

Use of a Thyroid Probe for Assaying Internal Contamination Following a RDD

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Project Overview

- ▣ Simulation using Slab Phantom and Point Source
- ▣ Validation of MCNP Model
- ▣ DCAL Source Distribution
- ▣ MCNP Simulations with MIRD Phantoms
- ▣ Final Product – Emergency Procedure Guidelines

Capintec Captus 3000 TUS

- ❑ Typical Thyroid Uptake System
- ❑ Used to assay thyroid uptake of radioisotopes in nuclear medicine procedures
- ❑ Hospital personnel uptake records
- ❑ 1024 channel MCA mode with ROI identification by isotope
- ❑ 2 collimators –
 - Thyroid uptake collimator
 - Bioassay collimator



Capintec Captus 3000 TUS

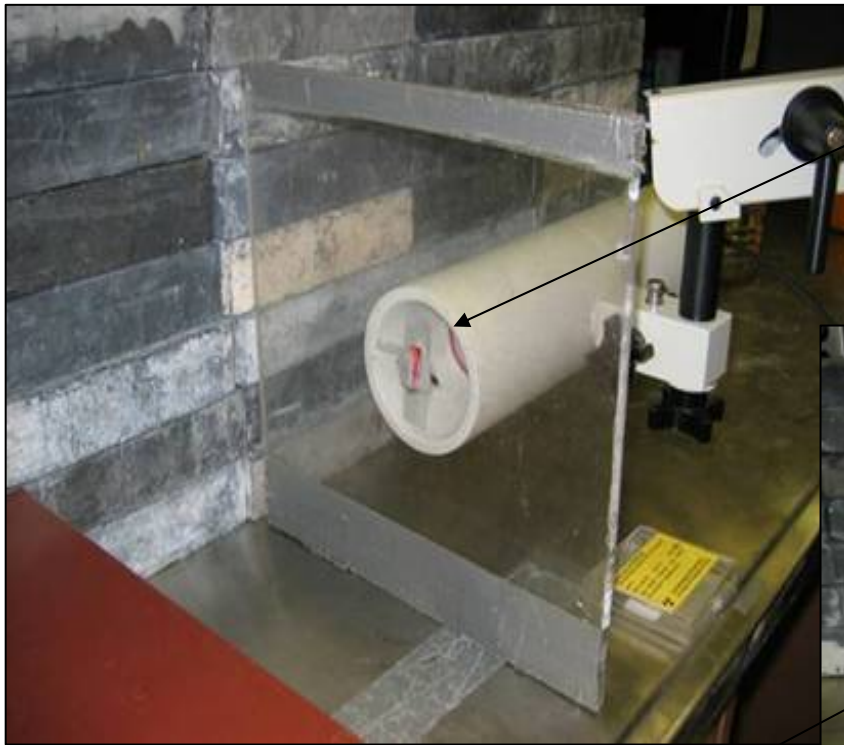


Slab Phantom Measurements

- Simulate chest wall thickness
 - Varying thickness of PMMA
 - 100mm backscatter material – virtual water
 - Source holder placed behind PMMA, holds small cylindrical source



