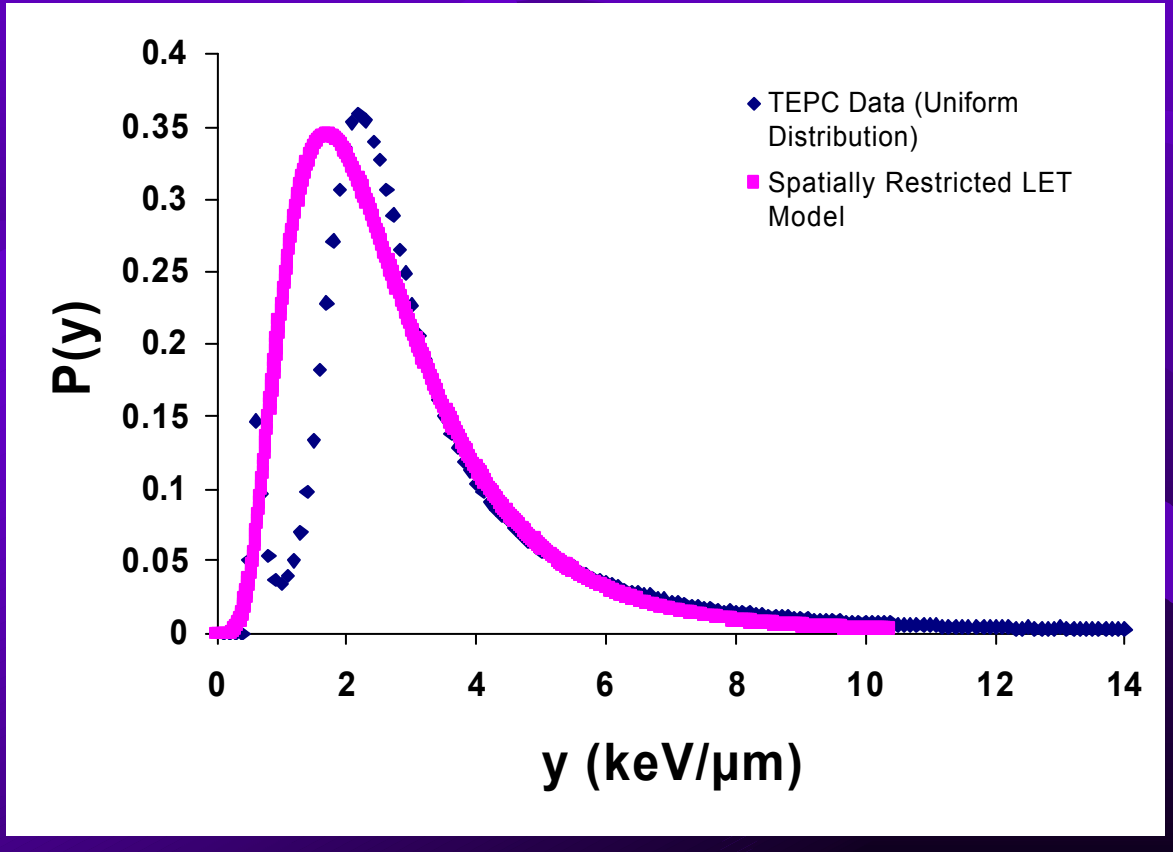


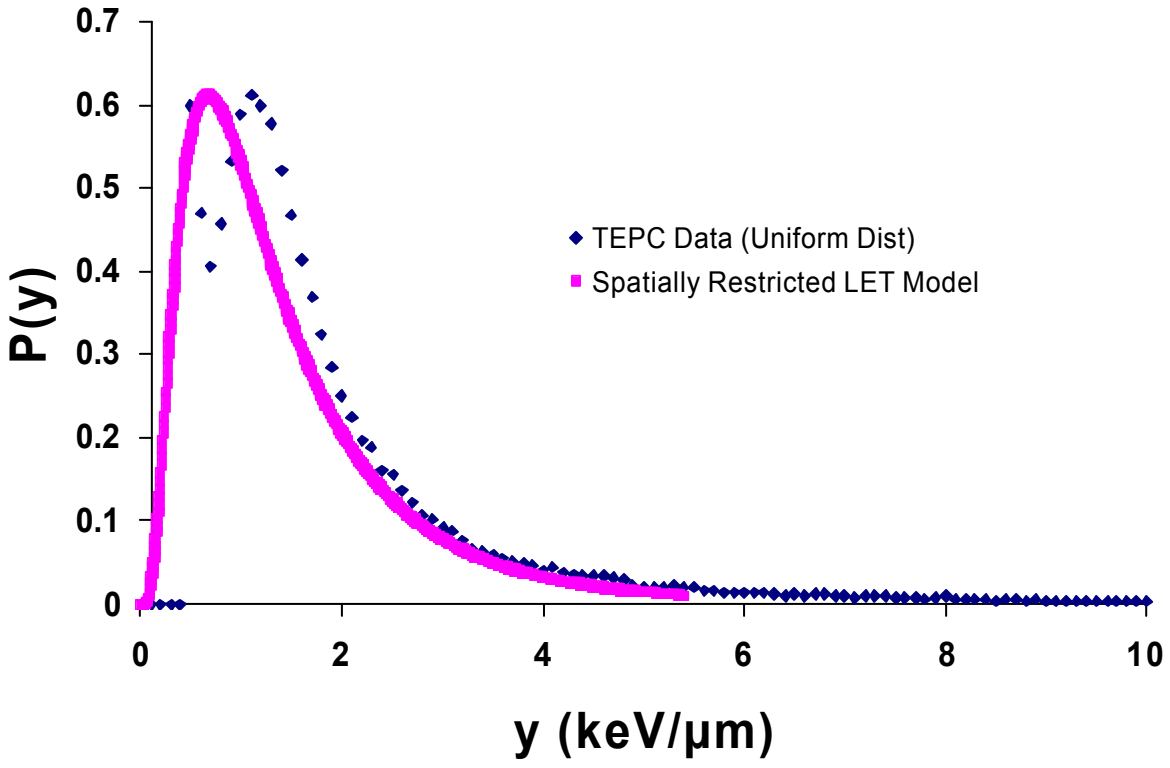
A schematic of the TEPC detector


TEPC Active
Volume Orientations
Particle Beam


0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
P(y)dy
0.6
5.6
10.6
y (keV/um)
P(y)dy Transverse
P(y)dy Parallel
P(y)dy 45 Degrees


0.12
0.10
0.08
0.06
0.04
0.02
0.00
P(y)
0
2
4
6
8
10
y (keV/µm)
TEPC Data
LET*Chord Length


0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
P(y)
0
2
4
6
8
10
12
14
y (keV/µm)
TEPC Data (Uniform Distribution)
Spatially Restricted LET Model


0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
P(y)
0
2
4
6
8
10
y (keV/µm)
TEPC Data (Uniform Dist)
Spatially Restricted LET Model

Preliminary ICCHIBAN Results

- Combined distributions of five angles of irradiation begin to approximate μ-random distribution
- Counting statistics limited conclusions
- Spatially restricted LET model chosen
- General purpose chord length distribution code for right-cylindrical volume

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KC135 Microgravity Flight Correlated TEPC Response Function Changes and Anomalies With:

- Vibration
- Electromagnetic fields
- Three gravity environments (0.0, 1.0, 1.8 g's)

