

To Rib or De-Rib, that is the question

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Internal Dosimetrist



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Presentation Outline

- MARA Program at LLNL
- Scope of the Project
- Results
- Takeaways

Military Academic Research Associates Program at LLNL



- Cadets/Midshipmen or faculty at one of the military academies
- Past Projects include:
 - Physics
 - Chemical Engineering
 - Chemistry

<https://internships.llnl.gov/mara/>

Scope of the Project

- Introduce Darrin to in vivo measurement methods and data analysis
- Determine the effect of the ribcage on the efficiency for detection of activity deposited in the lungs
 - New measurements
 - Review of existing data

Measurements

LLNL Boneless Phantom & Am-241/Eu-152 Lung Set



Data Analysis

- Compared Efficiency
 - Energy
 - Chest Wall Thickness

$$\text{Efficiency} = \frac{\text{net CPS}}{\text{Activity} \times \text{Abundance}}$$

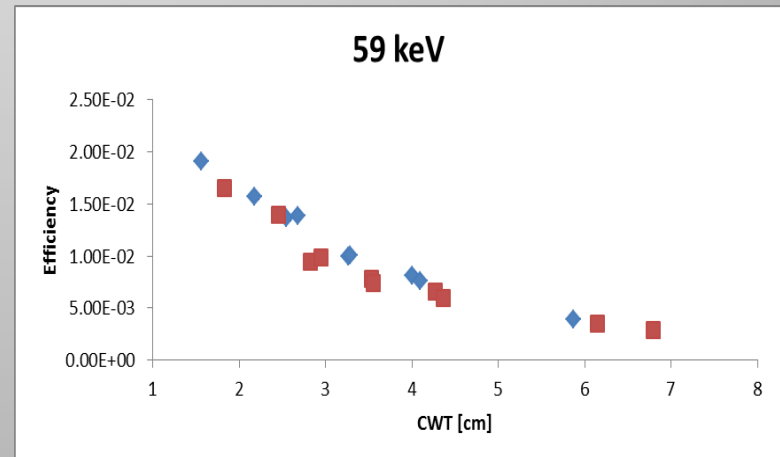
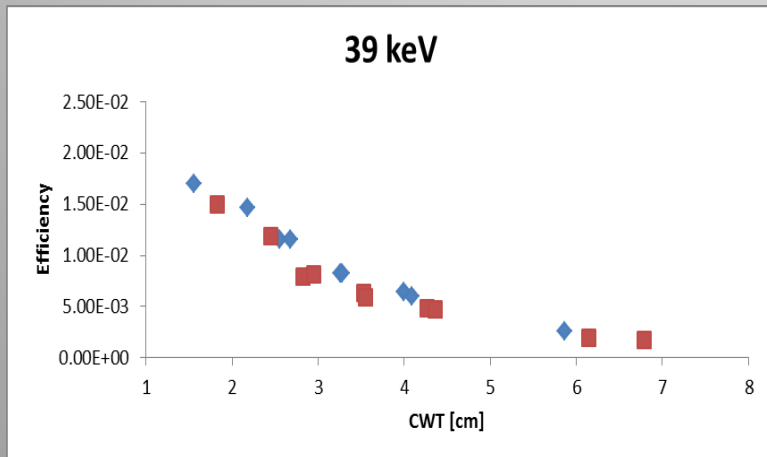
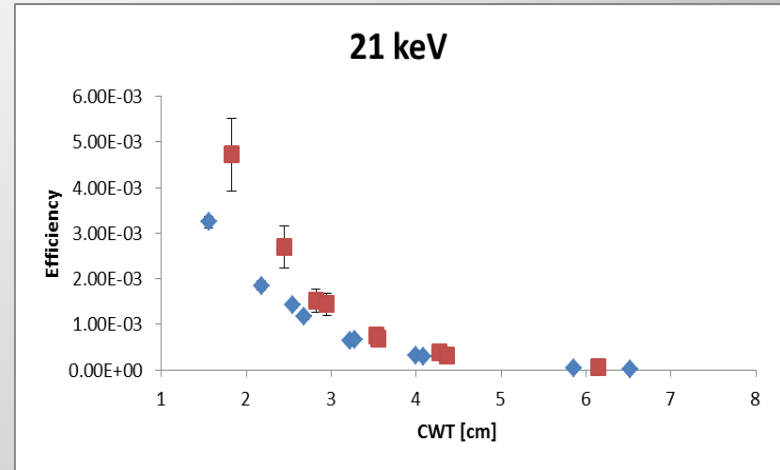
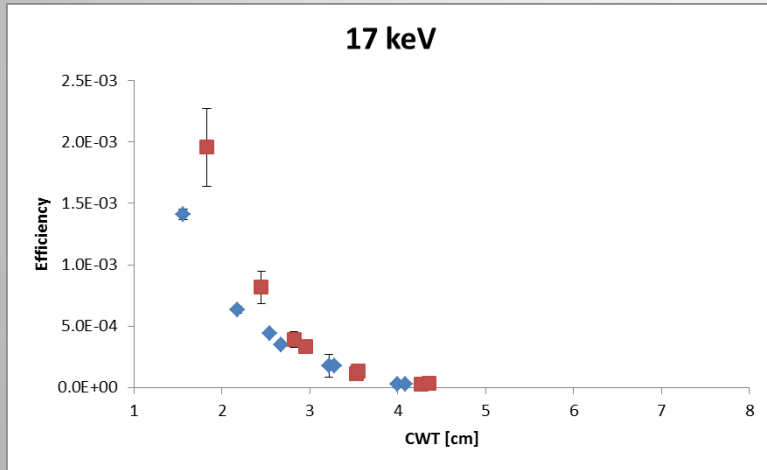
Isotope	Activity (nCi)
Am-241	2085
Eu-152	246

