

New Scanner Models and the ImPACT CT Dosimetry Spreadsheet: Tips and Strategy

S.Edyvean, Nick Keat, Maria Lewis
Acknowledgements: Ed McDonagh,
David Platten, Jim Weston

CTDosimetry

1. CTDosimetry basics
2. Understanding the matching
3. Tips - incorporating new scanner models for your own use
4. A strategy - for incorporating new scanner models into a new downloadable version of CTDosimetry

CTDosimetry - Patient Dose Calculator

- Matches new scanner models to old models
 - In order to use existing organ dose datasets (NRPB SR250)
 - NRPB SR250 Calculated using Monte Carlo methods on old models
- Free download from ImPACT web site
- Also requires purchase of NRPB SR-250 (£50)

The screenshot shows the homepage of impactscan.org. At the top is a green banner with the text 'impactscan.org'. Below this is a blue navigation bar with the text ':: ImPACT'. The main content area is divided into several sections: a main text block on the left, a 'Did you know .?.' section on the right, and a 'What is a CT scanner?' section at the bottom right. There are also sidebars with links for 'on this page' and 'around the site'. A blue bar at the bottom contains the text ':: hot stuff'.

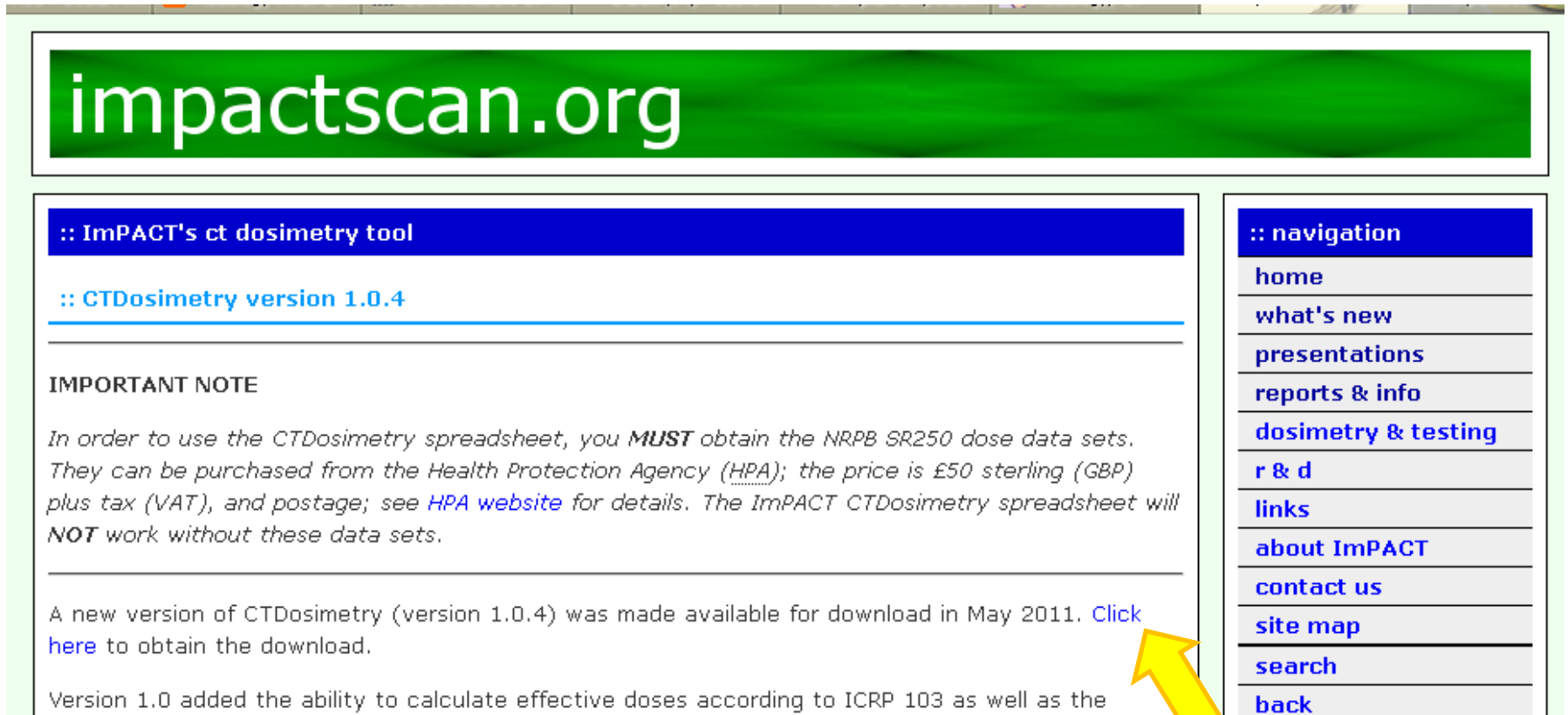
<http://www.impactscan.org>

The screenshot shows a file explorer window with a table of files. The table has three columns: Name, Size, and Type. The files listed are:

Name	Size	Type
CTDosimetry_1.0.4.xls	659 KB	Microsoft C
MCSET01.DAT	109 KB	DAT File
MCSET02.DAT	110 KB	DAT File
MCSET03.DAT	108 KB	DAT File
MCSET04.DAT	108 KB	DAT File
MCSET05.DAT	108 KB	DAT File
MCSET06.DAT	108 KB	DAT File
MCSET07.DAT	108 KB	DAT File
MCSET08.DAT	108 KB	DAT File

Getting started

- Download the spreadsheet (free)



impactscan.org

:: ImpACT's ct dosimetry tool

:: [CTDosimetry version 1.0.4](#)

IMPORTANT NOTE

*In order to use the CTDosimetry spreadsheet, you **MUST** obtain the NRPB SR250 dose data sets. They can be purchased from the Health Protection Agency ([HPA](#)); the price is £50 sterling (GBP) plus tax (VAT), and postage; see [HPA website](#) for details. The ImpACT CTDosimetry spreadsheet will **NOT** work without these data sets.*

A new version of CTDosimetry (version 1.0.4) was made available for download in May 2011. [Click here](#) to obtain the download.

Version 1.0 added the ability to calculate effective doses according to ICRP 103 as well as the

:: navigation

- home
- what's new
- presentations
- reports & info
- [dosimetry & testing](#)
- r & d
- links
- about ImpACT
- contact us
- site map
- search
- back

Getting started

- Fill out some details

We have tested it extensively and regularly check for viruses - but we would, of course, recommend that you use all due diligence before using the application. We can not take any liability for the use of this tool and any subsequent losses.

We value feedback from users as to any bugs or usability issues that remain.

CT Dosimetry spreadsheet download

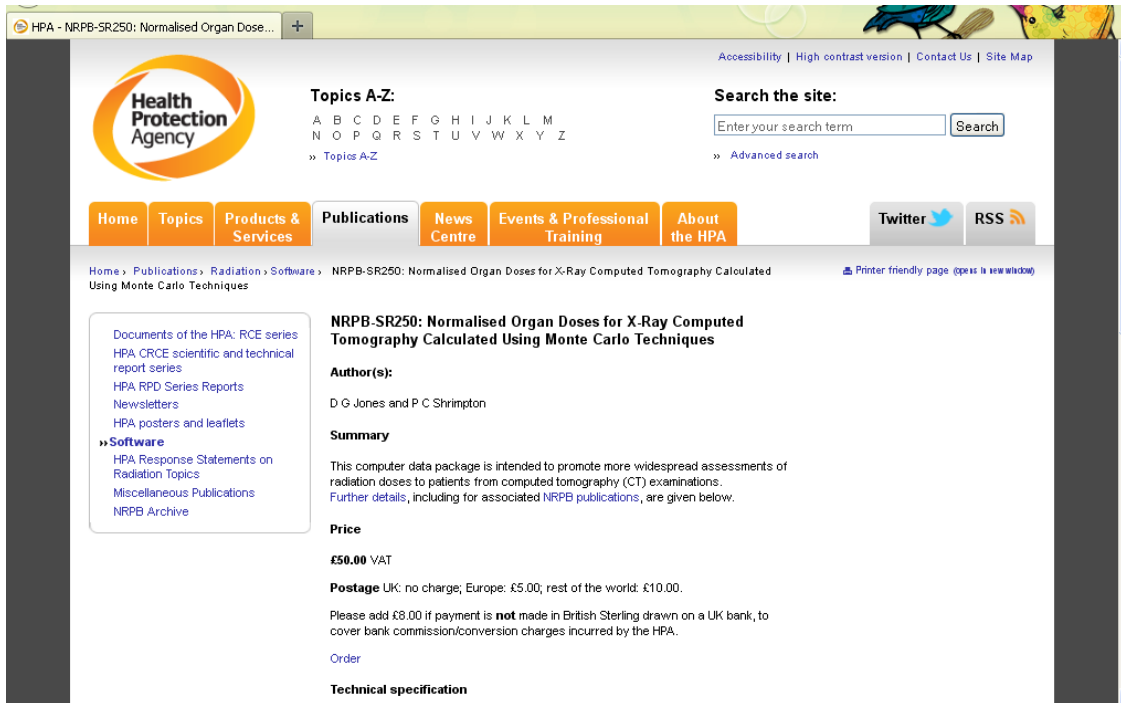
your name: (optional)	<input type="text" value="{anon}"/>
please indicate your profession:	
clinical: <input type="radio"/> radiologist <input type="radio"/> radiographer <input type="radio"/> clinician / other health professional	non-clinical: <input type="radio"/> physicist <input type="radio"/> engineer <input type="radio"/> patient <input type="radio"/> other <input type="text" value=""/>
name of your hospital /trust/ organisation / company: (optional)	<input type="text" value=""/> is it: <input type="text" value="...choose one..."/>
tick if you are in UK healthcare <input type="checkbox"/> if so: are you NHS <input type="radio"/> non NHS <input type="radio"/>	
I understand that I must obtain the NRPB SR250 data sets from the HPA in order to use the spreadsheet: <input type="checkbox"/>	
<input type="button" value="download document"/>	

