

Evaluation of the dose distribution according to tube voltage in pediatric head CT examination

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Introduction

Pediatric Head CT Examination

CT Scanning with Low Tube Voltage



✓ Low Contrast Resolution  UP

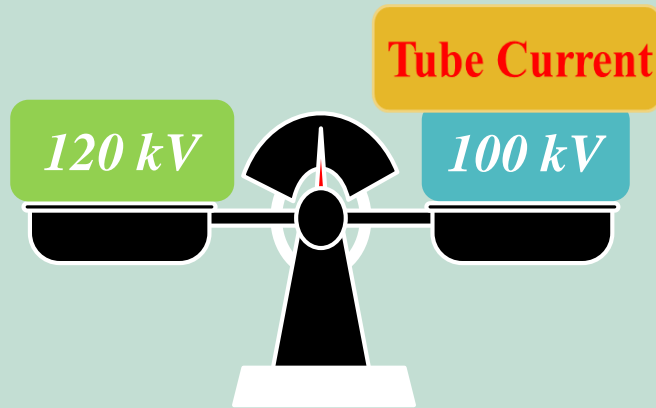
✓ Image Noise **BAD**

✓ Usage of Contrast Medium  Down

Low-Contrast



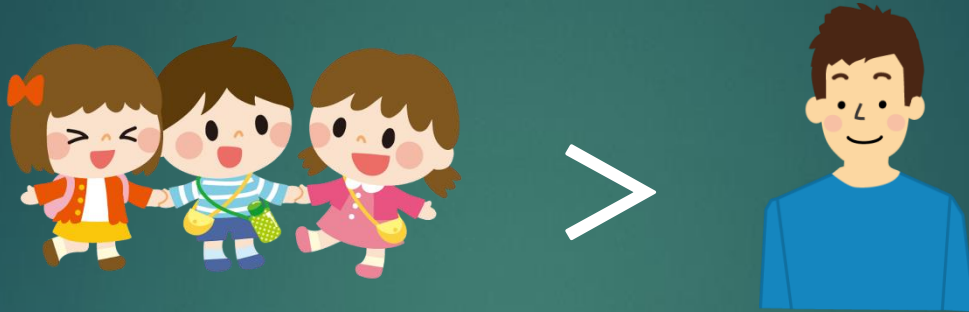
Image Quality



*Index
Parameter*

CTDI_{vol}

Radiation Risk associated with CT Examination



**Radiation Risk Estimation
is very important !**

Purpose

The dose distribution according to *tube voltage* and *patient size* is evaluated.

Methods

Protocol

kV	mAs
80	730
100	390
120	250
140	170

CTDI_{vol}
about
46 mGy

- ◆ Beam Width : 10 mm
- ◆ Scan Range : 100 mm
- ◆ Beam Pitch : 1.0
- ◆ Non-Helical
- ◆ FOV : 200 mm

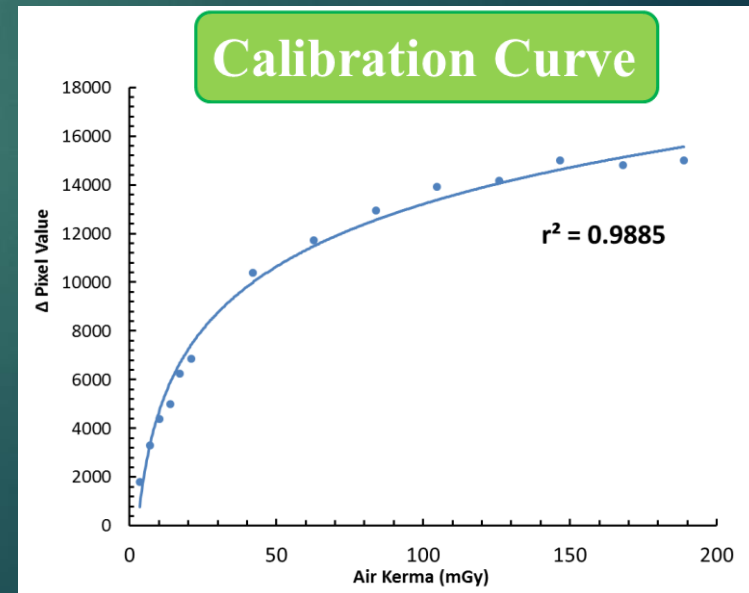
Supria (HITACHI Medical)



