

# TASK GROUP 113

## Reference Organ and Effective Dose Coefficients for Common Diagnostic X-ray Imaging Examinations

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### Main Points

- The ICRP has established Task Group 113 to provide reference dose coefficients for radiographic, CT and fluoroscopic x-ray imaging procedures.
- The Task Group is performing Monte Carlo radiation transport simulations on a series of reference imaging examinations to report the resulting organ absorbed dose and effective dose coefficients.
- The scope of this work includes the use of the reference voxel computational phantoms of the ICRP, male and female new-born, 1-year-old, 5-year-old, 10-year-old, 15-year-old, and adult. See ICRP Reports 110 & 143.
- The work of the Task Group will lead to publications and electronic materials covering adult and paediatric organ and effective dose coefficients.

for any scanner by entering the selected CTDIvol and tube voltage of the protocol, and the relevant CTDI phantom (i.e. 16 or 32 cm).

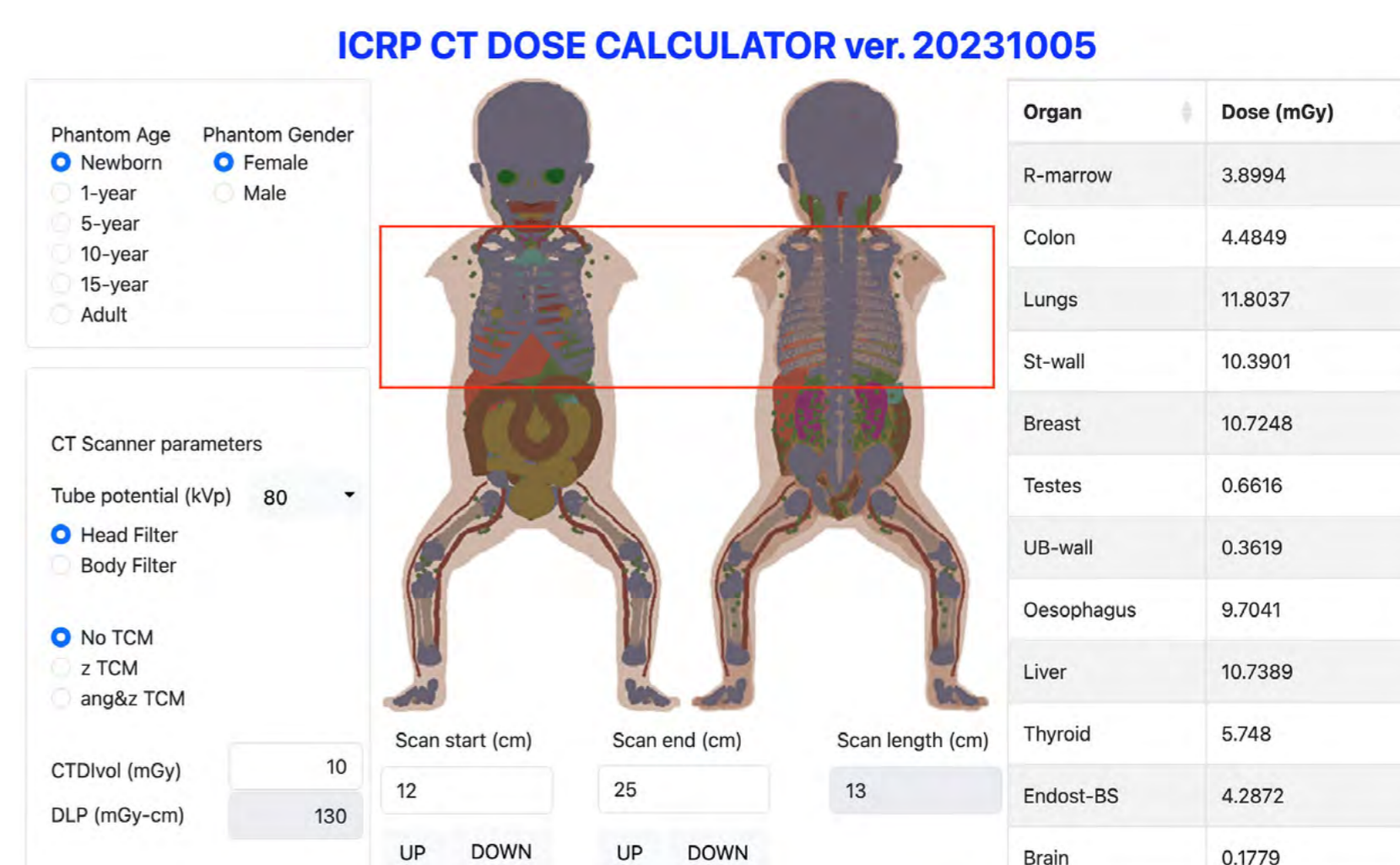


Fig 3. Schematic of the CT GUI

### Radiography

- Reference projections have been defined for commonly performed adult and paediatric examinations.
- Monte Carlo dose calculations have been carried out in 1 keV energy bins from 3 to 150 keV for adults and from 1 to 80, 100 or 120 keV for infants and children.
- Data are provided in 1 keV bins as dose per fluence at 1 m distance from the source (Figure 1) and can then be convolved with any user defined x-ray spectral distribution to obtain spectrum-specific coefficients.