Information submitted with your request is used to track the number of valid downloads and profile our user base. Access to the download is not restricted to those who fill in the form, but please



NRPB SR250

- Purchase NRPB SR-250 (£50) from PHE (HPA)



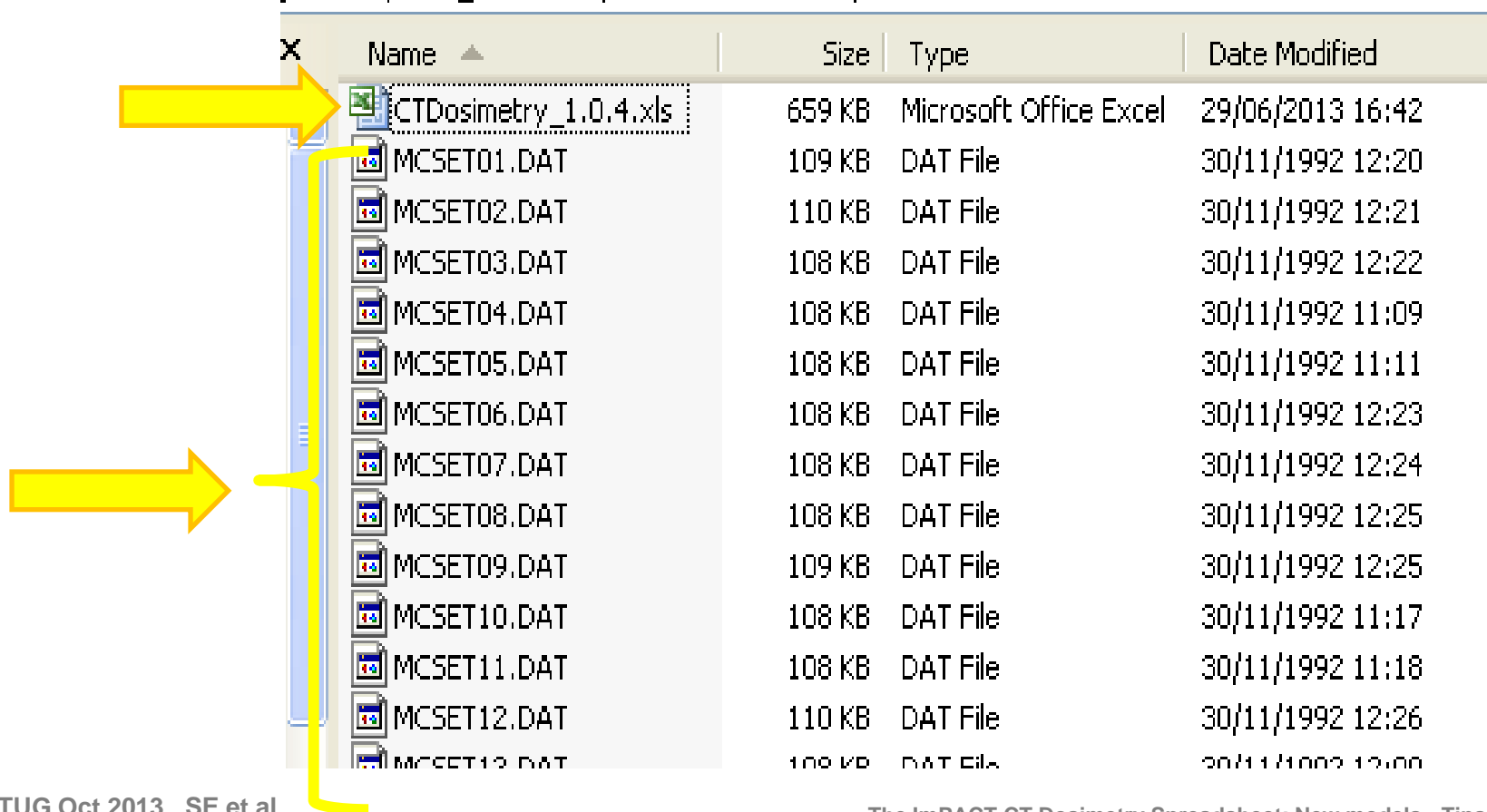
The screenshot shows the HPA website interface. At the top left is the Health Protection Agency logo. To its right is a 'Topics A-Z' navigation menu with letters A through Z. Further right is a search bar with the text 'Search the site:' and a 'Search' button. Below these are navigation tabs for 'Home', 'Topics', 'Products & Services', 'Publications', 'News Centre', 'Events & Professional Training', and 'About the HPA'. There are also social media icons for Twitter and RSS. The main content area displays the title 'NRPB-SR250: Normalised Organ Doses for X-Ray Computed Tomography Calculated Using Monte Carlo Techniques'. Below the title, it lists the author(s) as 'D G Jones and P C Shrimpton'. A 'Summary' section follows, describing the computer data package. The 'Price' is listed as '£50.00 VAT'. A 'Postage' section indicates 'UK: no charge; Europe: £5.00; rest of the world: £10.00'. There is also a note about adding £8.00 for non-UK payments. At the bottom of the page, there are links for 'Order' and 'Technical specification'.

http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1195733753330?p=1153846674387

Also a link is found at <http://www.impactscan.org/ctdosimetry.htm>

Placing of files

- Put spreadsheet and organ dose data sets (23 MC files) in the same directory



Name	Size	Type	Date Modified
CTDosimetry_1.0.4.xls	659 KB	Microsoft Office Excel	29/06/2013 16:42
MCSET01.DAT	109 KB	DAT File	30/11/1992 12:20
MCSET02.DAT	110 KB	DAT File	30/11/1992 12:21
MCSET03.DAT	108 KB	DAT File	30/11/1992 12:22
MCSET04.DAT	108 KB	DAT File	30/11/1992 11:09
MCSET05.DAT	108 KB	DAT File	30/11/1992 11:11
MCSET06.DAT	108 KB	DAT File	30/11/1992 12:23
MCSET07.DAT	108 KB	DAT File	30/11/1992 12:24
MCSET08.DAT	108 KB	DAT File	30/11/1992 12:25
MCSET09.DAT	109 KB	DAT File	30/11/1992 12:25
MCSET10.DAT	108 KB	DAT File	30/11/1992 11:17
MCSET11.DAT	108 KB	DAT File	30/11/1992 11:18
MCSET12.DAT	110 KB	DAT File	30/11/1992 12:26
MCSET13.DAT	109 KB	DAT File	30/11/1992 12:00

Open Spreadsheet

nCTDIw f_x $=(\text{VLOOKUP}(\text{MatchGroup}, \text{Matches}, \text{IF}(\text{BodyRegion}=1,4,7))+2*\text{VLOOKUP}(\text{M}$

ImpACT CT Patient Dosimetry Calculator										
Version 1.0.4 27/05/2011										
Scanner Model:					Acquisition Parameters:					
Manufacturer:	Siemens				Tube current	30	mA			
Scanner:	Siemens Balance, Emotion				Rotation time	1	s			
kV:	130				Spiral pitch	1				
Scan Region:	Head				mAs / Rotation	30	mAs			
Data Set	MCSET14	Update Data Set			Effective mAs	30	mAs			
Current Data	MCSET14				Collimation	10	mm			
Scan range					Rel. CTDI	Look up	1.00	at selected collimation		
Start Position	32.5	cm	Get From Phantom		CTDI (air)	Look up	33.2	mGy/100mAs		
End Position	62	cm	Diagram		CTDI (soft tissue)		35.5	mGy/100mAs		
Organ weighting scheme					nCTDI _w	Look up	24.1	mGy/100mAs		
ICRP 103					CTDI _w					
					7.2 mGy					
					CTDI _{vol}					
					7.2 mGy					
					DLP					
					213 mGy.cm					
Organ				w _T	H _T (mGy)	w _T .H _T	Remainder Organs			H _T (mGy)
Gonads				0.08	0.038	0.003	Adrenals			5.2
Bone Marrow				0.12	1.6	0.19	Small Intestine			0.28
Colon				0.12	0.24	0.029	Kidney			3
Lung				0.12	5.4	0.64	Pancreas			4.5
Stomach				0.12	3.8	0.46	Spleen			4.4
Bladder				0.04	0.021	0.00083	Thymus			6.1
Breast				0.12	4.5	0.54	Uterus / Prostate (Bladder)			0.04
Liver				0.04	4.2	0.17	Muscle			1.2
Oesophagus (Thymus)				0.04	6.1	0.24	Gall Bladder			2.3
Thyroid				0.04	0.28	0.011	Heart			6

