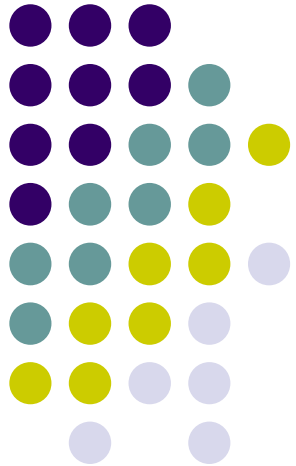
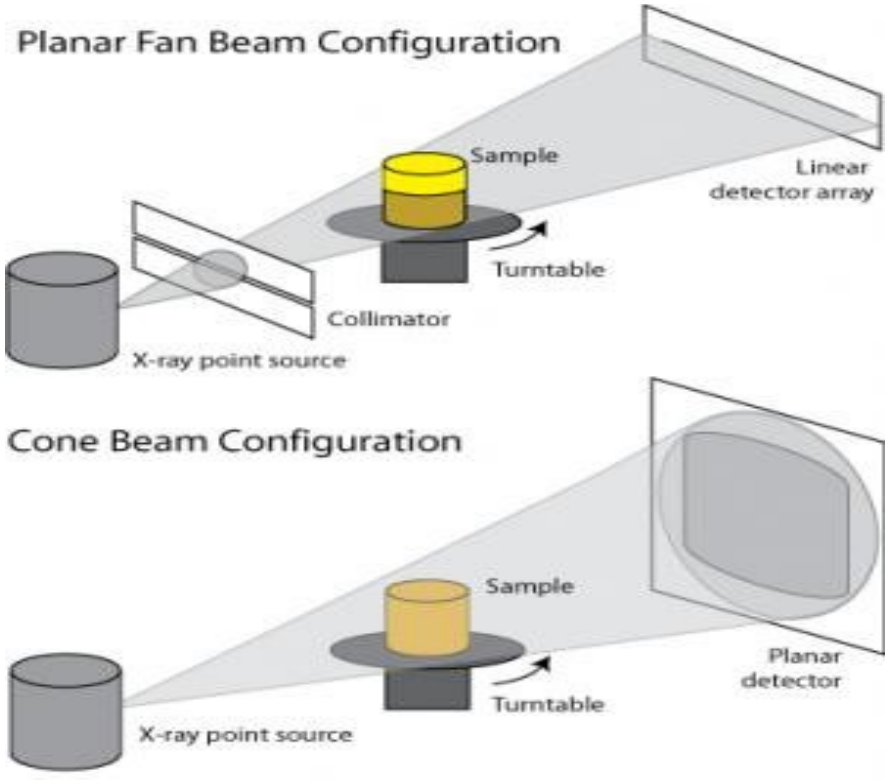
# A Complete dose study of double orbit cone beam computed tomography

