

Subject: VivaCT dose information-fyi
From: rasesh kapadia <rkapadia@scanco.ch>
Date: Thu, 17 Jun 2004 10:25:52 -0400
To: rkapadia@scanco.ch

Dear All

We have measured the following CTDI (CT dose index)

The detector was placed in the center of a 35 mm PMMA cylinder which was placed in the center of rotation.

70kV	300ms	85uA	Field of view 38.9mm	1000 Proj./180°:	CTDI = 260 mGy
55kV	300ms	109uA	Field of view 38.9mm	1000 Proj./180°:	CTDI = 220 mGy
45kV	300ms	133uA	Field of view 38.9mm	1000 Proj./180°:	CTDI = 190 mGy
70kV	300ms	85uA	Field of view 30.7mm	1000 Proj./180°:	CTDI = 420 mGy
55kV	300ms	109uA	Field of view 30.7mm	1000 Proj./180°:	CTDI = 350 mGy
45kV	300ms	133uA	Field of view 30.7mm	1000 Proj./180°:	CTDI = 305 mGy
70kV	300ms	85uA	Field of view 21.5mm	1000 Proj./180°:	CTDI = 850 mGy
55kV	300ms	109uA	Field of view 21.5mm	1000 Proj./180°:	CTDI = 720 mGy
45kV	300ms	133uA	Field of view 21.5mm	1000 Proj./180°:	CTDI = 620 mGy

high res = 1000 Proj./180°
medium = 500 Proj./180°
standard = 250 Proj./180°

The CTDI scales linear with the integration time (s), with the current (uA) and number of projections. If you have different settings there, it is easy to calculate the CTDI.

CTDI Definition:

Integral from +50mm to -50mm of $D(z)/N \times T$

where $D(z)$ is the dose profile along a line z which is perpendicular to the tomographic plane

N is the number of tomographic sections produced in a single rotation

T is the nominal tomographic section thickness

- - - - -

For Example:

How to estimate how much radiation would be incurred by a mouse scanned at 25 um resolution (MR) at 55 kVp, 109 uA, 150 ms IT, for about 30 minutes?

- - - - -

If you take your settings you can calculate the CTDI.

First thing you have to be aware is that the CTDI is something like the local dose but it takes the cone beam geometry and the not perfect collimation of the x-ray beam into account (The CTDI value is always higher than a local dose measurement with for example TLDs). It does not matter how many stacks you are scanning. The dose you have at one point which is within the volume you are scanning gets the

same local dose if you are performing a 1 stack or a 4 stack measurement. With the 55kVp/109uA HR with 300ms we have a value at the 30.7 mm position of 350mGy. Because you have MR we can divide the values by a factor of 2 and because you have 150ms instead of 300ms there is an other factor of 2. You would get 87.5mGy for the position 30.7mm. Because of the cone beam the dose has a quadratic dependency to the diameter of the field of view. $(30.7\text{mm}/25\text{mm})^2=1.5$. The CTDI value for your settings is in the order of $87.5\text{mGy} \times 1.5 = 132\text{mGy}$.

If you need any more specific information, please let us know.