Dose Evaluation

- ◆ Radiochromic Film : GAFCHROMIC XR-QA2 Film (ASHLAND)
- ◆ Scanner: EPSON ES-G11000
 - RGB (48 bit)
 - 150 dpi
 - Scan Time: pre-exposure, 24 h post-exposure

$$\Delta \text{Pixel Value [PV]} = \text{PV}_{\text{post}} - \text{PV}_{\text{pre}}$$

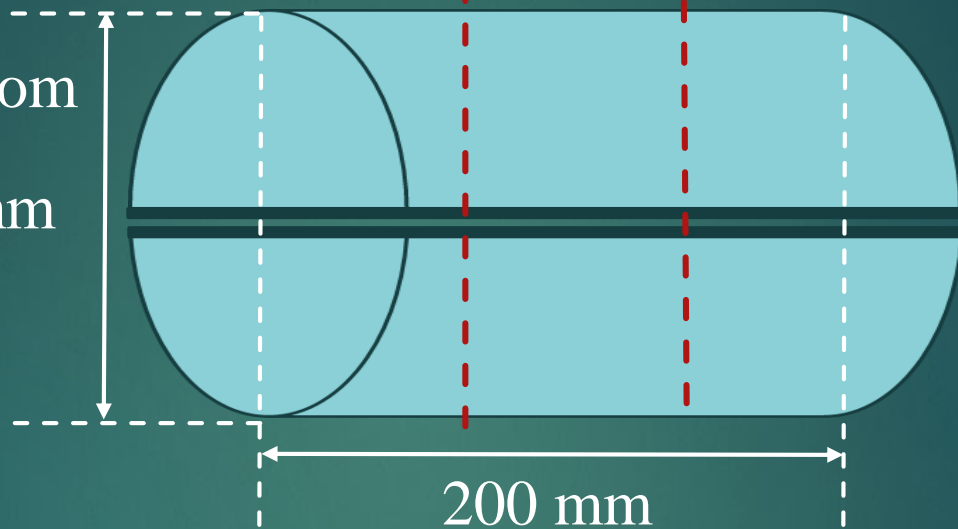


Measurement

PMMA Phantom
 $\Phi 100, 150$ mm

Scan Range

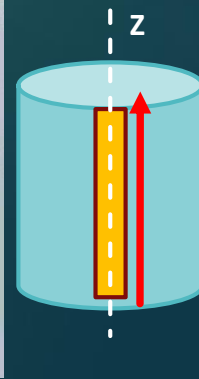
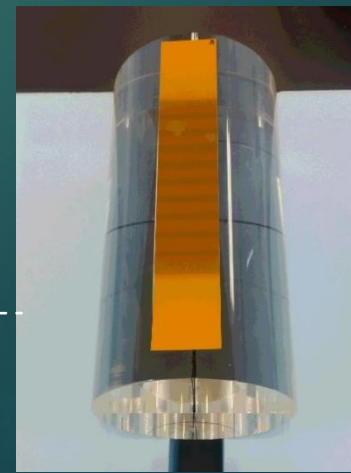
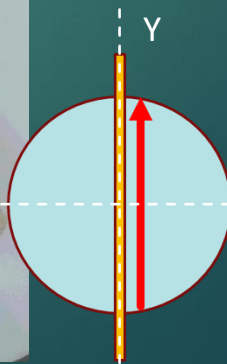
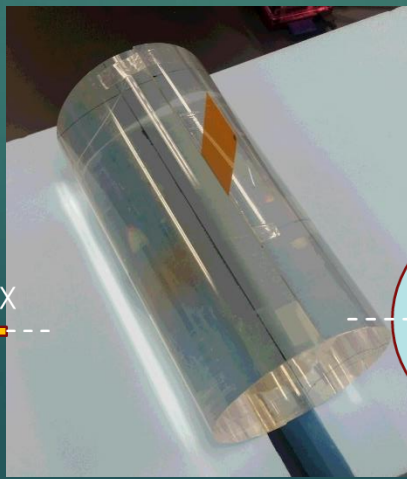
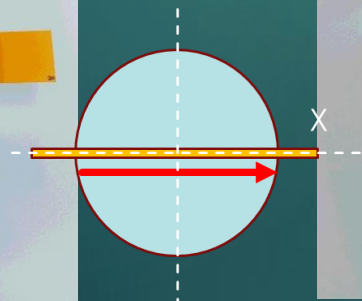
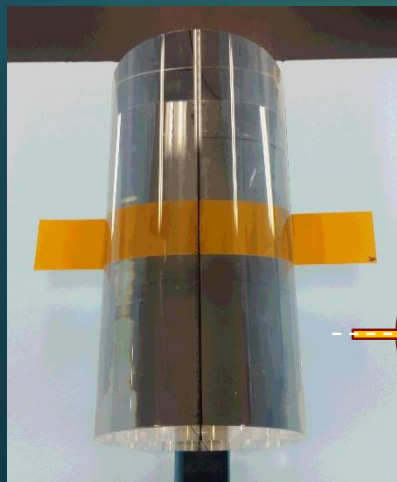
100 mm