Ariel Jefferson

Department of Radiation Oncology
Virginia Commonwealth University
Medical Center

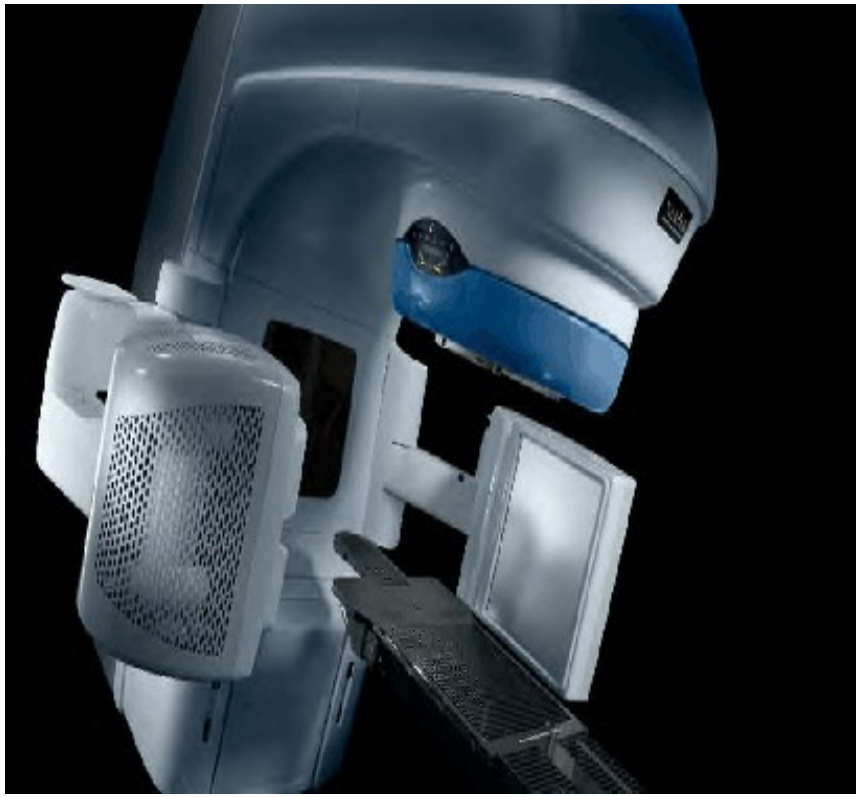


# Fan-beam vs. Cone-beam



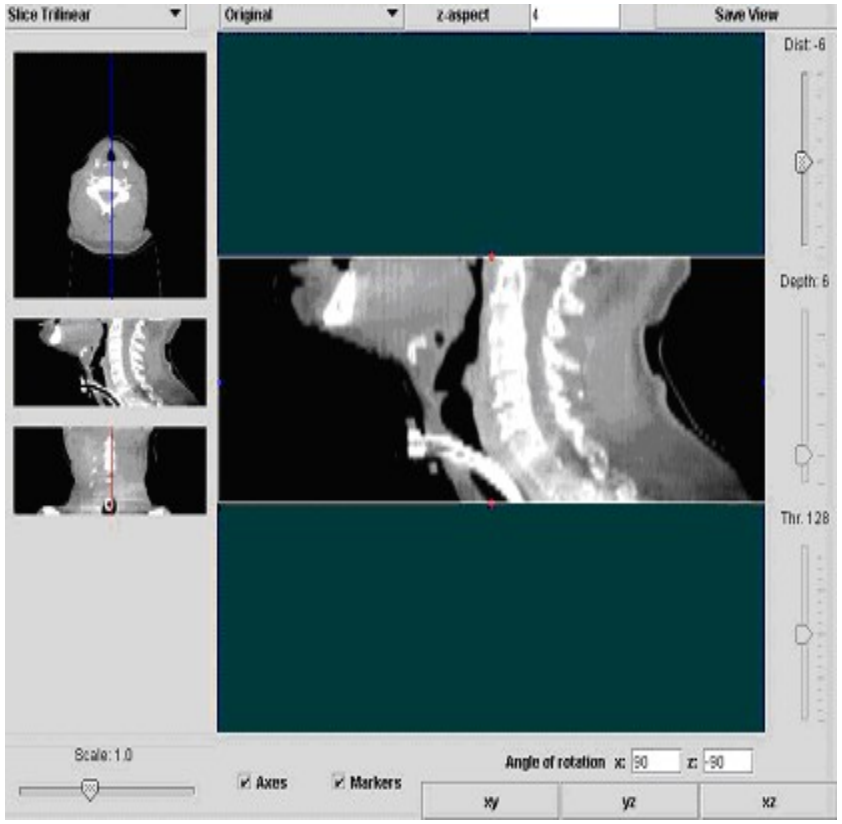

# Project Outline

- Department of Radiation Oncology, VCU Medical Center
  - Image-guided radiotherapy
- CT imaging using X-rays
- Double Orbit = New method of obtaining CT scans
  - Measure exact absorbed radiation dosage from new, non-standard method of image-guidance