- Dose coefficients are also provided for some “typical” examples of x-ray spectra and examinations, 384 in total for adults and 496 for paediatric, at 50 to 130 kV and filtration of 2.5, 3.0, 3.5 mm Al and for paediatric cases additionally for 3.0 mm Al+0.1 mm Cu. These coefficients are reported as organ absorbed and effective doses per Kerma Area Product (KAP or PKA) and per air kerma free in air at 1 m distance from the source and can be obtained at the ICRP Dose viewer (Figure 2). The ICRP Publication will appear in 2024.

### Fluoroscopically Guided Interventions

- All FGI procedures are tailored to the individual patient whose organ dose is dependent on patient size, procedure complexity, operator’s factors, and equipment factors. There is a considerable range of both PKA and mean PKA for every FGI procedure type. Thus, it is not possible to define a reference examination.
- Radiation Dose Structured Reports (RDSR) data (11 types of FGI procedure, 100 patients per procedure) have been collected from three health care institutions in the United States.
- RDSR data have been translated to the input data for Monte Carlo simulations combined with a library of body size-dependent computational human phantoms for individualized- and event-specific organ dose calculations.
- From the resulting data, “typical” or “average” organ and effective doses will be estimated per FGI procedure.

### Paediatric Diagnostic Fluoroscopic Examinations

- Fifty-nine diagnostic fluoroscopy protocol outlines, encompassing 545 total x-ray fields were developed for clinical protocols of the voiding cystourethrogram, lower GI series (or ‘contrast enema’), upper GI series, and modified barium swallow examinations.
- To develop outlines, open-access American College of Radiology (ACR) practice parameters were consulted.
- Outlines encompass the same physical organ landmarks that would be viewed during the fluoroscopy examination and are meant to be indicative of the standard of practice worldwide.

