

High Doses in Cardiac CT Angiography at Harefield Hospital

Toshiba Aquilion scanner

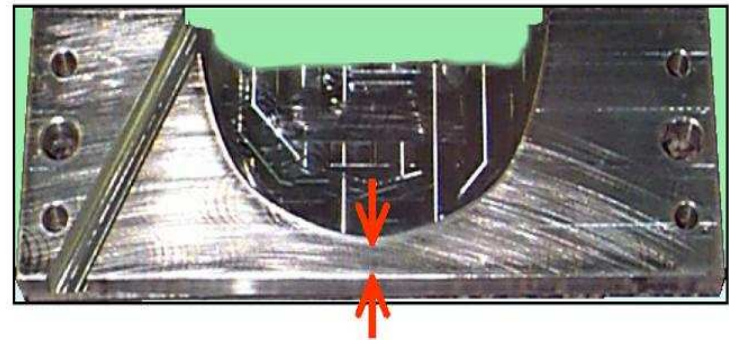
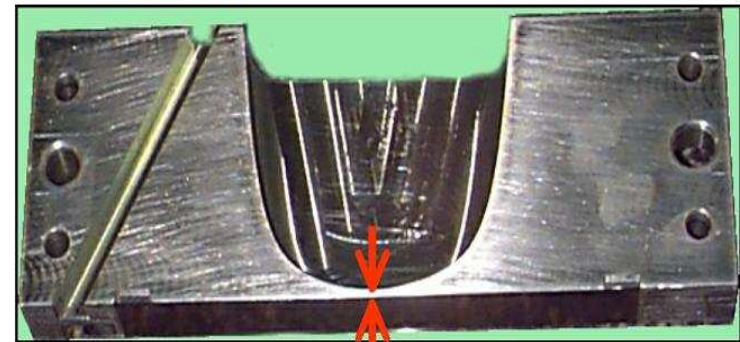
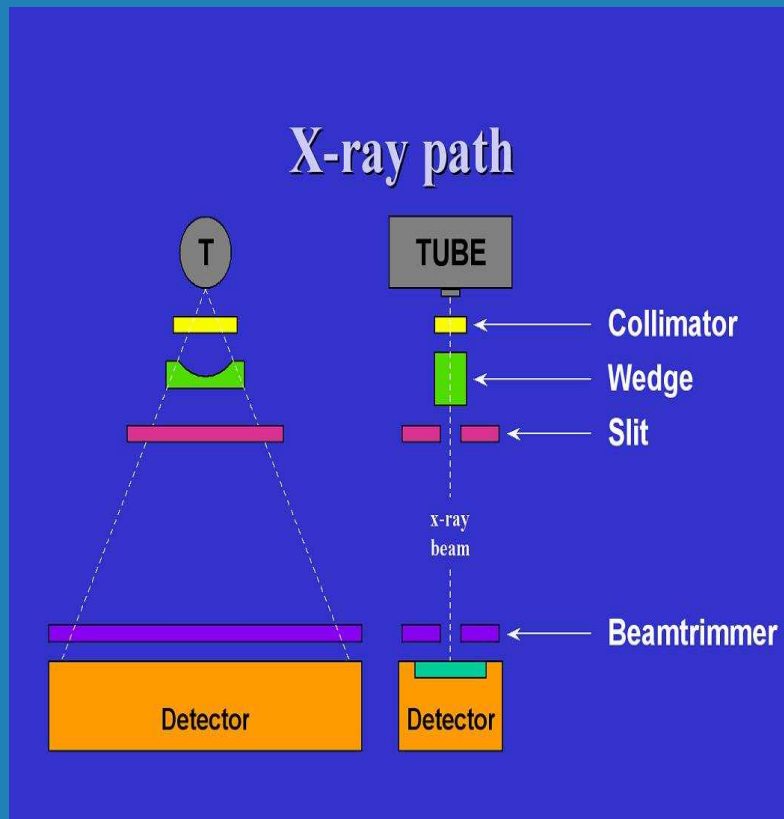
Size matters, M or L ?

