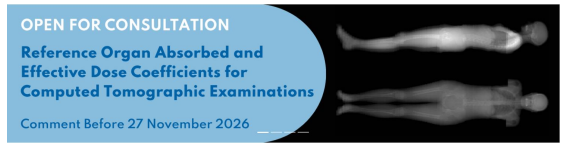
Reference Organ Absorbed and Effective Dose Coefficients for Computed Tomographic Examinations

Digital Workshop 20 October 2026

A consultation on the report of ICRP Task Group 113

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David Sutton

Digital Workshop Programme

Introduction – David Sutton

The ICRP Phantoms – Choonsik Lee

Development of the ICRP Reference Scanner – Jan Jansen

The ATCM model – Helmut Schlattl

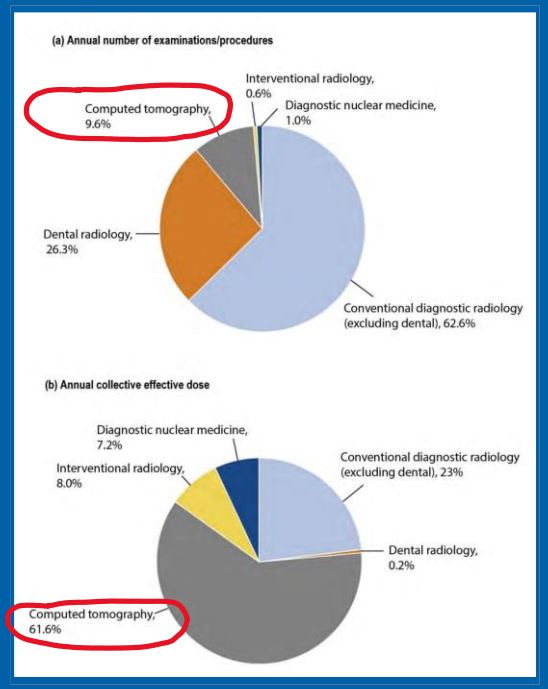
Calculation of Doses and the Dose Coefficient Library – Jan Jansen

The GUI Based Calculator with Examples – Choonsik Lee

Interpretation of Dose Coefficients – What do they mean and what not - Nina Petoussi-Henss

Q&A

ICRP TG 113 - Reference Organ and Effective Dose Coefficients for Common X-Ray Imaging Examinations



- The aim of the Task Group is to perform Monte Carlo radiation transport simulations on a series of reference imaging examinations and to report the resulting organ absorbed dose and effective dose coefficients.
- Five different projects.

Stream	Scope
Radiography	Adult & Paediatric
Computed Tomography	**Adult & Paediatric**
Fluoroscopically Guided Interventions	Adult
Diagnostic Fluoroscopy	Paediatric
CT and Radiography	Fetus & Pregnant Patients

Report Summary - Background

- ICRP has recently provided reference dose coefficients for common radiographic examinations, and this publication extends that work to computed tomography.
- The availability of ICRP reference organ and effective dose coefficients in CT will facilitate the work of national and international authorities responsible for estimation of patient doses and will also be of benefit to practitioners working in the field.
- As part of the work the Task Group has developed a virtual, representative scanner—the ICRP reference scanner—that incorporates a theoretical, non-manufacturer-specific model of Automatic Tube Current Modulation.

Report Summary – Reference Scanner

- Modelled 102 separate operating conditions for 13 CT scanners from 4 manufacturers on the ICRP reference adult male and female phantoms and derived organ dose and effective dose coefficients per phantom slab.
- Using the results from the 102 models we have defined a representative ‘ICRP scanner’ for which organ and effective dose coefficients can be determined for adult, paediatric and pregnant phantoms.
- Users can use the $CTDI_{vol}$ from their own scanner with a bespoke GUI calculator or manually.