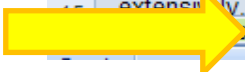
CTUG Oct 2013 _SE et al

ScanCalculation Phantom Paediatric Scanners MatchData Collimation MonteCarloData

Introduction Tab

- Useful tips for running

1	
2	ImPACT CT Patient Dosimetry Calculator
3	Version 1.0.4 27/05/2011
4	
5	Introduction
6	This spreadsheet is a tool for calculating patient organ and effective doses from CT scanner examinations. It makes use of the NRPB Monte Carlo dose data sets produced in report SR250 (link at bottom of page). SR250 provides normalised organ dose data for irradiation of a mathematical phantom by a range of CT scanners
7	As SR250 was produced in 1993, it does not include data for more modern scanners. To overcome this problem, the ImPACT CT scanner dose survey was carried out by physicists in the UK and Europe.
8	This work, provides a method for 'matching' the dose distribution of newer scanners to scanners included in SR250. The matching results are included in this spreadsheet. As new scanners are introduced, their matches will be included in updates to this spreadsheet. More details can be found on the dose survey page on the ImPACT website (link below)
9	The results produced by the CTDosimetry spreadsheets have been checked against those produced by CTDOSE, produced by John Le Heron, the standard software used to calculate doses from the NRPB SR250 datasets. The two methods produce identical results for a range of scans and scanners, with the exception of small differences between the doses calculated for muscle and for the 'remainder' organs. These differences are present despite an apparent similarity in calculation method, and are typically 1-2%.
10	
11	Installation
12	The system should work on any PC with Microsoft Excel 2000 or above. It has not yet been tested on a Apple computer, but it is anticipated that it should work on a Mac.
13	Installation is fairly simple, and only requires the SR250 data sets (MCSET01.DAT to MCSET23.DAT) to be present in the same directory as this spreadsheet. (SR250 is sold by the NRPB - see link below)
14	Macros are used on this spreadsheet for a variety of purposes. Depending on your version of Excel, and macro options, the security level may have to be switched to 'medium' (select 'Tools' -> 'Options' -> 'Security' -> 'Macro Security'), and/or ImPACT added to your trusted Macro sources.
15	This spreadsheet has been checked for macro viruses, and the logic and calculations been tested extensively. However ImPACT accept no responsibility for loss or damage incurred as a result of its use.
16	Introduction ScanCalculation Phantom Paediatric Scanners MatchData Collima



Macros

- Adjust the macro settings

CTDosimetry_1.0.4.xls [Compatibility Mode] - Microsoft Excel

Home Insert Page Layout Formulas Data Review View

Security Warning Macros have been disabled. Options...

nCTDIw $=\text{VLOOKUP}(\text{MatchGroup}, \text{Matches}, \text{IF}(\text{BodyRegion}=1,4,7))+2*\text{VLOOKUP}(\text{MatchGroup}, \text{Matches}, \text{IF}(\text{B}...$

ImPACT CT Patient Dosimetry Calculator

Version

Scanner Model:

Manufacturer: Siemens

Scanner: Siemens Balance, Emotion

kV: 130

Scan Region: Head

Data Set MCSET14 Update Data Set

Current Data MCSET14

Scan range

Start Position 32.5 cm Get From Phantom Diagram

End Position 62 cm

Organ weighting scheme

Microsoft Office Security Options

Security Alert - Macro

Macro

Macros have been disabled. Macros might contain viruses or other security hazards. Do not enable this content unless you trust the source of this file.

Warning: It is not possible to determine that this content came from a trustworthy source. You should leave this content disabled unless the content provides critical functionality and you trust its source.

[More information](#)

File Path: H:\...UG Nov 2013\ImPACT CTDosimetry and MC files\CTDosimetry_1.0.4.xls

Help protect me from unknown content (recommended)

Enable this content

Scanner models

- But your scanner is not there ...

Home Insert Page Layout Formulas Data Review View

nCTDI_w fx =(VLOOKUP(MatchGroup,Matches,IF(BodyRegion=1,4,7))+2*VLOOKUP(Ma

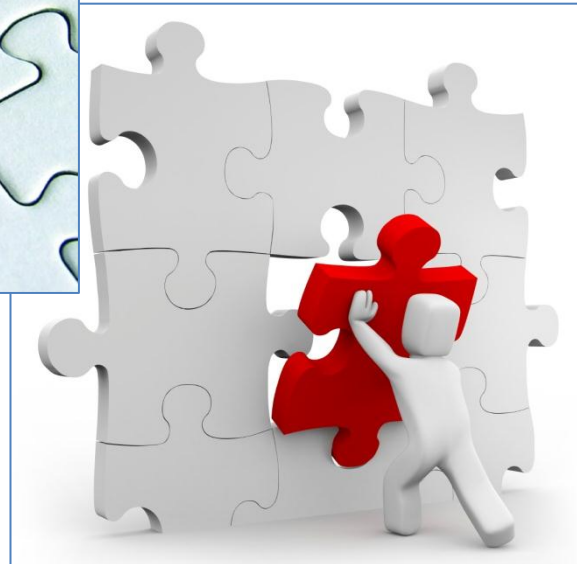
	A	B	C	D	E	F	G	H	I	J	K	L
1												
2	ImPACT CT Patient Dosimetry Calculator											
3	Version 1.0.4 27/05/2011											
4												
5	Scanner Model:											
6	Manufacturer:	Siemens										
7	Scanner:	Siemens Definition AS										
8	kV:	Siemens CR, CR512, DRH										
9	Scan Region:	Siemens Somatom 2, DR1/2/3										
10	Data Set	Siemens DRG, DRG1										
11	Current Data	Siemens Somatom Plus 4 Series										
12	Scan range	Siemens Somatom AR-C, AR.SP, AR-T										
13	Start Position	Siemens AR.HP										
14	End Position	Siemens Plus, DXP, Plus-5										
15		Siemens Hi Q										
16	Organ weight	Siemens Balance, Emotion										
17		Siemens Volume Zoom, Access										
18		Siemens Emotion Duo										
19		Siemens Sensation 4										
20		Siemens Sensation 16										
21	Organ	Siemens Sensation 16 Straton										

Acquisition Parameters:		
Tube current	30	mA
Rotation time	1	s
Spiral pitch	1	
mAs / Rotation	30	mAs
Effective mAs	30	mAs
Collimation		mm
Rel. CTDI	Look up 1.00	(assumed)
CTDI (air)	Look up #N/A	mGy
CTDI (soft tissue)	#N/A	mGy
nCTDI _w	Look up #N/A	mGy

CTDI _w	#N/A	mGy
CTDI _{vol}	#N/A	mGy
DLP	#N/A	mGy



CTDosimetry - Missing Scanners



Own use



**Collaboration for a new
version of CTDosimetry**

64 Slice Scanners

64 slice data

If you are wanting guidance on how to use the current spreadsheet to estimate the dose from 64 slice scanners, please read [this document](#).

<http://www.impactscan.org/ctdosimetry.htm#CTDoseDownload>

ImPACT CT Patient Dosimetry Calculator: 64 Slice Scanners

1. Current Version 0.99x, Jan 06

Includes Siemens Sensation 64 and GE VCT

2. Philips Brilliance 40 and 64

Calculate as for a Philips MX8000 IDT. Essentially CTDI values in air and in phantom are similar, implying that filtration the same. Only difference is therefore that the beam is wider on the 40 and 64 scanners.

Use 'collimation (mm)' eg 7.5 or 40 mm, and type in value for 'relative CTDI' factor, form table below, in cell (I,12) on ScanCalculation page.

Data from Philips 64

Collimation		Relative CTDI factor	
(n x mm)	(mm)	Small fs	Large fs
12 x 0.625	7.5	-	1.018
16 x 0.625	10	1.002	1.000
12 x 1.25	15	-	0.875
40 x 0.625	25	0.877	0.876
32 x 1.25	40	-	0.749
64 x 0.625	40	0.749	0.748

(fs = focal spot)

3. Toshiba Aquilion 64

Detector array is the same. Assume that filtration is the same, therefore can calculate as for a Toshiba 16.

se 12/5/2006

Missing Scanner Models 2011

CT scanner models - suggested classification

Level	GE	Philips	Siemens	Toshiba
LOW	BrightSpeed Elite		Emotion 16 Spirit Definition AS 20/40^	
MED	LightSpeed VCT: (Body,'small' filter) Optima 660s (32)*			Aquilion 32~
HIGH	Optima 660 (64) LightSpeed VCT Xte**	Brilliance 64 Essence+ Ingenuity CT	Definition AS+	Aquilion 64 inc. Body, 'S' filter Aquilion CX & CXL~
PREMIUM	Discovery CT750 HD	Philips iCT SP** Philips iCT	Definition Dual Source Definition Flash	Aquilion PRIME (80)~~ Aquilion Premium (160)~~ Aquilion ONE (320)
WIDE BORE	LightSpeed Xtra (WB) Optima 580	Brilliance Big Bore	Definition Open 20/40	Toshiba Aquilion LB

* Same dosimetry as Optima 660?