X-axis

Y-axis

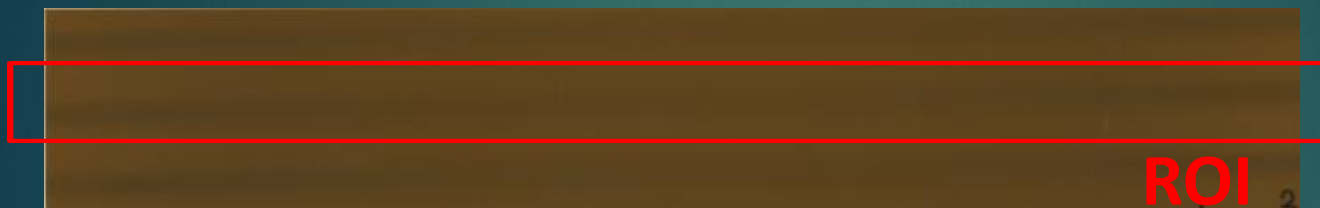
Z-axis



Results

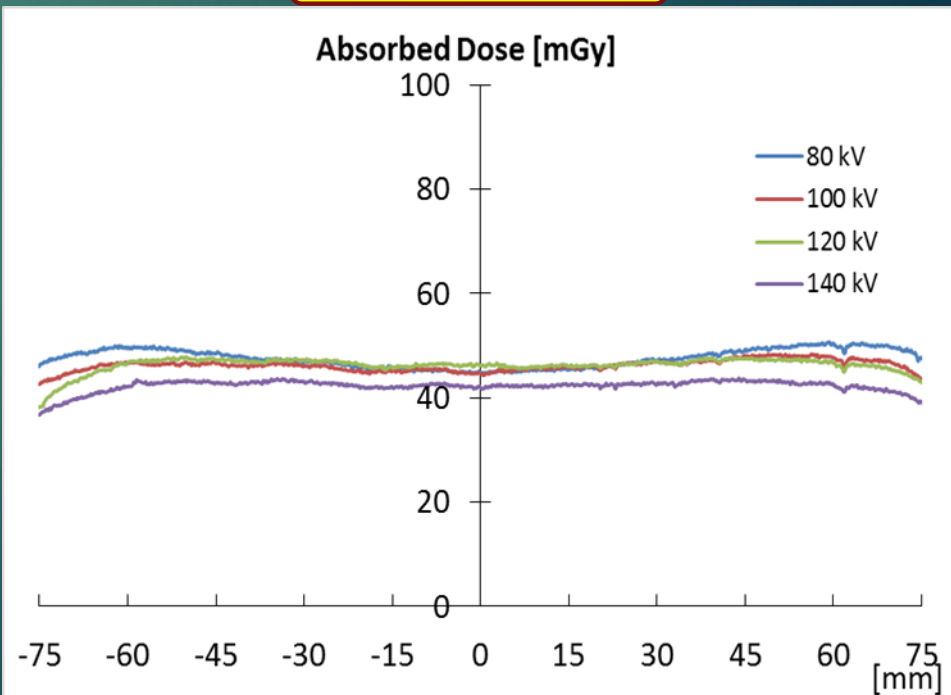
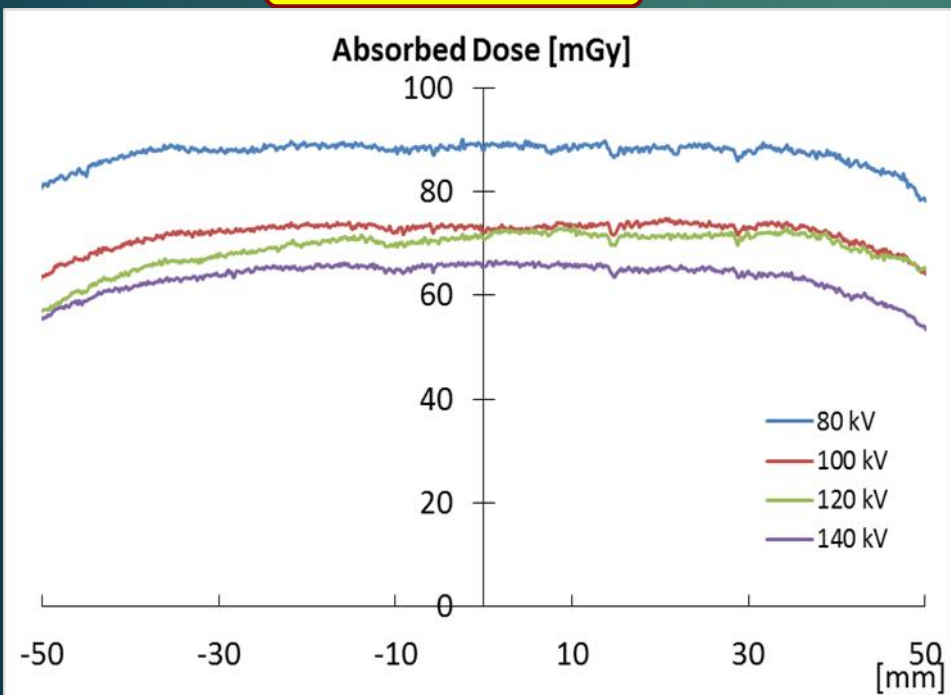
Dose Distribution