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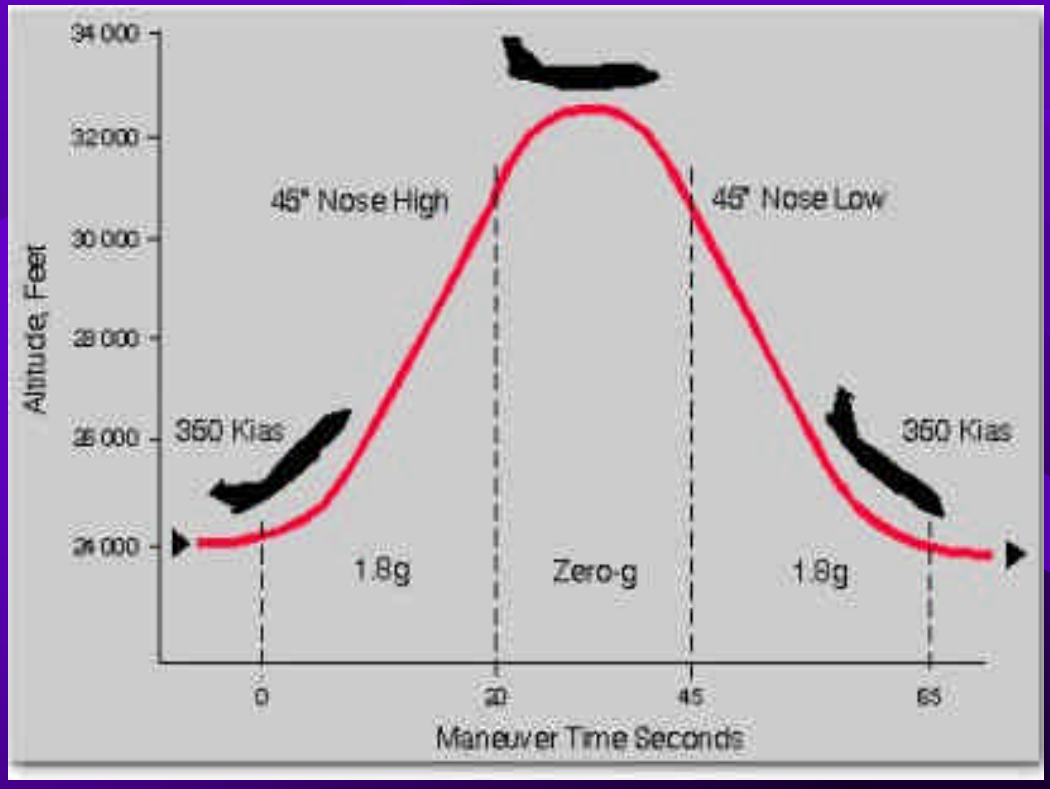

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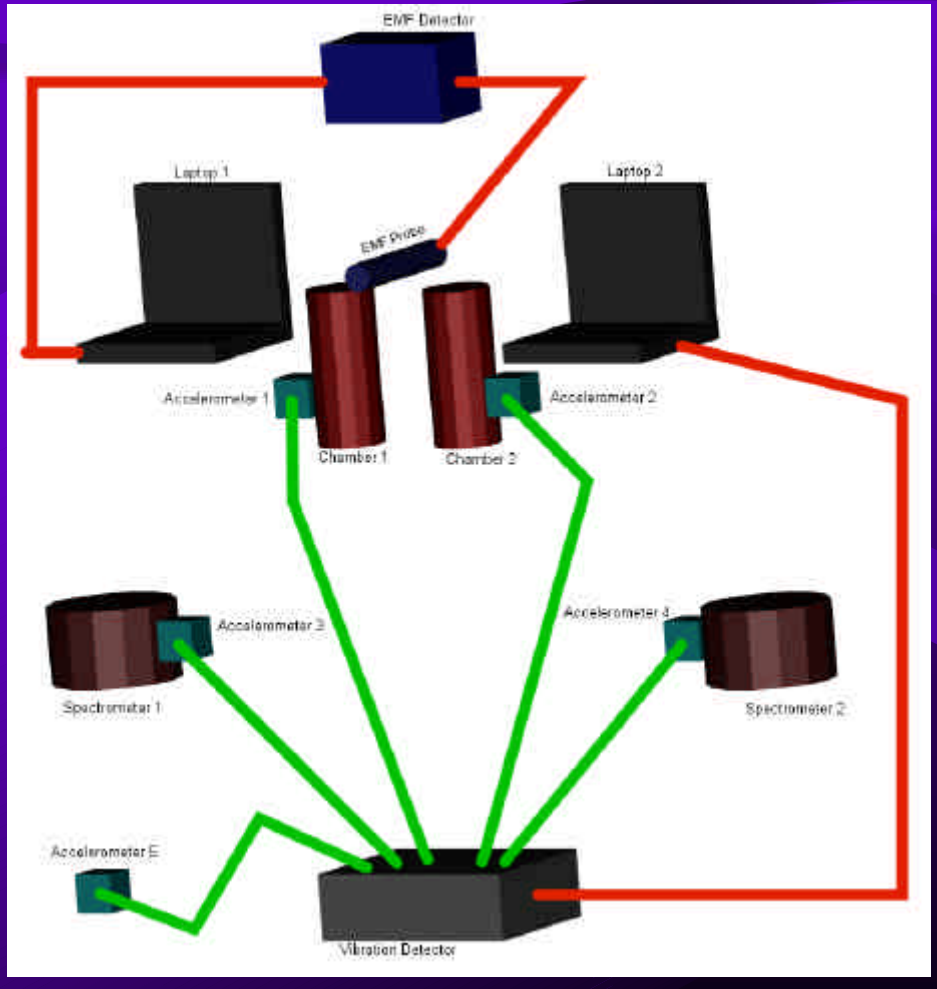