** Same dosimetry as VCT?

+ Same dosimetry as Brilliance?

++ Same dosimetry as iCT?

^ Same dosimetry as Definition AS 64?

~ Same dosimetry as Aquilion 64

~~ Same dosimetry as Aquilion ONE

CT scanner models in Nuclear Medicine

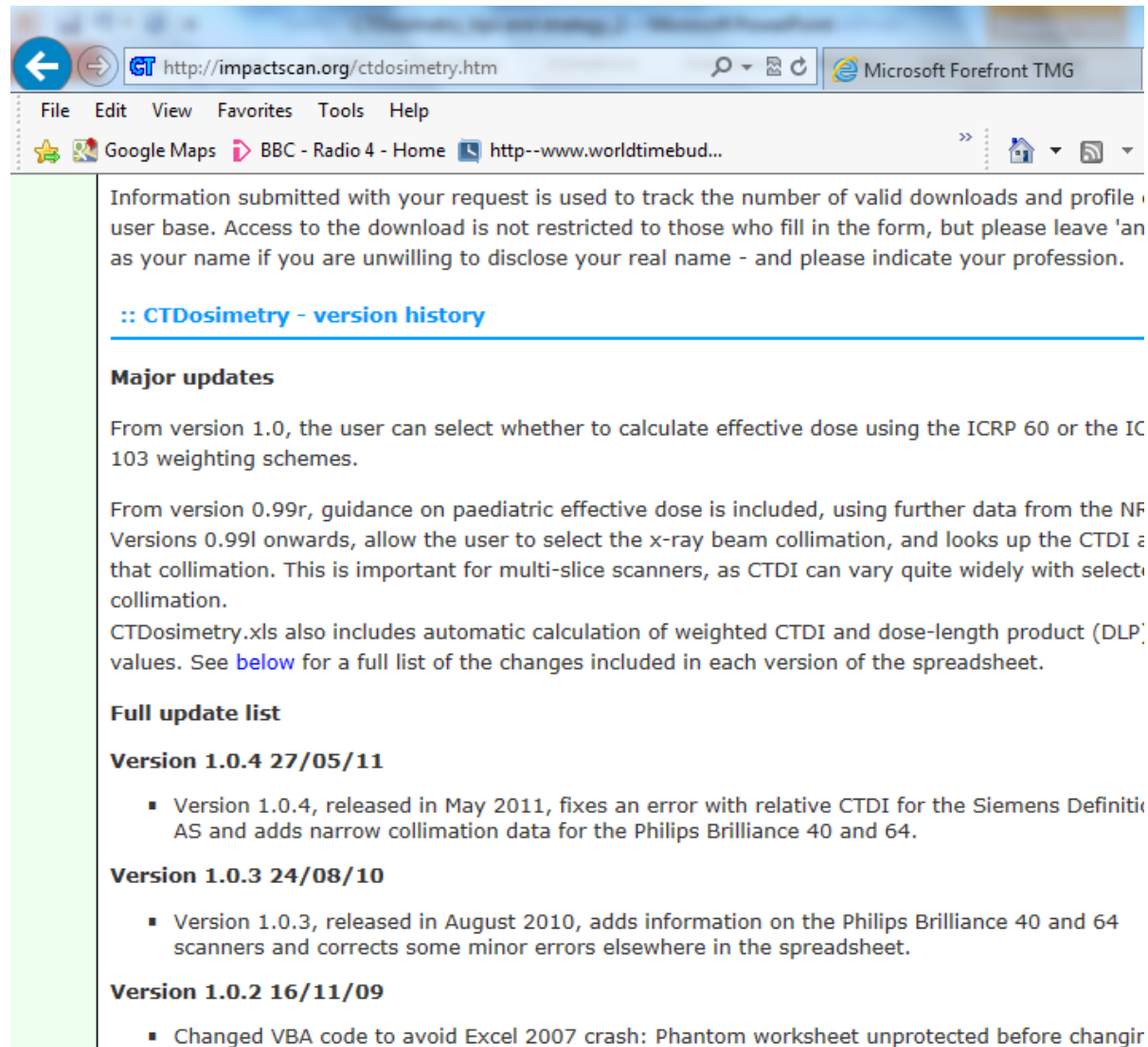
- PET-CT, SPECT-CT does not name CT scanner

Manufacturer	PET Model	CT component
GE Healthcare	Discovery ST	4 slice Lightspeed
	Discovery ST	16 slice Lightspeed
	Discovery STE	8 slice Lightspeed
	Discovery STE	16 slice Lightspeed
	Discovery VCT	64 slice Lightspeed
	Discovery VCT	64 slice VCT
	Discovery 690	64 slice Lightspeed

Manufacturer	PET Model	CT component
Philips	Gemini GXL	16 slice Brilliance
	Gemini TF	16 slice Brilliance
	Gemini TF	64 slice Brilliance

Manufacturer	PET Model	CT component
Siemens Medical	Biograph	6 slice Emotion
	Biograph	16 slice Sensation
	Biograph	16 slice Somatom Emotion
	Biograph	40 slice Sensation
	Biograph	64 slice Sensation
	Biograph	64 slice Somatom
	mCT	128 slice Definition AS
	mCT	40 slice Definition AS
	mCT	64 slice Definition AS

Check out latest Version



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[:: CTDosimetry - version history](#)

Major updates

From version 1.0, the user can select whether to calculate effective dose using the ICRP 60 or the IC 103 weighting schemes.

From version 0.99r, guidance on paediatric effective dose is included, using further data from the NF Versions 0.99l onwards, allow the user to select the x-ray beam collimation, and looks up the CTDI at that collimation. This is important for multi-slice scanners, as CTDI can vary quite widely with select collimation.

CTDosimetry.xls also includes automatic calculation of weighted CTDI and dose-length product (DLP) values. See [below](#) for a full list of the changes included in each version of the spreadsheet.

Full update list

Version 1.0.4 27/05/11

- Version 1.0.4, released in May 2011, fixes an error with relative CTDI for the Siemens Definition AS and adds narrow collimation data for the Philips Brilliance 40 and 64.

Version 1.0.3 24/08/10

- Version 1.0.3, released in August 2010, adds information on the Philips Brilliance 40 and 64 scanners and corrects some minor errors elsewhere in the spreadsheet.

Version 1.0.2 16/11/09

- Changed VBA code to avoid Excel 2007 crash: Phantom worksheet unprotected before changir

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Own use

The ImPACT CT Dosimetry Spreadsheet: New models - Tips and Strategy

Understanding the Matching

impactscan.org

:: dose survey summary

This article originally appeared in 'Rad' magazine, in 2000, and discusses the results of the ImPACT dose survey.

[Estimating patient dose on current CT scanners: Results of the ImPACT* CT dose survey](#)

M.A. Lewis, S. Edyvean, S.A. Sassi, H. Kiremidjian, N. Keat and A.J. Britten. ImPACT, Medical Physics, St. George's Hospital, London

Introduction

CT has for a long time been recognised as a high dose procedure and, in 1989, the NRP conducted a wide-scale national survey to investigate the doses received from CT examinations in the

<http://www.impactscan.org/dosesurveysummary.htm>,
www.impactscan.org/CTDosimetry