The Toshiba scanner



- **Aquilion**
- **Detector**
64x0.5
- **Min rot**
– 0.35
- **FOV**
– **SS,S,M**
– **L, LL**
- **Focal spot**
– **F,B**

wedges



Wedge types

Typical dose data

data 12.02.07			
CT COR Angio + calcium score			
		CF=	0.019
		DLP	E
Pt number		mGycm	mSv.
1		1131	21
2		1041	20
3		1489	28
4		1014	19
5		1344	26
6		1352	26
7		1147	22
8		1414	27
	avg=	1242	24

Patient information 1

```
Birth Date : 1949.07.23      Age : 58Y
Sex : M      Weight(kg) : 114      Height(cm) : 173.0
Patient Comments : CORONARY ANGIOGRAM
Study Date : 2007.10.02      Body Part : CORONARY ANGIOGRAM
Requesting Department :
Referring Physician : HW
Reporting Physician : TM
Operator Name : KG
Total Image Number : 1515

<< Dose Information >>
Total mAs : 7684      Total Scan time : 31.71
CTDIvol      (Head) : -      (Body) : 661.00
DLP(mGycm)   (Head) : -      (Body) : 1494.20
Body Size Mean(mm) : 337.00      Body Size Max(mm) : 361.00
Body Size Min(mm) : 329.00

<< Contrast/Enhance Information >>
Contrast Enhance : 05
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Patient dose information 2

Study ID : 1704 Study Date : 2007.10.02 (P. 2)
Accession Number : 99901039088

<< Detail Information >>

1. Calcium Score 3 mm Large

	Total mAs	Exposure Time	CTDIvol	DLP
SCANOSCOPE(2)	504.00	6.73		
NORMAL_CT(11)	1100.00	2.75	11.20(Body)	147.40(Body)

2. Cardiac CTA (100 kg Plus)

	Total mAs	Exposure Time	CTDIvol	DLP
NORMAL_CT	35.00	0.35	5.20(Body)	2.10(Body)
DYNAMIC_CT	2097.00	13.98	557.90(Body)	111.60(Body)
HELICAL_CT	3948.00	7.90	86.70(Body)	1233.10(Body)

Cardiac CTA consol display (main)