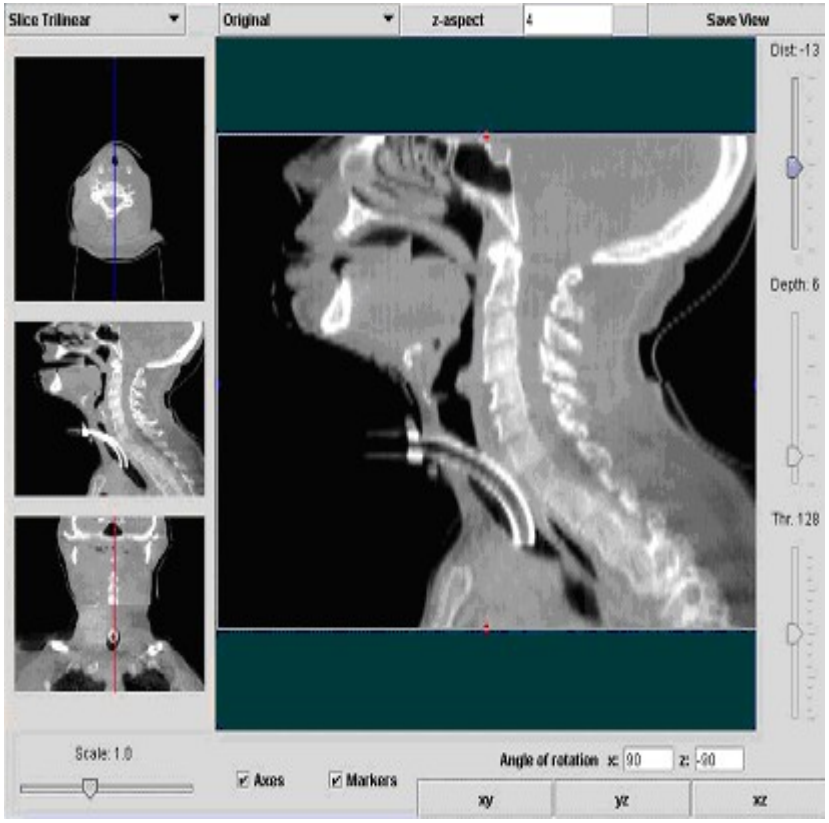


Varian systems LINAC with on-board imager

# Previous research on double orbit modality



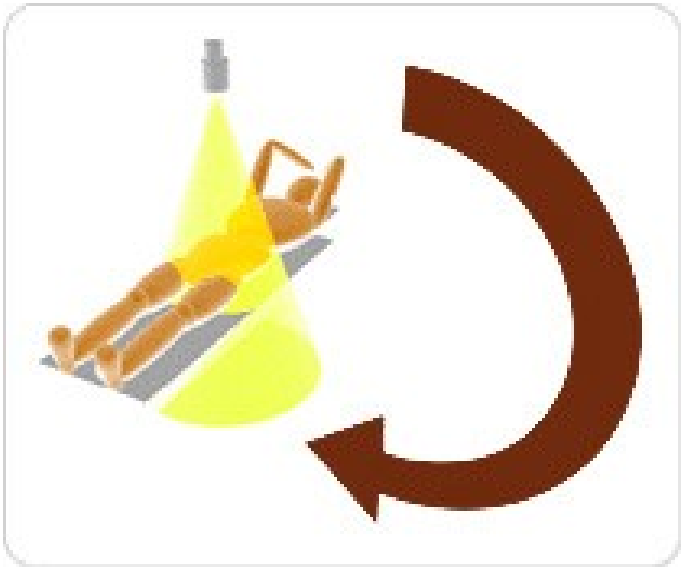

Human head and neck area scanned with **single** orbit CBCT (14cm)