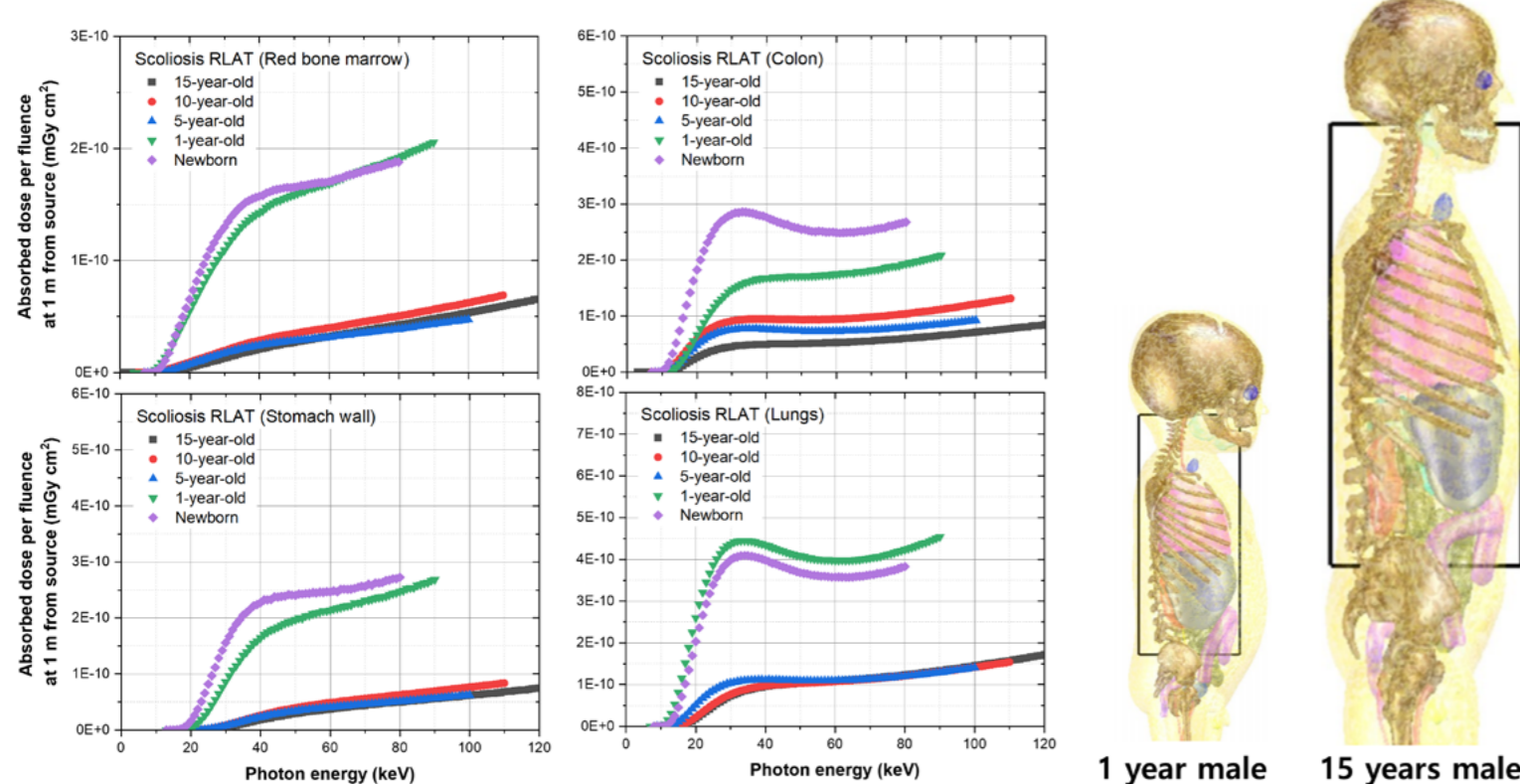


Fig 1. Scoliosis right lateral projection

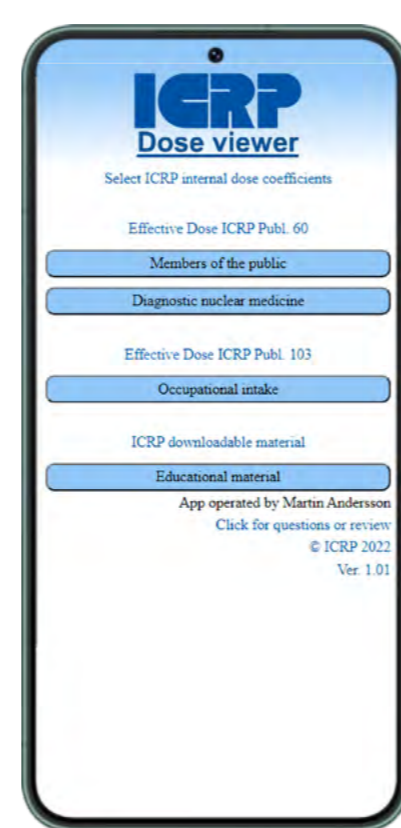


Fig 2. ICRP dose viewer

### Computed Tomography

- Rather than developing a tool that is specific to any one CT scanner or to a pre-determined set of scanners, the Task Group has developed a so called ICRP representative scanner was developed, based on the characteristics of 13 CT scanners (and 102 different operating conditions).
- Organ dose coefficients were calculated for all male and female adult and paediatric phantoms for phantom slab (for newborn for double slab). Coefficients relating to effective dose are provided.
- The results from the ICRP scanner are made representative