The screenshot displays the main console interface for a cardiac CTA scan. The top section shows patient information: ID 999999-001, Name XXXXXX-001, Sex (Age), Xray-Name Cardiac CTA (80kV-100kV), and # of Images 1203. A central 3D model of the patient in the gantry shows the scan area. The bottom section contains a table of scan details.

Start	Start Time	Wait	Start Pos.	End Pos.	Scan Mode	# of Scans	kV	mA	D-FOV (C-FOV.)	Rot. Time (Total Scan Time)	Thickness (mm)	Range	PreScan Voice	PostScan Voice	CE
P	***	***			DualScano		120	50				500.0	06	10	-
A	***	***			DualScano		120	100				500.0	06	10	-
P	***	0.0			S&V	1	120	100	200.0(M)	0.35(0.35)	1.0(4.0)	4.0	00	00	-
P	***	5.0	***	***	SureStart	***	120	100	200.0(M)	0.35(50.05)	0.5(2.0)	***	00	00	ON
A		0.0			Helical	1	120	m450	200.0(M)	0.35(8.112)	0.5(32.0)	120.0	06	10	ON

Cardiac CTA consol display (dose)

The screenshot shows a cardiac CTA console interface. At the top, it displays "# of images 1203". Below this is a 3D visualization of a patient lying in the gantry, with various control icons and a "Breath In Breath Normal" indicator. To the right of the gantry view, there are technical parameters: "WL= 130", "WW= 170", "Aquilion", and "CORC".

Below the gantry view is a table with tabs for "Main", "Dose", "Scan Details", and "Recon. Details". The "Dose" tab is active, showing a table of scan parameters and dose metrics.

Start Pos.	End Pos.	Scan Mode	Couch Movement (mm)	Synchro Scan	Stack Mode.	DLP	Efficiency Z-dir.(%)	CTDIvol
		DualScano						
		DualScano						
		S&V	0.0	***	4-Stack	2.1mGy.cm	49.4	5.2mGy
***	***	SureStart	***	***	4-Stack	221.1mGy.cm@max	32.8	1.11Gy
		Helical	0.0	ON	***	1.14Gy.cm	-	78.2mGy

Cardiac CTA consol display scan details