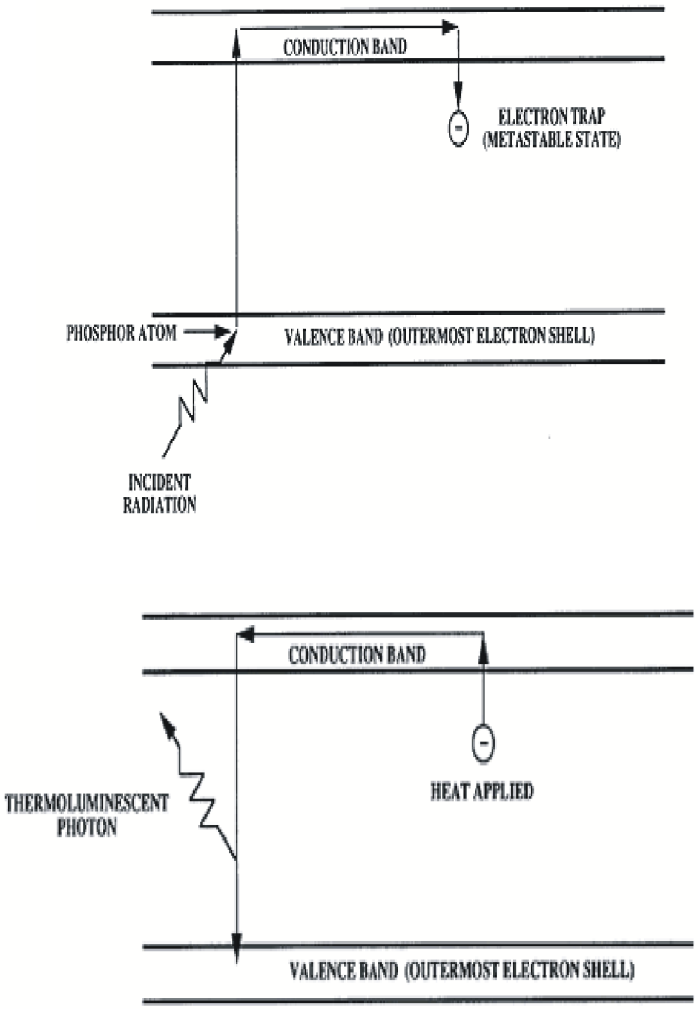

Human head and neck area scanned with **double** orbit CBCT (28cm)

# Method

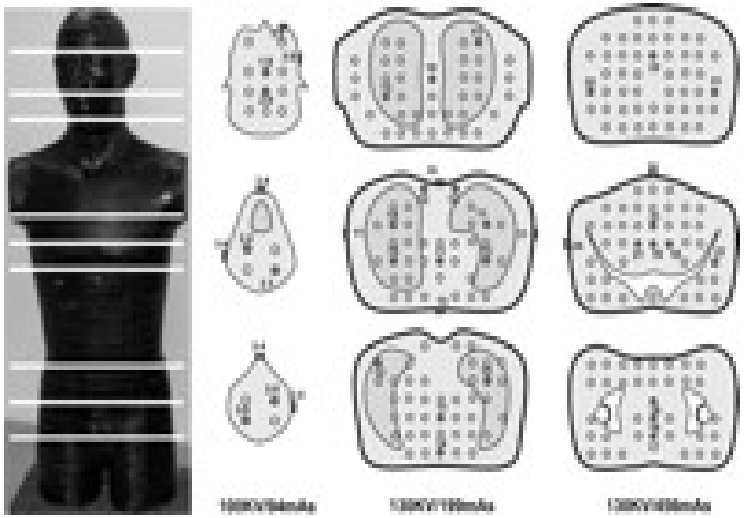
- Double orbit cone beam
- Step and shoot modality
- Two tests
  - X-ray film, water phantom
    - Optical density > relative exposure > absorbed radiation dose
  - Thermoluminescent dosimeter, Rando phantom
    - tubes of thermoluminescent crystals
    - Disperse tubes throughout the phantom
    - when heated, emit light