X-axis



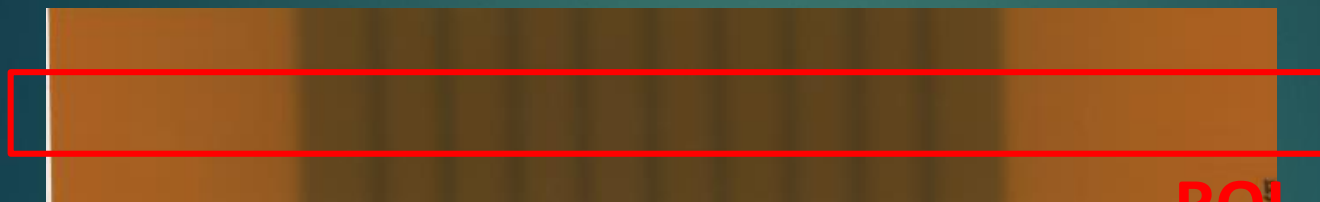
$\Phi 100$ mm

$\Phi 150$ mm

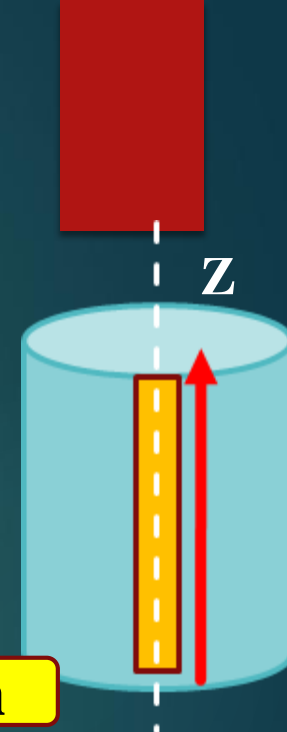