Slab Phantom Measurements



Source placement
relative to collimator



Entire assembly

Slab Phantom Measurements

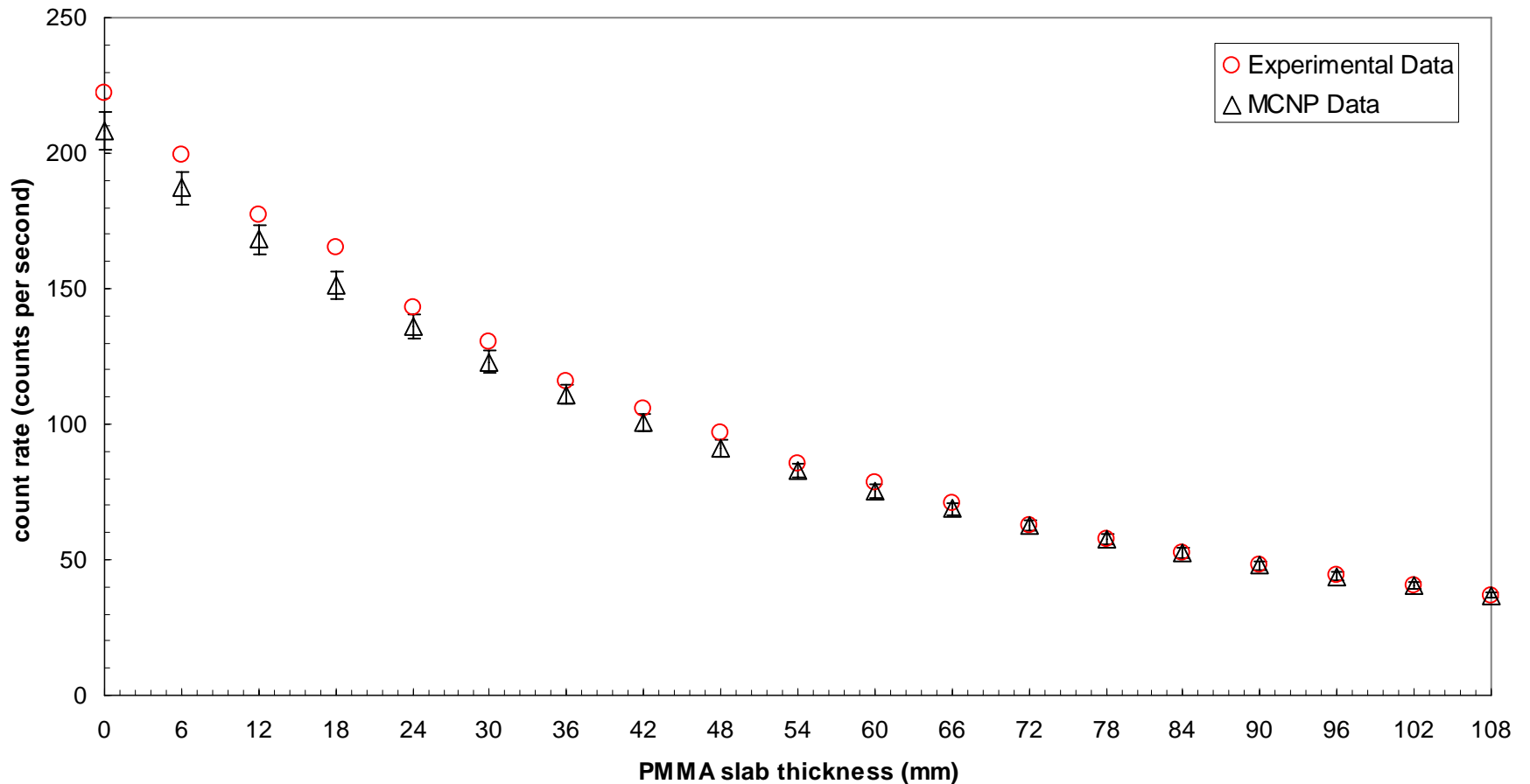
- 6 isotopes

Isotope	Photon Energy, Mev
Am-241	0.059
Ba-133	0.031, 0.356
Cs-137	0.662
Co-60	1.173, 1.332
Mn-54	0.8348
Na-22	0.511, 1.275