<http://www.impactscan.org/slides/ecr2002/ctdosimetrydatabase.pdf>



Imaging
Performance
Assessment of CT
Scanners

A Medical Devices
Agency Evaluation Group



CT dosimetry and a data base for CTDI values

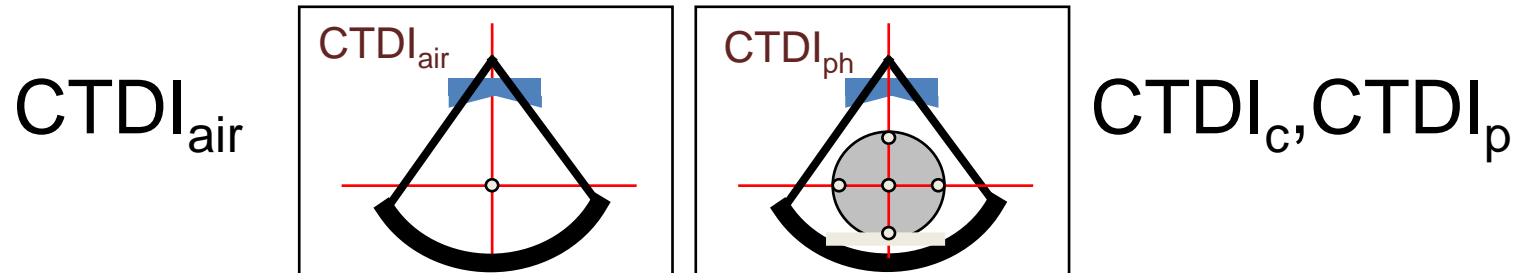
EFOMP Workshop at ECR 2002

S. Edyvean, ImPACT
St George's Hospital,
London



'ImPACT' factor

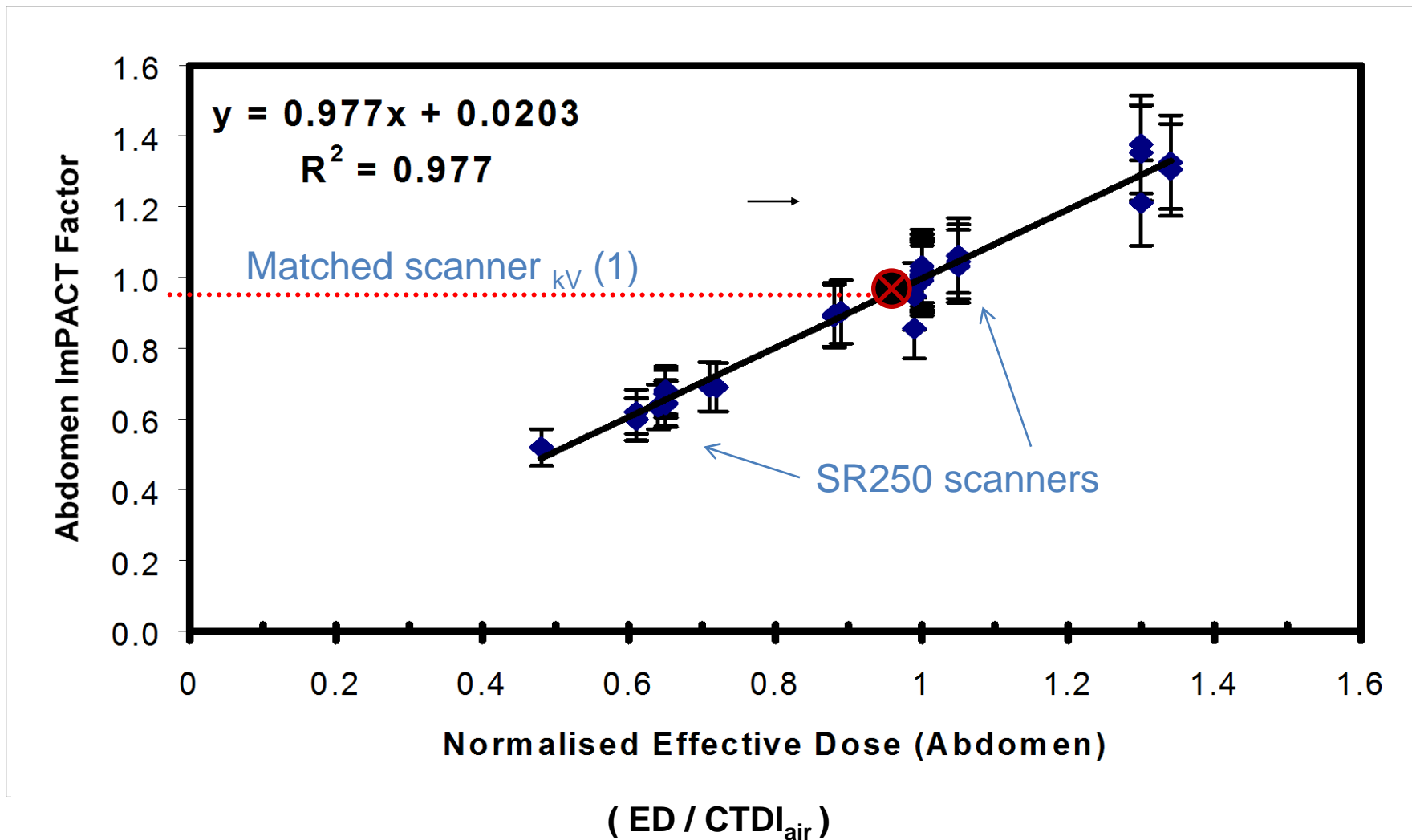
- Measurements on old (SR250) scanners
 - CTDI_{air}, and CTDI_{phantom} (c & p)



- MC data sets and CTDI data for old scanners
 - Multi-variate analysis : combination which gave best correlation -> 'ImPACT' Factor

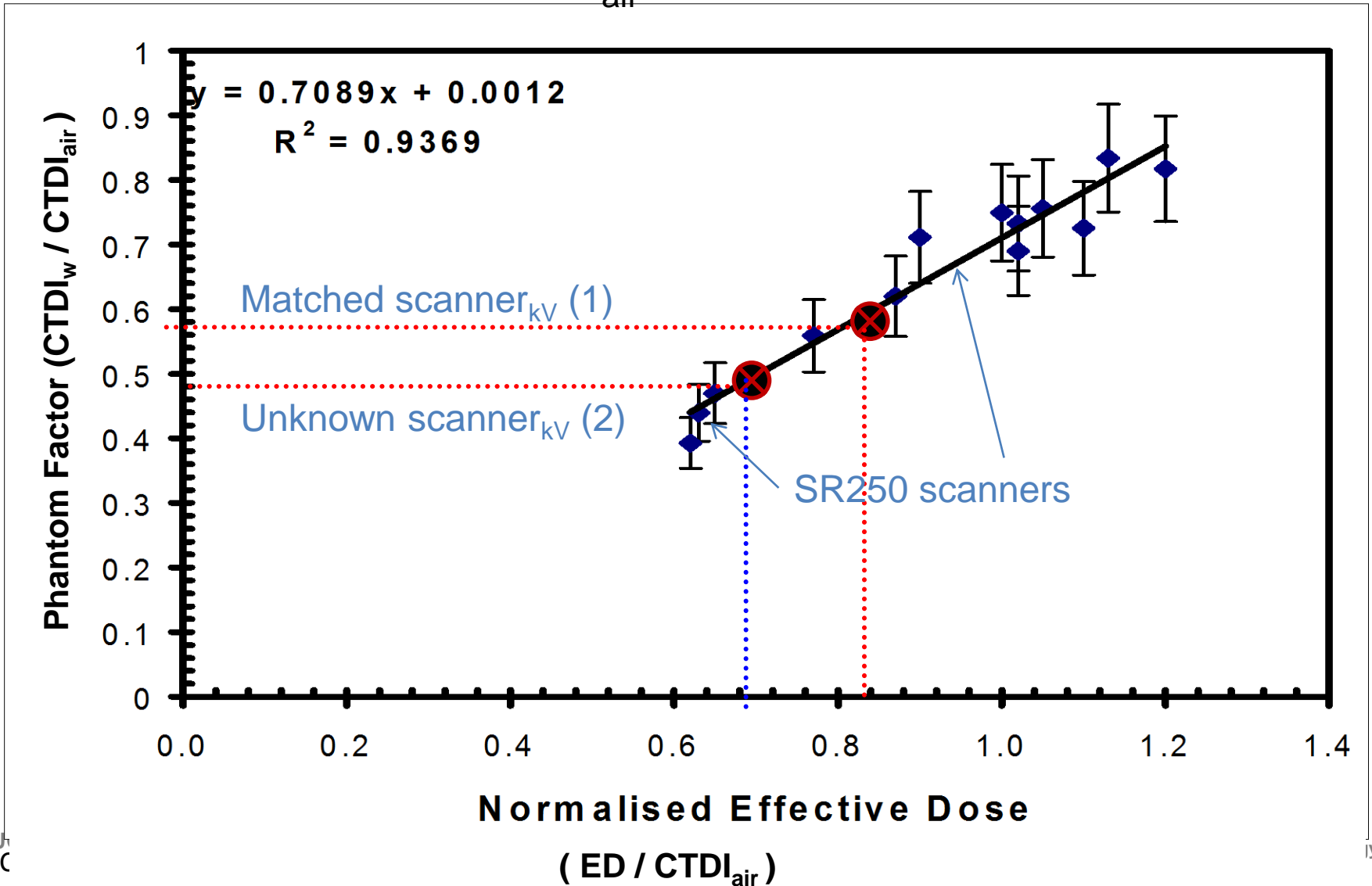
$$\text{ImF} = a. (\text{CTDI}_c / \text{CTDI}_{\text{air}}) + b. (\text{CTDI}_p / \text{CTDI}_{\text{air}}) + \text{constant}$$