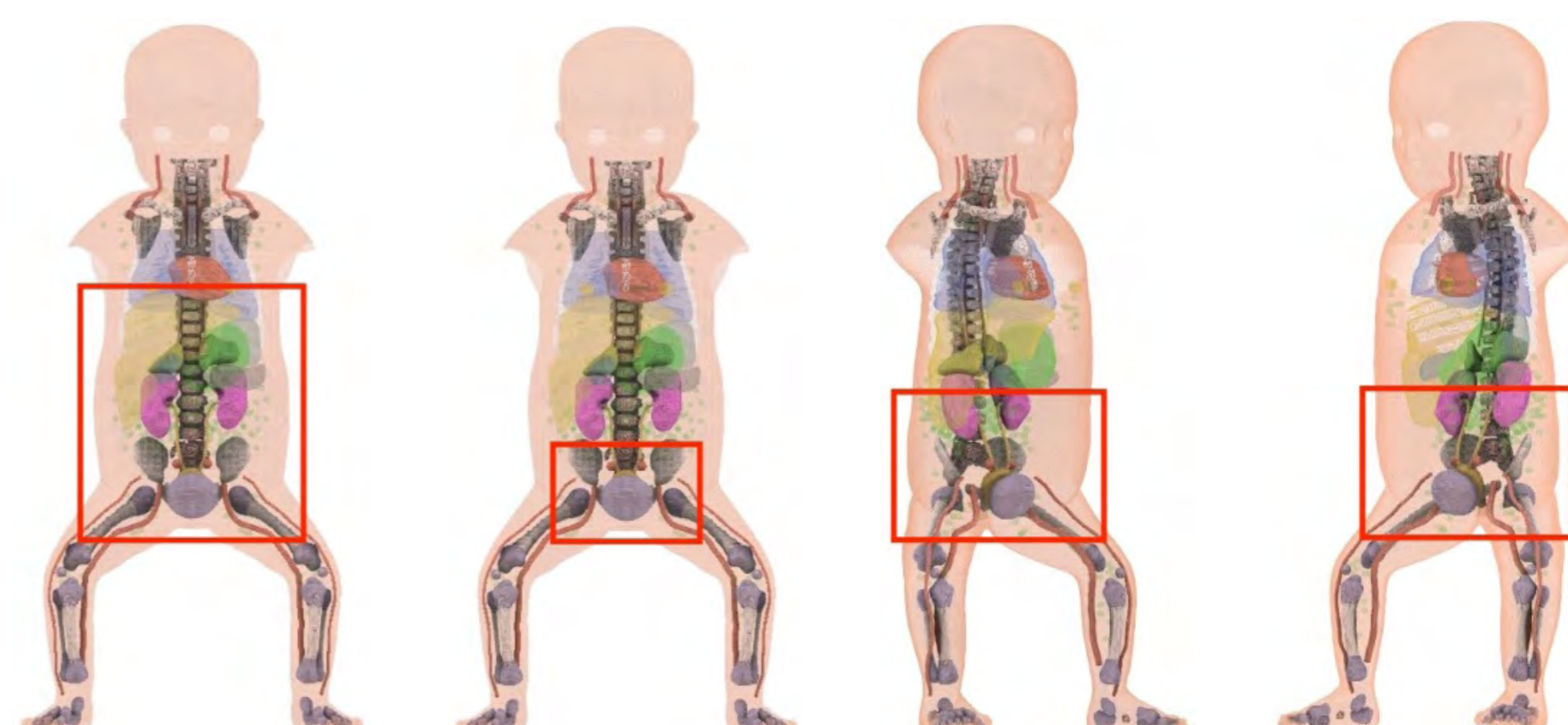


Fig 4. Renders of newborn female phantom with fluoroscopy fields overlaid (red outlines) for a normal voiding cystourethrogram