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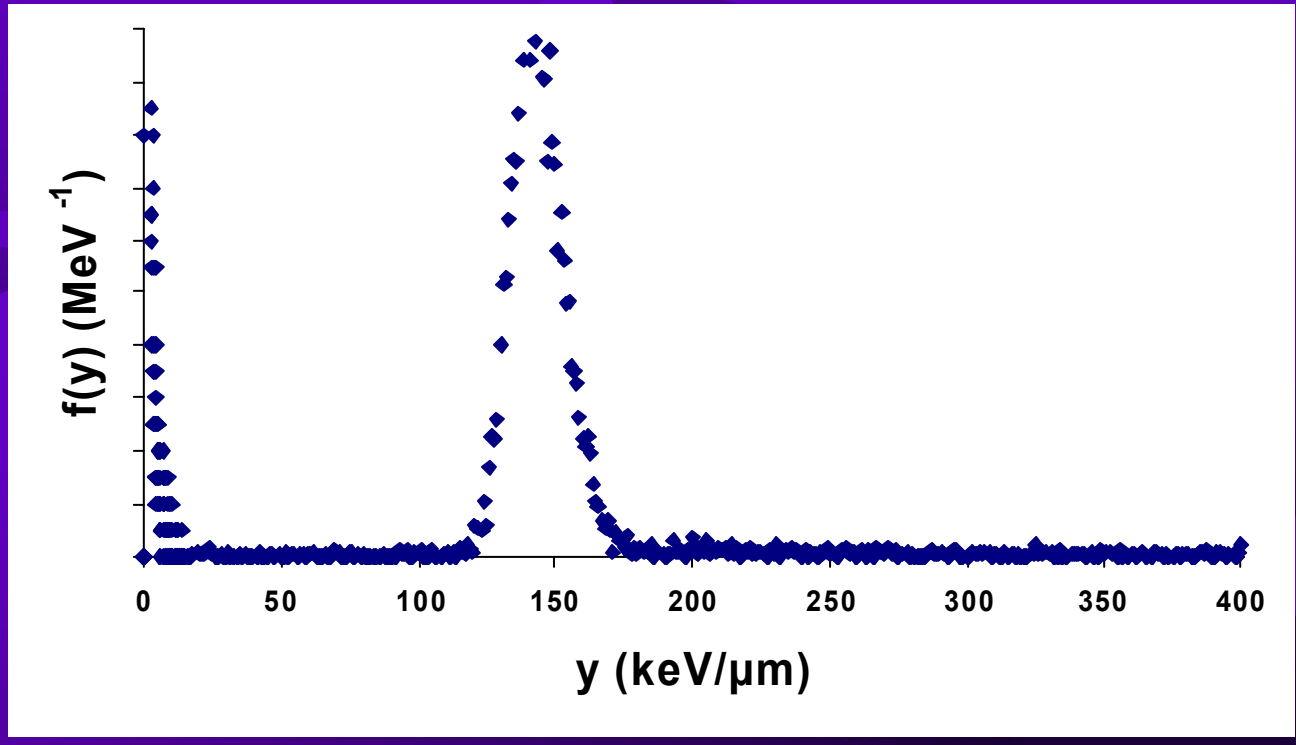
f(y) (MeV -1)
0
50
100
150
200
250
300
350
400
y (keV/µm)