ImF vs Effective Dose

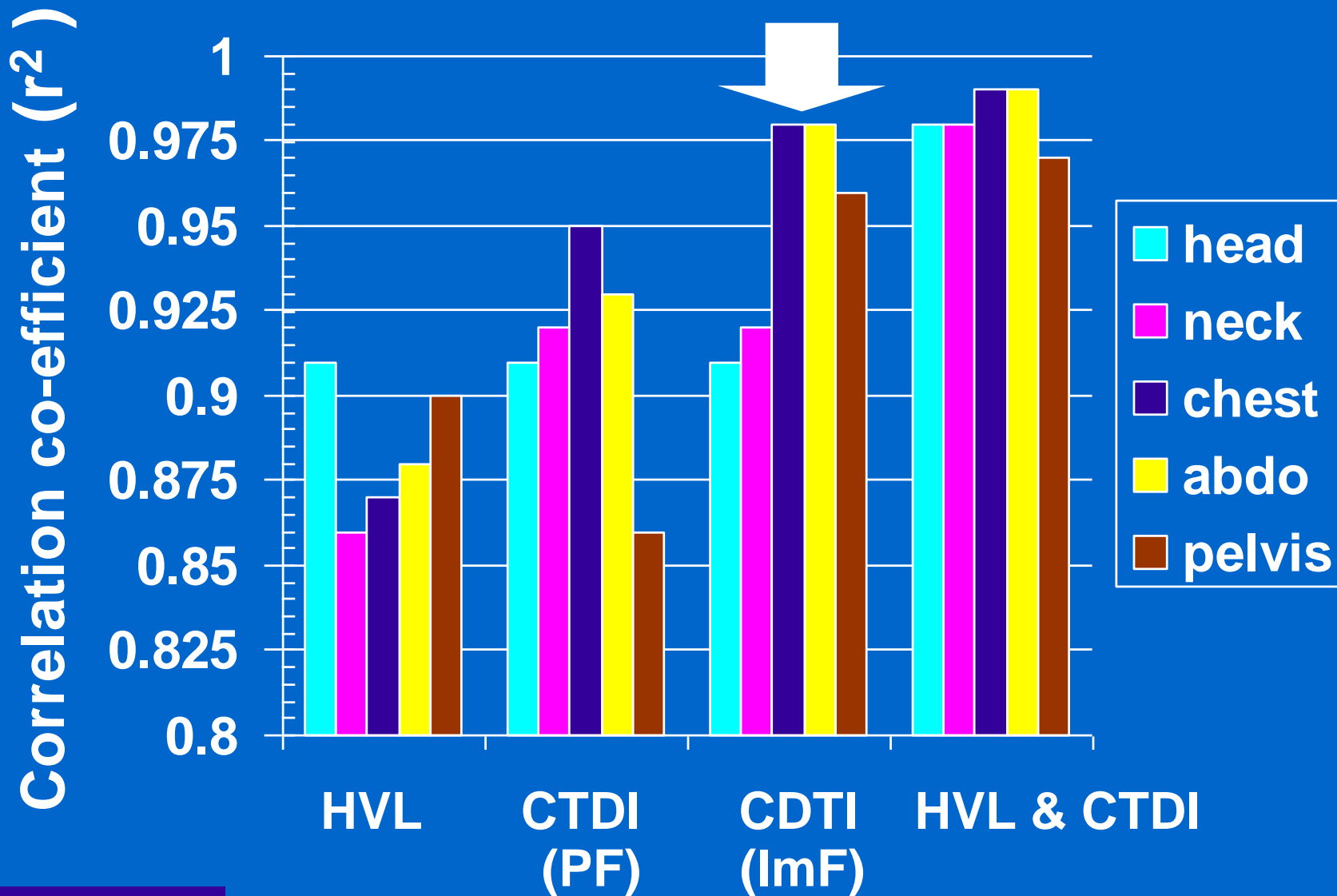


CTDI_w/CTDI_{air} vs normalised ED

- Use ratios of CTDI_w / CTDI_{air}



Correlations for data combinations



CTDosimetry

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Adding a new scanner

Adding a new scanner to ImPACT CT Dosimetry

S. Edyvean, Nick Keat

ImPACT 2012

Adding a new scanner to CTDosimetry: Overview

- Download spreadsheet for CTDI data from ImPACT web-site
 - <http://www.impactscan.org/ctdosimetry.htm>
 - And of course CTDosimetry
- Measure CTDI for new scanner
- In CTDosimetry.xls
 - Add CTDI data to ‘Scanners’ worksheet
 - Add collimation data to ‘Collimation’ worksheet
- As an example, let’s add the GE “SuperNewPlus” scanner

CTDI Dose Data Required

Scanner_matching_CTDI_data_v1.0.xls [Read-Only] [Compatibility Mode] - Microsoft Excel

Home Insert Page Layout Formulas Data Review View

O1

1 **CTDI Dose Data required for matching scanners in IMPACT CTDosimetry Calculator**

2 Worksheet for scanners with one beam shaping filter for each of head and body scanning

3

4 **Please return your data via e-mail to drsig@impactscan.org**

5

6 PLEASE FILL IN THE FIELDS IN BLUE

7

8 Data supplied by:

9 Contact phone:

10 Email:

11 Date:

12

13 Scanner manufacturer:

14 Scanner model:

15

16 **1. HEAD data**

17

18 **1a. CTDI_{100,air} for different filter and kV combinations, and for each collimation**

19 Axial (not spiral) mode. At isocentre, in air

20 Chamber calibration factor: Temp (°C): Pressure (mbar): Overall cal. Factor

21

Mode (Filter)	kV	mA	Rotation time (s)	mAs	No. physical detector rows	Width of each detector row (mm)	Total Beam Width (mm)	Readings (air Kerma - mGy)			Mean reading	CTDI _{100,air} (mGy)	CTDI _{100,air} (mGy/100 mAs)	
Filter 1	KV1			0			~10 mm					#DIV/0!	#DIV/0!	#DIV/0!
Filter 1	KV2			0			~10 mm					#DIV/0!	#DIV/0!	#DIV/0!
Filter 1	KV3			0			~10 mm					#DIV/0!	#DIV/0!	#DIV/0!
Filter 1	KV4			0			~10 mm					#DIV/0!	#DIV/0!	#DIV/0!
Filter 1	kV5			0			~10 mm					#DIV/0!	#DIV/0!	#DIV/0!

28

Mode (Filter)	kV	mA	Rotation time (s)	mAs	No. physical detector	Width of each detector	Total Beam Width (mm)	Readings (air Kerma - mGy)			Mean reading	CTDI _{100,air} (mGy)	CTDI _{100,air} (mGy/100 mAs)
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CTDI data v1.0 Single filter CTDI data v1.0 Multi-filter

Measure CTDI for new scanner

- Use standard kV, mAs, rot time, ~ 10 mm collimation
- Measure CTDI₁₀₀ for all kVs
 - In air at 10 mm
 - Centre and mean periphery in body and head phantoms at 10 mm
- At all beam widths in air at standard kV
 - Calculate CTDI relative to ~ 10 mm width
- Normalise to 100 mAs
- For SuperNewPlus with 4 kVs, and 4 beam widths

kV	Air	Head (C&P)	Body (C&P)
80	10 mm	10 mm (C &P)	10 mm (C &P)
100	10 mm	10 mm (C &P)	10 mm (C &P)
120	Beam 1-4	10 mm (C &P)	10 mm (C &P)
140	10 mm	10 mm (C &P)	10 mm (C &P)

Add CTDI data to Scanners Worksheet (1)

- In CTDosimetry...
- Add new data to 'Scanners' worksheet
 - Un-protect worksheet

42	GE.l	140	GE.l.140	GE LightSpeed 16	43.9	29.7	29.0	40.0	10.8	18.6	0.93	1.17	11	20	20	1	
43	GE.m	80	GE.m.080	GE LightSpeed Pro 16	14.5	7.5	8.1	10.1	1.7	4.1	0.77	0.76	6	11	11	1	
44	GE.m	100	GE.m.100	GE LightSpeed Pro 16	23.3	13.7	13.9	17.6	3.6	7.7	0.83	0.91	9	15	9	1	
45	GE.m	120	GE.m.120	GE LightSpeed Pro 16	33.3	20.9	20.8	26.6	6.0	11.9	0.87	1.00	10	15	13	1	
46	GE.m	140	GE.m.140	GE LightSpeed Pro 16	44.4	28.8	28.4	37.0	8.9	16.7	0.90	1.06	10	19	20	1	
47	GE.n	80	GE.n.080	GE LightSpeed RT				7.9	9.2	1.6	4.3	0.81	0.82	8	11	9	2
48	GE.n	100	GE.n.100	GE LightSpeed RT				13.5	15.9	3.3	7.8	0.87	0.97	10	15	13	1
49	GE.n	120	GE.n.120	GE LightSpeed RT				20.1	23.9	5.6	12.1	0.91	1.07	11	19	20	1
50	GE.n	140	GE.n.140	GE LightSpeed RT				28.7	34.6	8.7	17.7	0.94	1.13	11	19	17	1
51	GE.o	80	GE.o.080	GE LightSpeed VCT				10.0	14.8	1.9	4.9	0.88	0.59	10	6	13	1
52	GE.o	100	GE.o.100	GE LightSpeed VCT				17.4	24.2	4.0	8.8	0.95	0.74	11	11	17	1
53	GE.o	120	GE.o.120	GE LightSpeed VCT				26.1	35.0	6.7	13.3	1.00	0.84	13	11	14	2
54	GE.o	140	GE.o.140	GE LightSpeed VCT				35.5	46.9	9.9	18.3	1.02	0.91	15	15	19	1
55	GE.p	80	GE.p.080	GE LightSpeed VCT (small hd, lar				8.4	10.4	1.7	4.4	0.78	0.78	6	11	11	2
56	GE.p	100	GE.p.100	GE LightSpeed VCT (small hd, lar				14.9	18.4	3.8	8.3	0.85	0.94	9	15	13	1
57	GE.p	120	GE.p.120	GE LightSpeed VCT (small hd, lar				22.5	27.9	6.5	13.1	0.90	1.04	10	17	20	2
58	GE.p	140	GE.p.140	GE LightSpeed VCT (small hd, lar				31.0	38.8	9.6	18.5	0.92	1.10	11	19	20	1