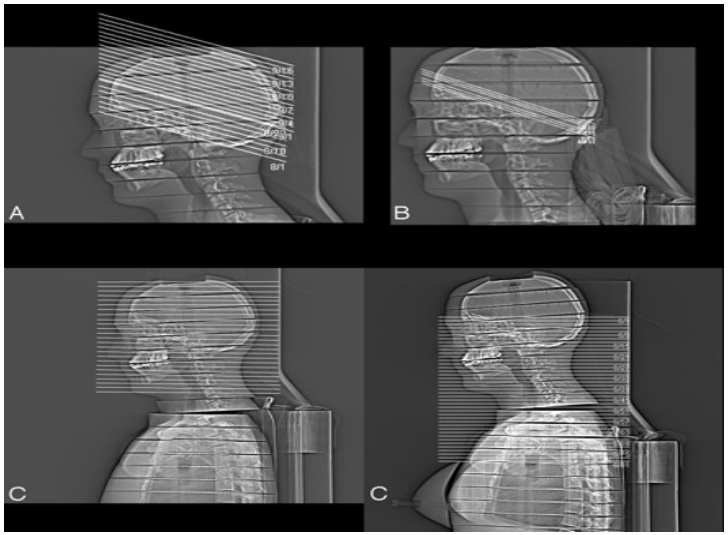
# Thermoluminescent dosimeters



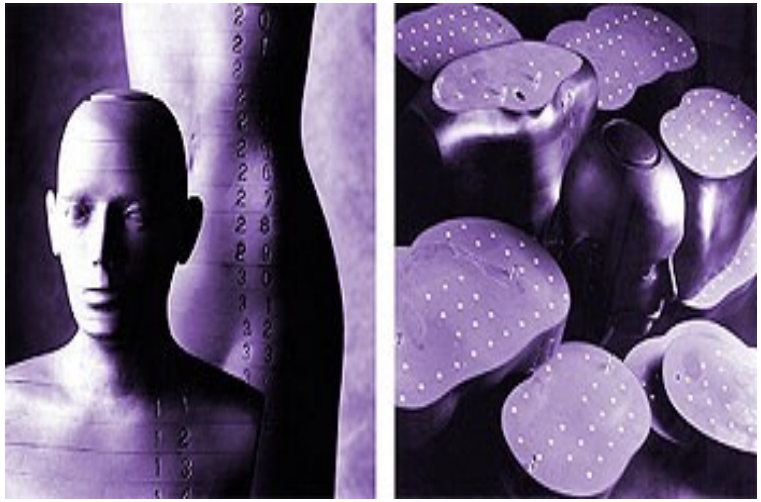

# Phantoms



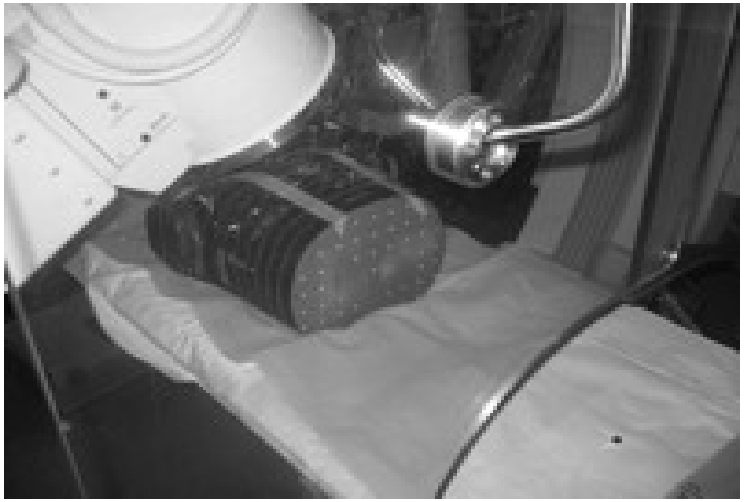
Phantom slices with TLD's inserted




Interior anatomy of Rando phantom

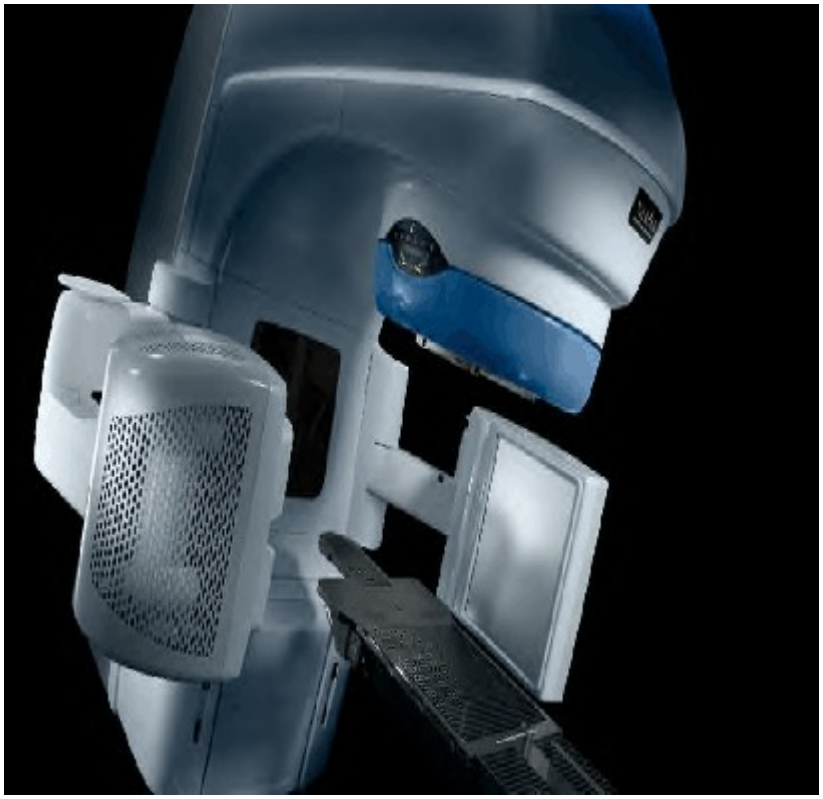


Rando phantom



Phantom simulation of human torso

# Possible results and implications



Varian systems LINAC with on-board imager

- Double orbit method
- Determine exact amount of absorbed radiation; expect small dose
- Inform the public about exact dosimetry of double orbit cone beam CT