Main Dose **Scan Details** Recon. Details

1st

Thickness 0.5x64	kV 120	mA m450	Rot. Time 0.35	Range 120.0	Cardiac CTA
HP 12.6	D-FOV 200.0 (M)	Eff. mAs 800	Total Scan Time 8.112	Direction OUT	Image Thickness 0.5
ECG Synchronization 0-ROD	CE ON	Comment <input type="text"/>	<input type="text"/>	<input type="text"/>	Recon. Interval 0.3

Add Scan Previous BreathControl **Confirm**

Patient group 1

PATIENT / DATA	kVp	Protocol mA	Rotation time (sec)	Total mAs	Scan length (mm)	Exposure time (sec)	FOV (mm)	Pitch	Actual mA used (calculated from Total mAs/Exposure time)	Displayed CTDIvol (mGy)	CTDIw/100mAs calc from actual mAs***	Displayed DLP (mGy.cm)	ImPACT predicted CTDIvol from assumed CTDIw/100 mAs of 9.4mGy*	Ratio Displayed /Expected CTDIvol	E in mSv
PAT 5	120	400	0.35	3944	151.5	9.86	233	0.197	400	102.6	14.4	1821	66.8	1.54	35
PAT 7	120	400	0.35	2814	117.3	7.97	188	0.197	353	101.1	16.1	1452	59.0	1.71	28
PAT 3	120	400	0.35	3020	131.4	8.75	200	0.197	345	86	14.0	1355	57.6	1.49	26
PAT 8	120	450	0.35	3175	118	8.08	208	0.197	393	104	14.9	1477	65.6	1.58	28
PAT 9	120	450	0.35	3086	112.5	7.7	216	0.197	401	93.6	13.1	1263	66.9	1.40	24
PAT 1	120	450	0.35	3481	145.5	9.8	242	0.197	355	96.4	15.3	1401	59.3	1.63	27
PAT 10	120	500	0.35	3373	126.6	8.48	223	0.197	398	89.9	12.7	1372	66.4	1.35	26
PAT 12	120	500	0.35	4438	133.5	8.88	333	0.197	500	102.7	11.6	1641	83.5	1.23	31
PAT 2*	120	500	0.35	3649	135.5	9.8	234	0.175	372	88.7	11.9	1228	70.0	1.27	23
PAT 6	120	500	0.35	5139	162	10.28	235	0.197	500	101.8	11.5	1884	83.5	1.22	36
PAT 13	120	600	0.35	4878	133.2	8.85	269	0.197	551	86.4	8.8	1377	92.1	0.94	26
PAT 4**	120	600	0.35	4727	118.5	8.03	231	0.197	589	120.5	11.5	1741	98.3	1.23	33