Energy (keV)	Abundance	Isotope
17	11.72%	Am-241
21	2.92%	Am-241
40	59.4%	Eu-152
45	14.39%	Eu-152
59	35.9%	Am-241
122	28.58%	Eu-152
244	7.58%	Eu-152
344	26.5%	Eu-152

ACT II Detectors

No Ribs vs. *Ribs*

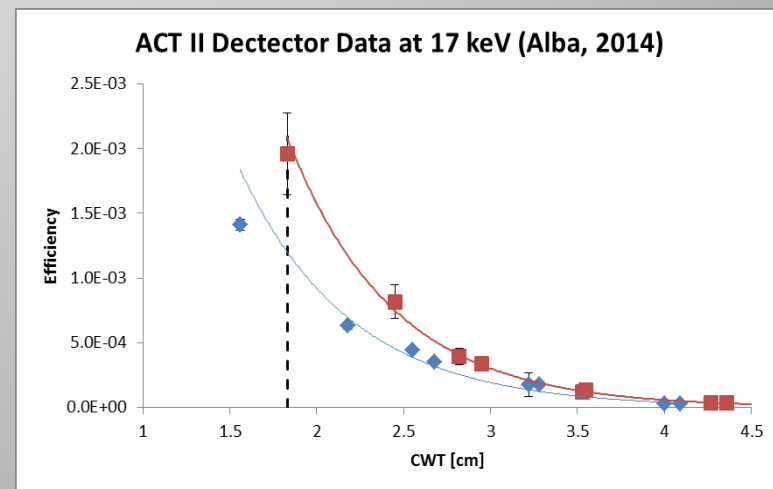
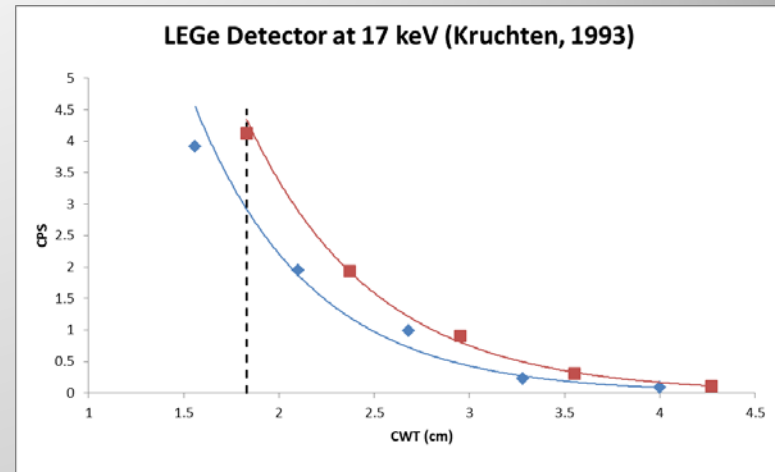
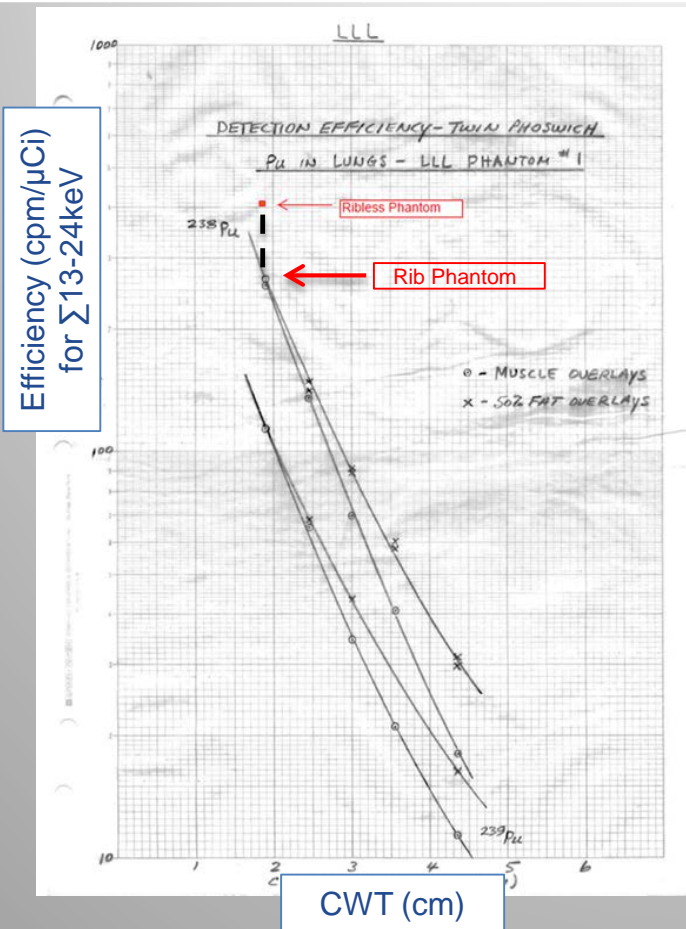
Error Bars Represent 2σ



Ratio of No Rib to Rib

at 1.83cm CWT and 17keV

Detector	Phoswich	LEGe	ACT II
Ratio	~1.45	~1.41	~1.63



Takeaways – Ribs versus no Ribs

- Efficiencies are similar for energies $\geq 39\text{keV}$
- Efficiencies are similar for CWT $> 3\text{cm}$
 - Regardless of photon energy
- Confirms past observations and conclusions

- *Benefits to our program from having a MARA student intern:*
 - *Highly qualified and motivated students*
 - *Teaching opportunities, which reinforced our technical capabilities and knowledge*
 - *Supports development within our routine program*

Video Teleconference on the Intercomparison of In vivo Measurement Facilities

- 1st VTC was on July 31, 2014
 - Plan to make it at least an annual event
- Presentations covering:
 - Facilities
 - Research and development projects
 - Current topics and issues facing the facilities
- Participants from:
 - Various DOE facilities (LLNL, Hanford, BNL, SNL)
 - University of Cincinnati
 - International Facilities (Israel, Canada)

Interested? Email Megan at Lobaugh1@llnl.gov

Questions?