Dose Distribution

Z-axis



ROI

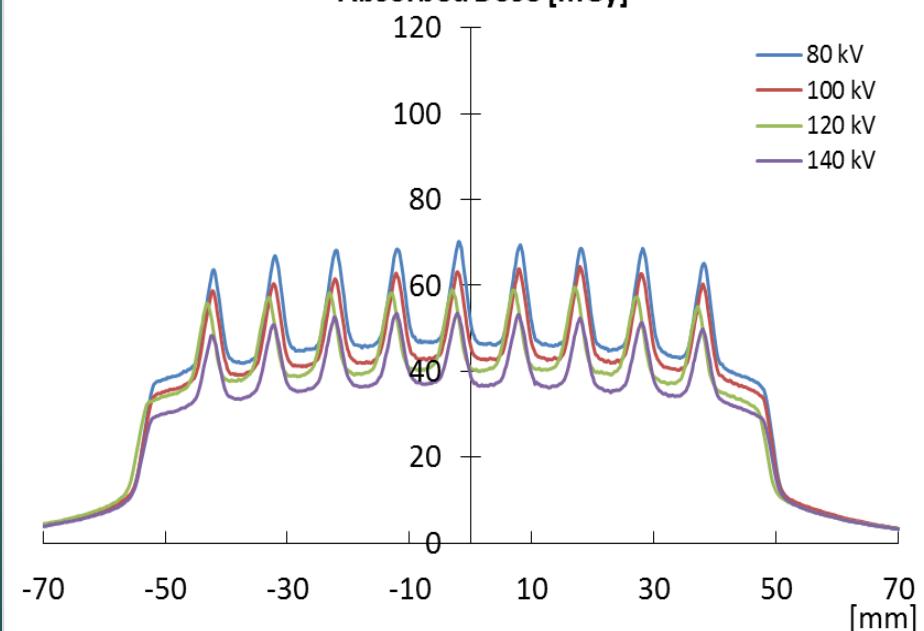
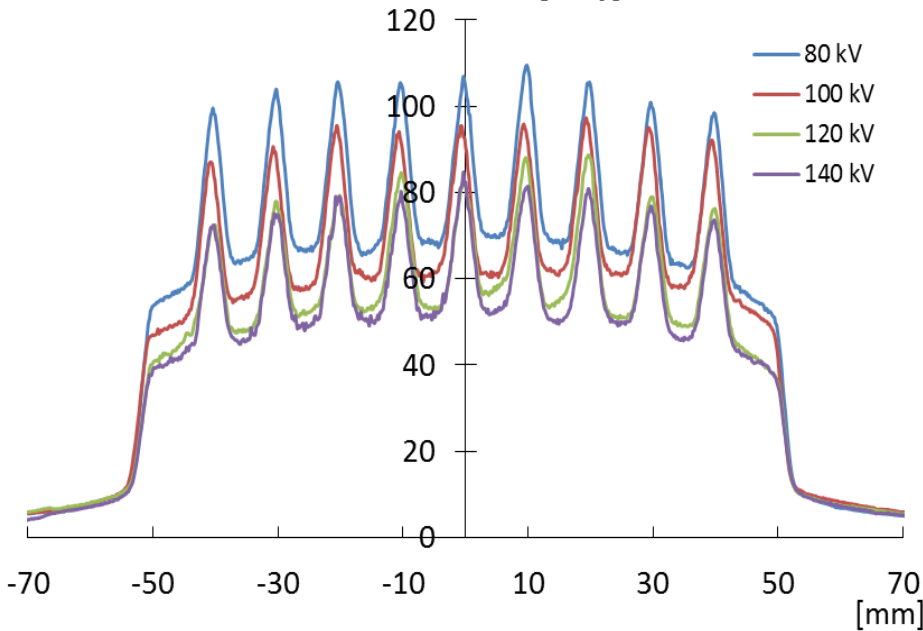