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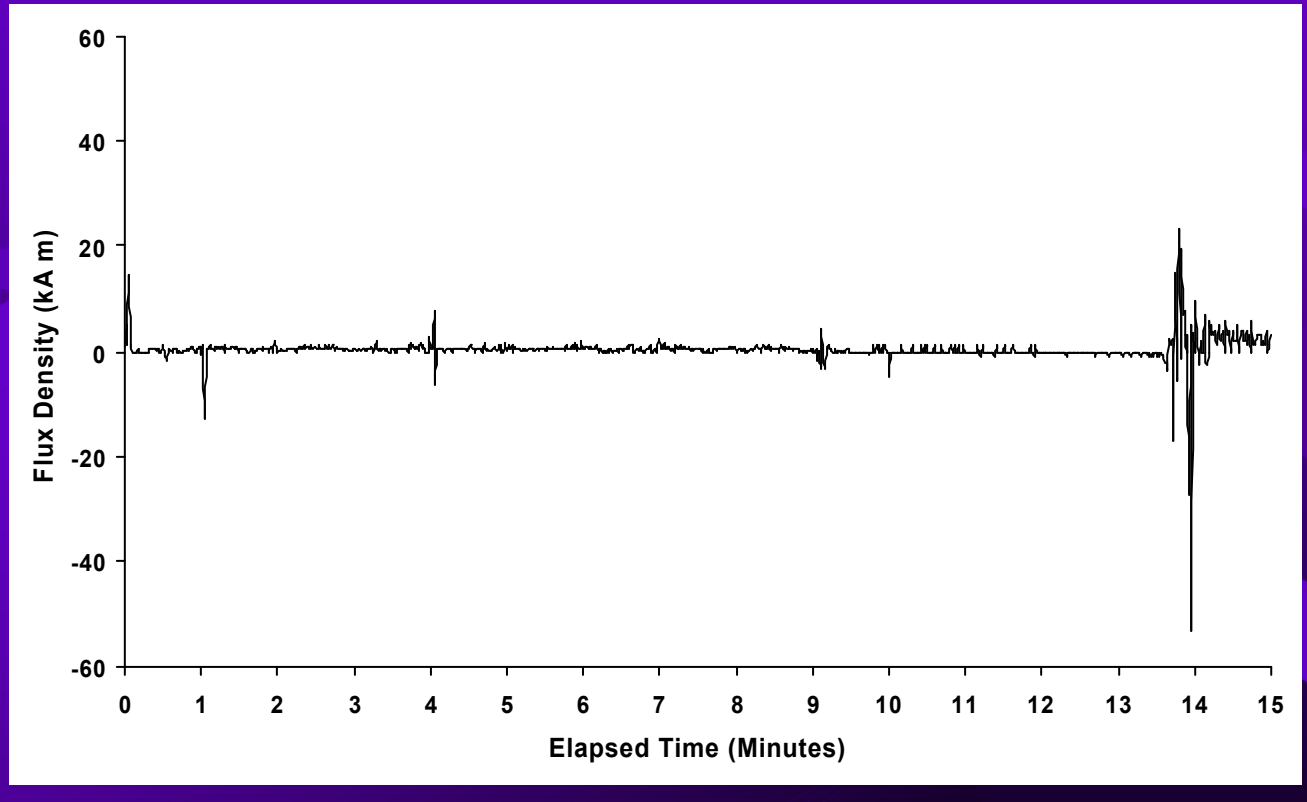