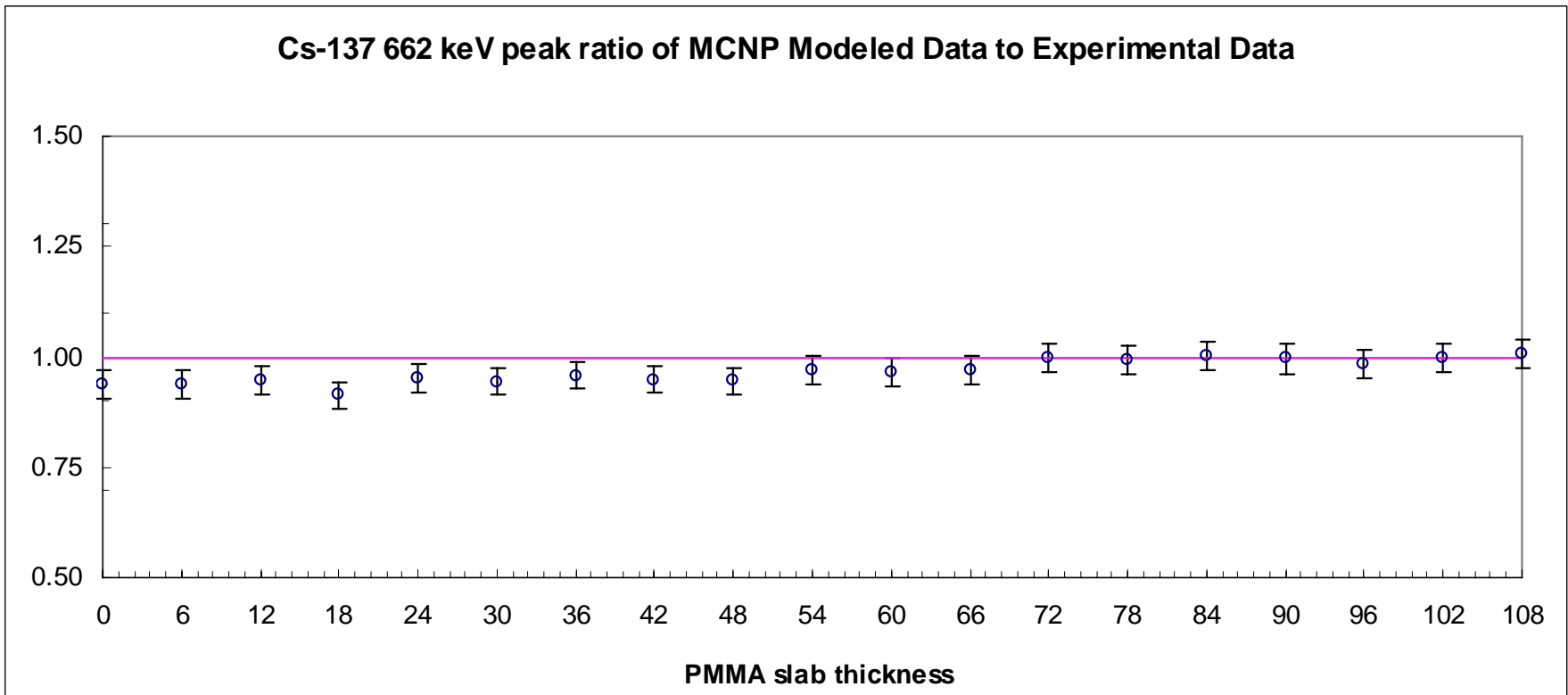
- PMMA thicknesses ranging from 0mm to 108mm in 6mm increments
- 1% error accepted under ROI
- Thyroid Uptake Collimator and Bioassay Collimator

Validation of MCNP Model

Cs-137 662 keV ROI Comparison of Experimental Count Rate and MCNP Modeled Count Rate



Validation of MCNP Model



MIRD Anthropomorphic Phantoms

- Phantoms
 - Reference Male
 - Reference Female
 - Adipose Male
 - Adipose Female
 - Post-Menopausal Adipose Female
 - Child
- Sources Distributed to Organs Based on DCAL
- Designated Positions for Placing Detectors on Phantoms

Continuing Work

- Complete detector simulation with anthropomorphic phantoms and various isotopes

Ir-192	I-131	Am-241	Cs-137	Co-60	Sr/Y-90
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- Calculations of MDA, MDD, MDI, etc
- Development of Emergency Procedure Guidelines

Measurements with Torso Phantom

(Analysis Pending)



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- ❑ Project funded by the Radiation Studies Branch of CDC



Capintec, Inc.