Φ100 mm

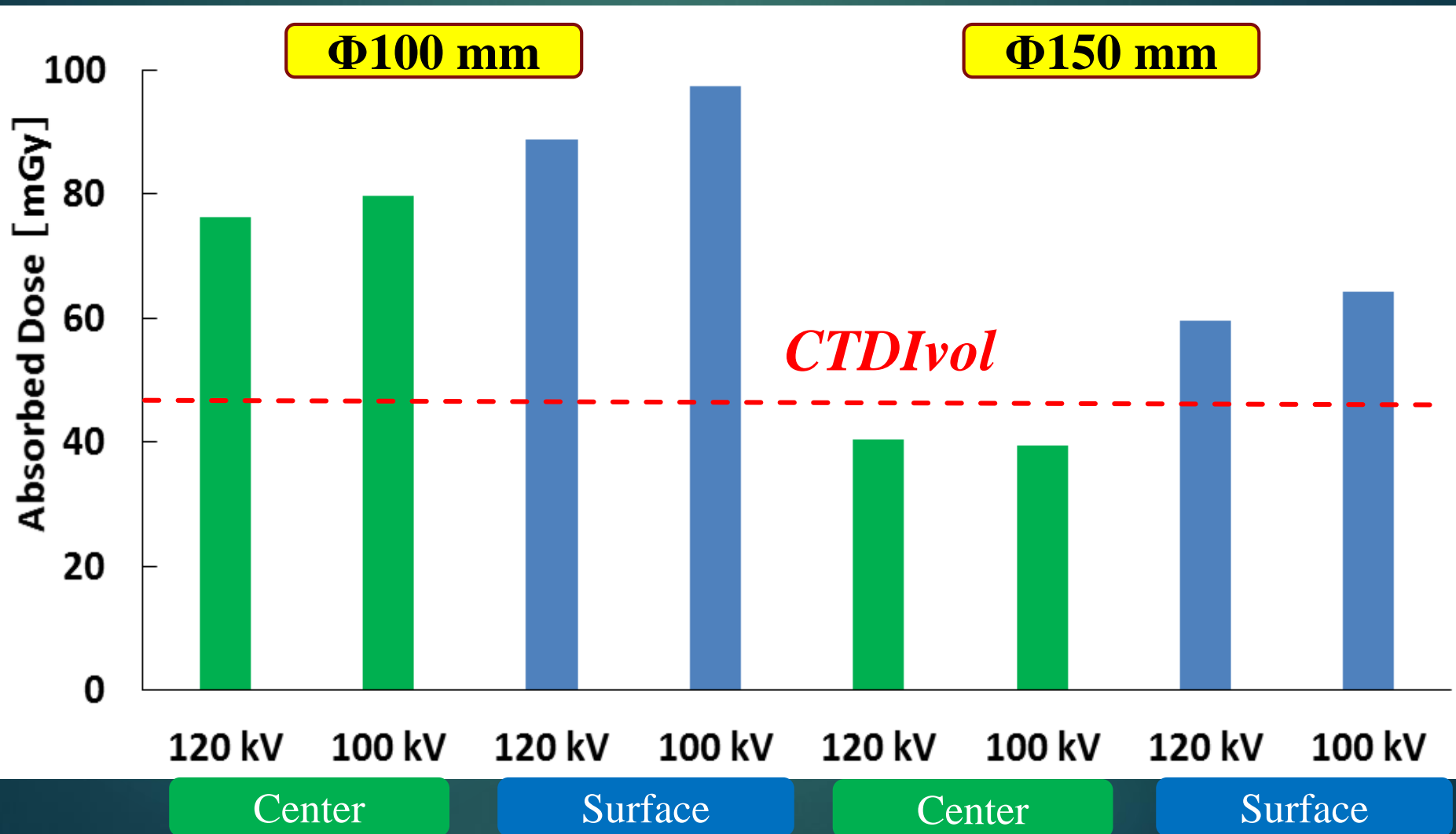
Φ150 mm

Absorbed Dose [mGy]

Absorbed Dose [mGy]



Maximum Absorbed Dose



Conclusion

For Estimation of Radiation Risk

The dose distributions should be evaluated for each *tube voltage* and *patient size*.