Add CTDI data to Scanners Worksheet (1)

- Add new data to 'Scanners' worksheet
 - Un-protect worksheet
 - Select rows below last scanner from your vendor

1	Scanner	kVp	Sub-group	Scanner	CTDI (Head, mGy/100mAs)			CTDI (Body, mGy/100mAs)			ImPACT Factor		Scanner Match			
	Group				Air	Centre	Perip	Air	Centre	Perip	Head	Body	Head	Body		
57	GE.p	120	GE.p.120	GE LightSpeed VCT (small hd, large bd)	34.9	22.4	22.5	27.9	6.5	13.1	0.90	1.04	10	17	20	21
58	GE.p	140	GE.p.140	GE LightSpeed VCT (small hd, large bd)	46.8	31.3	31.0	38.8	9.6	18.5	0.92	1.10	11	19	20	16
59	PH.a	120	PH.a.120	Philips 310, 350 (GE2, no Cu)	32.8	18.7	21.2				0.87		10	5	13	14
60	PH.b	120	PH.b.120	Philips 310, 350 (GE2, w. Cu)	15.8	11.2	11.6				1.00		14	5	14	14
61	PH.c	120	PH.c.120	Philips 310, 350 (GE3, no Cu)				21.7	4.2	10.2		0.90	3	15	15	15
62	PH.d	120	PH.d.120	Philips 310, 350 (GE3, w. Cu)							1.11	1.14	20	20	16	16
63	PH.e	80	PH.e.080	Philips AV, LX, SR7000	4.3	2.6	3.0	8.7	1.4	3.5	0.93	0.73	11	11	20	5
64	PH.e	100	PH.e.100	Philips AV, LX, SR7000	13.2	8.8	9.6	13.2	2.6	5.7	0.98	0.89	13	13	22	22
65	PH.e	120	PH.e.120	Philips AV, LX, SR7000	19.2	13.6	14.8	19.3	4.3	9.0	1.03	1.01	16	16	19	19
66	PH.e	130	PH.e.130	Philips AV, LX, SR7000	22.6	16.0	17.6	22.8	5.3	11.1	1.04	1.05	17	18	23	23
67	PH.e	140	PH.e.140	Philips AV, LX, SR7000	26.0	19.0	20.3	26.0	1.05	1.07	1.05	1.07	18	19	21	12
68	PH.f	120	PH.f.120	Philips CX, CX/S	20.5	14.2	15.4	19.2	1.01	0.90	1.01	0.90	15	14	18	18
69	PH.g	120	PH.g.120	Philips SR4000	18.2	12.5	13.5	18.2	0.90	0.92	1.00	0.92	13	15	14	15

1	Scanner	kVp	Sub-group	Scanner	CTDI (Head, mGy/100mAs)			CTDI (Body, mGy/100mAs)			ImPACT Factor		Scanner Match			
2	Group				Air	Centre	Perip	Air	Centre	Perip	Head	Body	Head	Body		
57	GE.p	120	GE.p.120	GE LightSpeed VCT (small hd, large bd)	34.9	22.4	22.5	27.9	6.5	13.1	0.90	1.04	10	17	20	21
58	GE.p	140	GE.p.140	GE LightSpeed VCT (small hd, large bd)	46.8	31.3	31.0	38.8	9.6	18.5	0.92	1.10	11	19	20	16
59																
60																
61																
62																
63	PH.a	120	PH.a.120	Philips 310, 350 (GE2, no Cu)	32.8	18.7	21.2				0.87		10	5	13	14
64	PH.b	120	PH.b.120	Philips 310, 350 (GE2, w. Cu)	15.8	11.2	11.6				1.00		14	5	14	14
65	PH.c	120	PH.c.120	Philips 310, 350 (GE3, no Cu)				21.7	4.2	10.2		0.90	3	15	15	15
66	PH.d	120	PH.d.120	Philips 310, 350 (GE3, w. Cu)							1.11	1.14	20	20	16	16
67	PH.e	80	PH.e.080	Philips AV, LX, SR7000	4.3	2.6	3.0	8.7	1.4	3.5	0.93	0.73	11	11	20	5
68	PH.e	100	PH.e.100	Philips AV, LX, SR7000	13.2	8.8	9.6	13.2	2.6	5.7	0.98	0.89	13	13	22	22
69	PH.e	120	PH.e.120	Philips AV, LX, SR7000	19.2	13.6	14.8	19.3	4.3	9.0	1.03	1.01	16	16	19	19
70	PH.e	130	PH.e.130	Philips AV, LX, SR7000	22.6	16.0	17.6	22.8	5.3	11.1	1.04	1.05	17	18	23	23
71	PH.e	140	PH.e.140	Philips AV, LX, SR7000	26.0	19.0	20.3	26.0	1.05	1.07	1.05	1.07	18	19	21	12

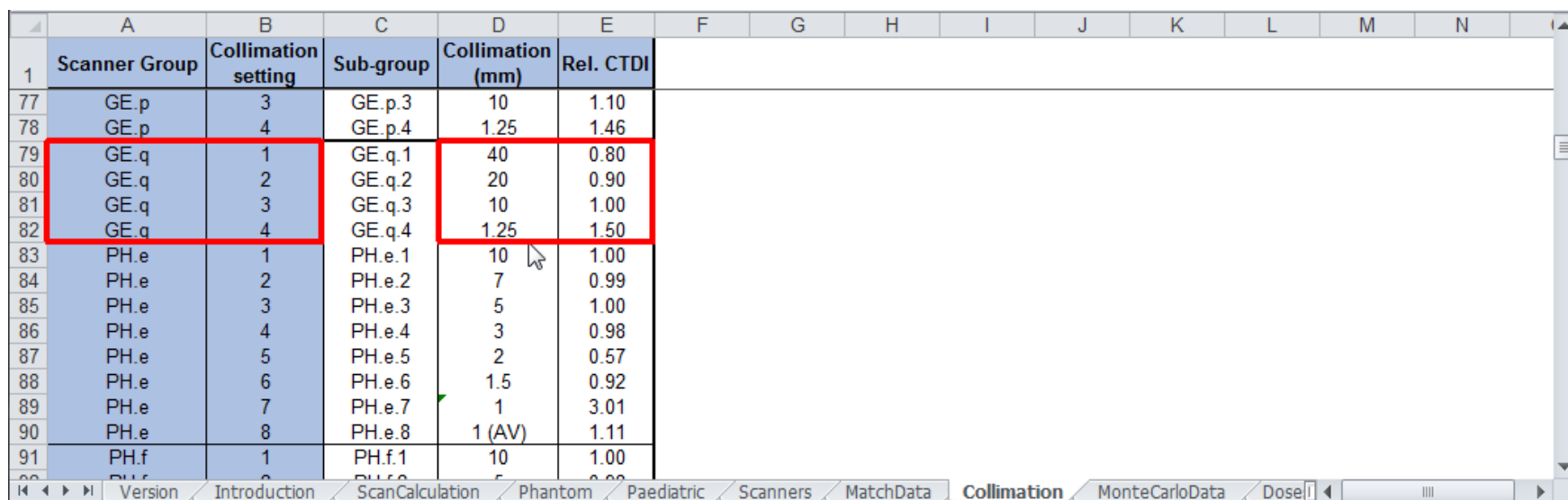
Add CTDI data to Scanners Worksheet (2)