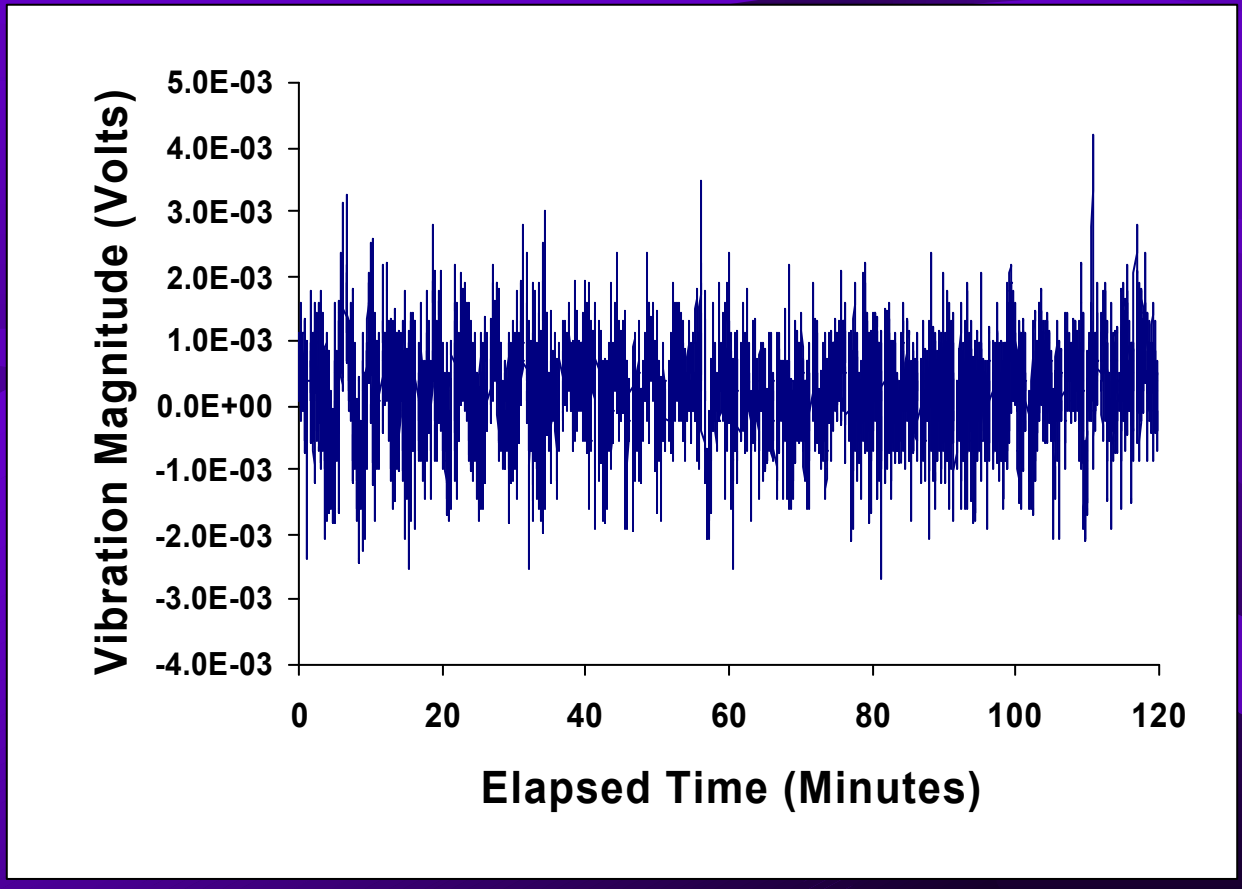
Vibration Magnitude (Volts)
5.0E-03
4.0E-03
3.0E-03
2.0E-03
1.0E-03
0.0E+00
-1.0E-03
-2.0E-03
-3.0E-03
-4.0E-03
0
20
40
60
80
100
120
Elapsed Time (Minutes)

Results From KC135 Flights

- No spurious lineal energy events induced by changes in EMF, vibration, or gravity environment
- No change in calibration point during changes in these environmental factors
- Active volume size marginal for flight dosimetry

Conclusions

- Preliminary analysis of proton ICCHIBAN-1 and ICCHIBAN-5 data completed
- Better counting statistics needed for future experiments
- Spatially restricted LET model chosen to model TEPC response
- The TEPC was insensitive to interference in proper operation by environmental factors aboard the KC135