Report Summary - Implementation

- The ICRP reference scanner has been used in Monte Carlo radiation transport simulations employing the family of ICRP reference male and female voxel computational phantoms to derive a library of dose coefficients. The dose coefficients are provided per phantom slice for the male and female newborn, 1-year-old, 5-year-old, 10-year-old, 15-year-old, and adult phantoms.
- To estimate the doses for any desired protocol, users can make use of a calculator accessible via a graphical user interface that accompanies the publication. They can also manipulate the data themselves using equations provided in the text. Worked examples are provided.
- The report does **not** provide any recommended protocols.
- A comprehensive analysis of the uncertainties associated with the work is presented.

Dose coefficients

- The tables of dose coefficients provide absorbed dose per $CTDI_{free\text{-}in\text{-}air}$, for both male and female phantoms at each reference age, for all organs assigned a tissue weighting factor in ICRP *Publication* 103, and also the lens of the eye. Conversion coefficients from $CTDI_{free\text{-}in\text{-}air}$ to $CTDI_w$ are also provided.
- As with the previous publication concerned with Radiography the tables also provide, for each phantom slice, a coefficient for either $\sum w_T \times H_T^M$ ($E_{103,\#\#M}$) or $\sum w_T \times H_T^F$ ($E_{103,\#\#F}$). A single coefficient for E is not provided since it is a sex averaged quantity and we do not provide or endorse any scanning protocols.
- The calculated dose coefficients are those which the reference person would experience, and are not directly applicable to the individual patient.

ICRP Reference Scanner – Recap

- Reference Scanner operates with
  - Tube voltage 80, 100, 120, or 140 kV and
  - Body or Head beam shaping filters.
- Virtual CT scanner is distributable and can be implemented in various Monte Carlo codes.
- ICRP scanner shows satisfactory dosimetric behaviour when compared to the simulated CT scanners.
- Incorporates a "simple physics-based" cosine model of ATCM that is **not** representative of any manufacturer ATCM.

Draft Report TOC

Topics in bold are the subject of talks in this workshop.

1. Introduction.
2. **The ICRP Reference Voxel Phantoms**.
3. **Development of the ICRP Reference Scanner & Determination of Organ Absorbed Doses.**
4. **Automatic Tube Current Modulation.**
5. **The Dose Coefficient Library**.
6. **The Graphical User Interface and the Data Files – some examples.**
7. **Uncertainties, Variability and Limitations.**
8. *Summary.*
9. *References.*

- *Annex A Comparing the ICRP Reference Scanner with the Modelled Scanners.*
- *Annex B Verification of the Calculations of Dose Coefficients (Spot Checks).*
- *Annex C Dosimetric Quantities in CT*
- *Annex D Electronic Supplement*.

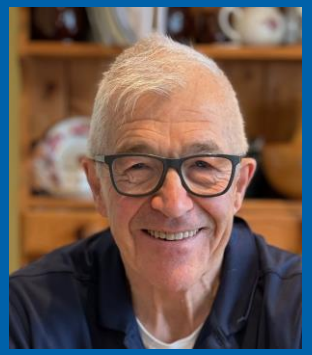
Target Audience

The publication is aimed at all those who have an interest in patient dosimetry and optimisation, including national and international authorities, medical physicists, radiologists, radiographers, researchers and other radiological practitioners.

We look forward to receiving your comments on the document !



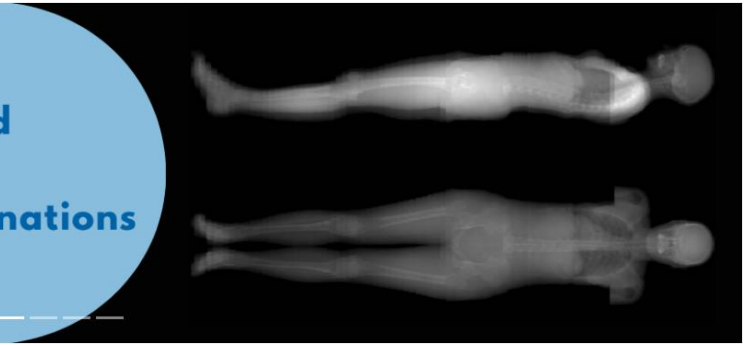




OPEN FOR CONSULTATION

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Comment Before 27 November 2026





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