- Add data to columns A, B, D-J (shown red below)
 - Cols C, K-L should fill in automatically, if not, copy and paste down
- Copy column M-P from cells above, and past into blanks
- Check data entered and match look realistic
 - Compare to similar scanners from same vendor
- Tidy up cell border formatting if required
- Re-protect worksheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Scanner	kVp	Sub-group	Scanner	CTDI (Head, mGy/100mAs)			CTDI (Body, mGy/100mAs)			ImPACT Factor		Scanner Match		
2	Group				Air	Centre	Perip	Air	Centre	Perip	Head	Body			
57	GE.p	120	GE.p.120	GE LightSpeed VCT (small hd, large bd)	34.9	22.4	22.5	27.9	6.5	13.1	0.90	1.04			
58	GE.p	140	GE.p.140	GE LightSpeed VCT (small hd, large bd)	46.8	31.3	31.0	38.8	9.6	18.5	0.92	1.10			
59	GE.q	80	GE.q.080	GE SuperNewPlus	10.0	8.0	9.0	10.0	2.0	5.0	1.18	0.94			
60	GE.q	100	GE.q.100	GE SuperNewPlus	20.0	15.0	16.0	20.0	4.0	10.0	1.07	0.94			
61	GE.q	120	GE.q.120	GE SuperNewPlus	30.0	25.0	25.0	30.0	6.0	15.0	1.14	0.94			
62	GE.q	140	GE.q.140	GE SuperNewPlus	40.0	30.0	30.0	40.0	10.0	20.0	1.03	1.12			
63	PH.a	120	PH.a.120	Philips 310, 350 (GE2, no Cu)	32.8	18.7	21.2				0.87				
64	PH.b	120	PH.b.120	Philips 310, 350 (GE2, w. Cu)	15.8	11.2	11.6				1.00				
65	PH.c	120	PH.c.120	Philips 310, 350 (GE3, no Cu)				21.7	4.2	10.2					
66	PH.d	120	PH.d.120	Philips 310, 350 (GE3, w. Cu)							1.11	1.14			
67	PH.e	80	PH.e.080	Philips AV, LX, SR7000	4.3	2.6	3.0	8.7	1.4	3.5	0.93	0.73			
68	PH.e	100	PH.e.100	Philips AV, LX, SR7000	13.2	8.8	9.6	13.2	2.6	5.7	0.98	0.89			
69	PH.e	120	PH.e.120	Philips AV, LX, SR7000	19.2	13.6	14.8	19.3	4.3	9.0	1.03	1.01			
70	PH.e	130	PH.e.130	Philips AV, LX, SR7000	22.6	16.0	17.6	22.8	5.3	11.1	1.04	1.05			

Add collimation data to Collimation worksheet

- Unprotect sheet, insert rows as before
- Add data to columns A, B, D, E, shown red below
 - Copy formula in C from above if it doesn't auto fill



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Scanner Group	Collimation setting	Sub-group	Collimation (mm)	Rel. CTDI									
77	GE.p	3	GE.p.3	10	1.10									
78	GE.p	4	GE.p.4	1.25	1.46									
79	GE.q	1	GE.q.1	40	0.80									
80	GE.q	2	GE.q.2	20	0.90									
81	GE.q	3	GE.q.3	10	1.00									
82	GE.q	4	GE.q.4	1.25	1.50									
83	PH.e	1	PH.e.1	10	1.00									
84	PH.e	2	PH.e.2	7	0.99									
85	PH.e	3	PH.e.3	5	1.00									
86	PH.e	4	PH.e.4	3	0.98									
87	PH.e	5	PH.e.5	2	0.57									
88	PH.e	6	PH.e.6	1.5	0.92									
89	PH.e	7	PH.e.7	1	3.01									
90	PH.e	8	PH.e.8	1 (AV)	1.11									
91	PH.f	1	PH.f.1	10	1.00									

Use new scanner

- Select another vendor on 'Manufacturer' drop down on ScanCalculation worksheet
- Select vendor of new scanner

Scanner Model:

Manufacturer: GE

Scanner:

kV: GE 8800 / 9000 Series

Scan Region: GE 9800 Series

Data Set: GE HiLight, HiSpeed, CT/i (No SmB)

Current Data: GE HiSpeed CT/i with SmartBeam

Scan range: GE Max

Scan range: GE Pace, Sytec

Start Position: GE Prospeed

End Position: GE FX/i, LX/i

End Position: GE QX/i, LightSpeed, LightSpeed Plus

End Position: GE HiSpeed ZX/i, NX/i

End Position: GE LightSpeed Ultra

Organ weight: GE LightSpeed 16

Organ weight: GE LightSpeed Pro 16

Organ weight: GE LightSpeed RT

Organ weight: GE LightSpeed VCT

Organ weight: GE LightSpeed VCT (small hd, large hd)

Organ weight: **GE SuperNewPlus**

Acquisition Parameters:

Tube current	30	mA
Rotation time	1	s
Spiral pitch	1	
mAs / Rotation	30	mAs
Effective mAs	30	mAs
Collimation		mm
Rel. CTDI	Lookup 1.00	(assumed)
CTDI (air)	Lookup #N/A	mGy/100mAs
CTDI (soft tissue)	#N/A	mGy/100mAs
nCTDI _w	Lookup #N/A	mGy/100mAs
CTDI _w	#N/A	mGy
CTDI _{vol}	#N/A	mGy
DLP	#N/A	mGy.cm

Quality control

- Check the results for the new scanner are sensible
 - Compare to quoted $CTDI_{vol}$ on scanner console
 - Compare to other similar scanners from same vendor
- Ensure new version of spreadsheet is re-named
- Rename spreadsheet (e.g. with suffix)
- **Only use it for own institution**

CTDosimetry

1. CTDosimetry basics
2. Understanding the matching
3. Tips - incorporating new scanner models for your own use
4. A strategy - for incorporating new scanner models into a new downloadable version of CTDosimetry



Collaboration

New Scanner Data – Current Status

- Request for data on web-site
- To be dealt with by
 - IPEM DRSIG
 - Thanks to DRSIG and to David Platten for organising
 - Ex-ImPACT staff

[:: a request to users of CTDosimetry](#)

ImPACT are changing the model for incorporation of new data into the spreadsheet. Rather than relying on our evaluations for data we are working with the [Institute of Physics and Engineering in Medicine's](#) Diagnostic Radiology Special Interest Group (IPEM's DR SIG) to update the data. We would like to invite users who have access to scanners that do not currently appear in CTDosimetry to make appropriate CTDI measurements and send their results to the DR SIG. If you would like to make measurements please download and use [this form](#).

<http://www.impactscan.org/ctdosimetry.htm#CTDoseDownload>

Contributing data for scanner matching

160

1 **CTDI Dose Data required for matching scanners in IMPACT CTDosimetry Calculator**

2 Worksheet for scanners with one beam shaping filter for each of head and body scanning

3

4 **Please return your data via e-mail to drsig@impactscan.org**

5

6 PLEASE FILL IN THE FIELDS IN BLUE

7

8 Data supplied by:

9 Contact phone:

10 Email:

11 Date:

12

13 Scanner manufacturer:

14 Scanner model:

15

16 **1. HEAD data**

17

18 **1a. CTDI_{100,air} for different filter and kV combinations, and for each collimation**

19 **Axial (not spiral) mode. At isocentre, in air**

20 Chamber calibration factor: Temp (°C): Pressure (mbar): Overall cal. Factor:

21

Mode (Filter)	kV	mA	Rotation time (s)	mAs	No. physical detector rows	Width of each detector row (mm)	Total Beam Width (mm)	Readings (air Kerma - mGy)			Mean reading	CTDI _{100,air} (mGy)	CTDI _{100,air} (mGy/100 mAs)
Filter 1	KV1			0			~10 mm				#DIV/0!	#DIV/0!	#DIV/0!
Filter 1	KV2			0			~10 mm				#DIV/0!	#DIV/0!	#DIV/0!
Filter 1	KV3			0			~10 mm				#DIV/0!	#DIV/0!	#DIV/0!
Filter 1	KV4			0			~10 mm				#DIV/0!	#DIV/0!	#DIV/0!

CTDI data v1.0 Single filter CTDI data v1.0 Multi-filter

New Scanner Models - Strategy

- In reality
 - Very little data submitted (until recently)
 - Recent data thanks to Paul Charnock and Gareth Iball
 - When we get data it needs to be validated
 - Ex-ImPACT staff and DRSIG: no time!
- However
 - St. George's Physics/ex-ImPACT staff staff/DRSIG all happy for (and want) a solution to be found
 - Ties in with PHE work (and uses HPA MC data)
 - Many keen (CTUG) physicists all wanting a solution....

New Scanner Models - Strategy

- Suggest that we form a CTDosimetry / CTDI database maintenance group comprising of
 - ex-ImPACT
 - DRSIG
 - CTUG enthusiastic physicists
- The data goes to a central email
 - A co-ordinator needed?

New Scanner Models - Strategy

- When we have 3 sets of data per scanner model
 - It gets sent to a group member / volunteer
 - Their only task is validating data for that scanner only.
- Once it has been checked/confirmed/?re-checked
 - it then can go to the publicly available next version of CTDosimetry
- Volunteers needed
 - To co-ordinate data
 - To check data
 - Help with web site?

CTDosimetry - Missing Scanners



Own use



**Collaboration for a new
version of CTDosimetry**

New Scanner Models and the ImPACT CT Dosimetry Spreadsheet: Tips and Strategy

S.Edyvean, Nick Keat, Maria Lewis
Acknowledgements: Ed McDonagh,
David Platten, Jim Weston