PAT 11	120	600	0.35	4681	129	8.61	280	0.197	544	123.1	12.7	1908	90.8	1.36	36
													=average	1.38	29
* Pitch of 0.197 documented - 0.175 calculated and assumed										*** a value of 9.4 mGy would be expected in this column					
**Total mAs of 1727 documented - 4727 assumed															
PATIENT GROUP 2															

Measurements NOT (!) done at acceptance testing

b) Measurements performed using body PMMA phantom, Medium FOV selected
120kV

Position	kV	mA	time secs	no. of slices	sw mm	eff. sw mm	reading "mGy"	CTDI mGy
Mean centre	120	450	0.35	4	8	32	0.307	9.69
Mean periph.	120	450	0.35	4	8	32	0.592	18.70

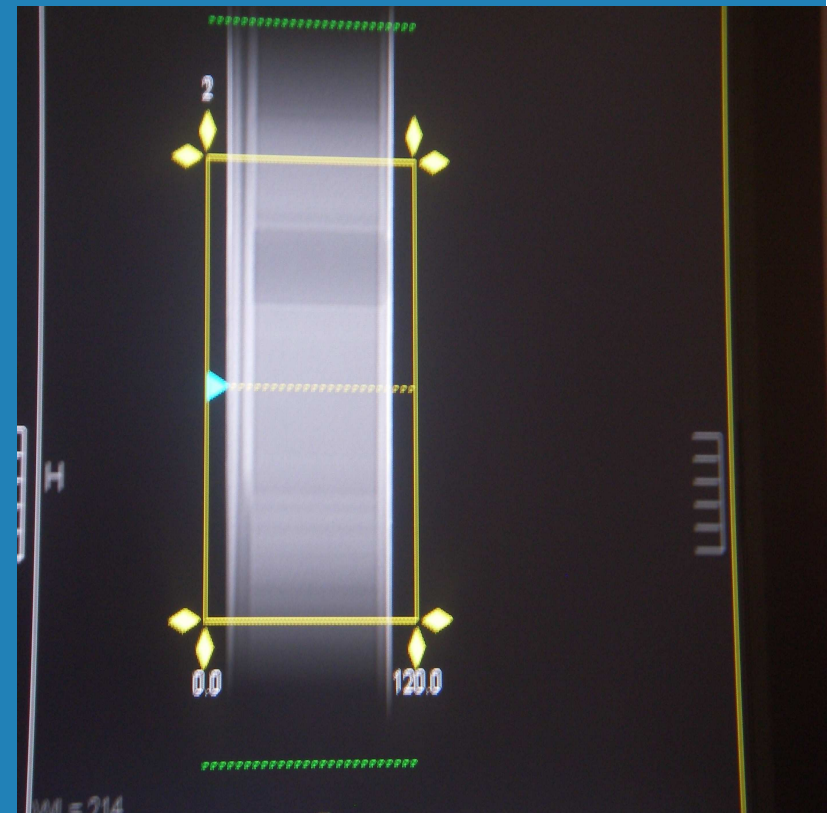
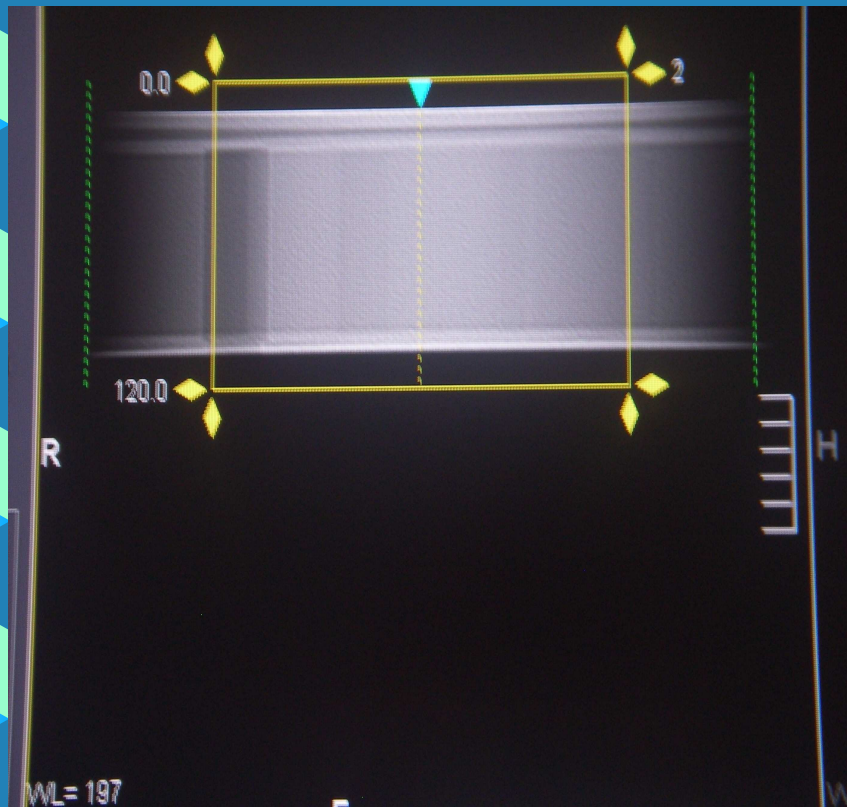
with overlap values

Displayed CTDI _{vol} (mGy)	14.8
measured CTDI _{vol} (mGy)	15.7
CTDI _{vol} calibration factor	1.1
CTDI _{vol} /100 mAs	10

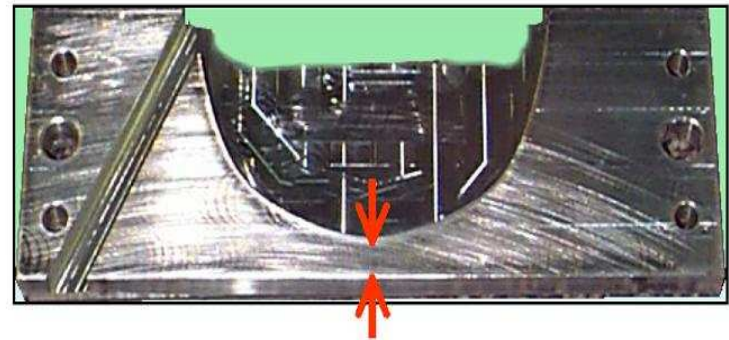
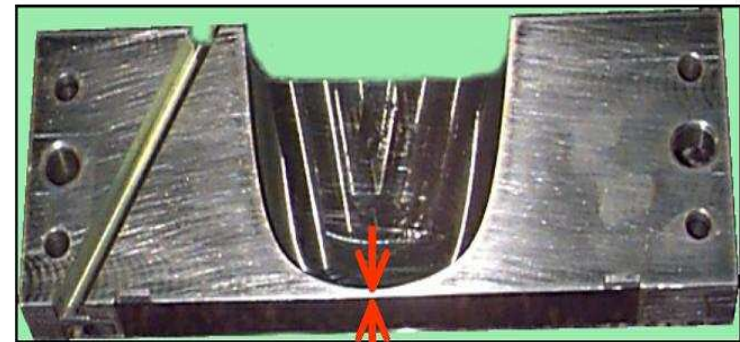
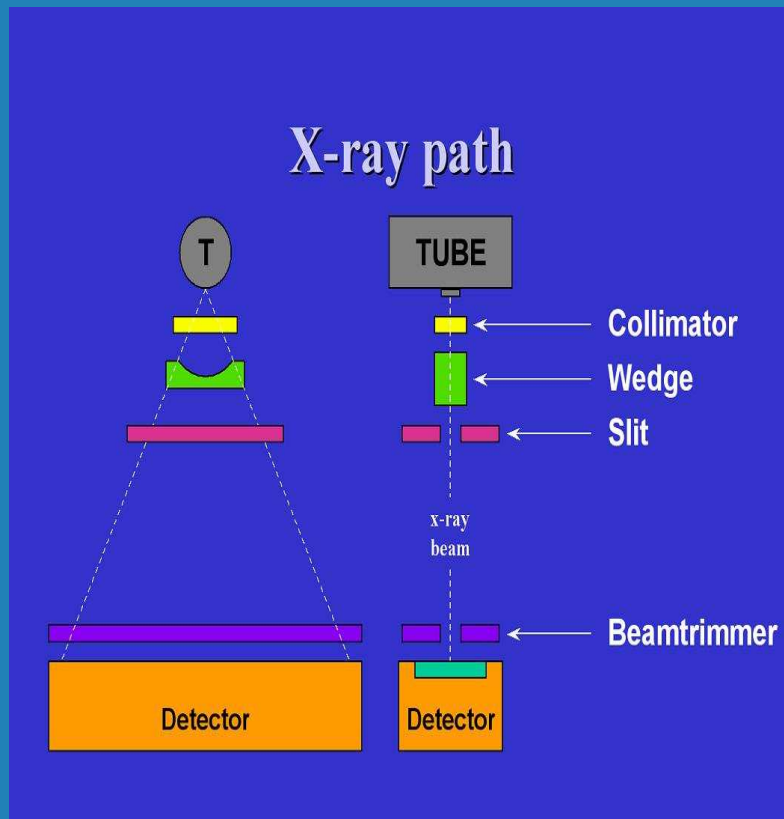
without overlap values

Displayed CTDI _{vol} (mGy)	14.8
measured CTDI _{vol} (mGy)	14.8
CTDI _{vol} calibration factor	1.0
CTDI _{vol} /100 mAs	9.4
TOSHIBA SPECIFICATION	9.4

Helical volume selection



wedges



Wedge types

Group 2 after protocol change.

PATIENT GROUP 2														
CT ANGIO DATA (POST PROTOCOL CHANGE) 16th July - 31st July														
PATIENT / DATA	kVp	Protocol mA	Rotation time (sec)	Total mAs	Scan length (mm)	Exposure time (sec)	FOV (mm)	Pitch	Actual mA used (calculated from Total mAs/Exposure time)	Displayed CTDIvol (mGy)	CTDIw/100mAs calc from actual mAs***	Displayed DLP (mGy.cm)	ImPACT predicted CTDIvol from assumed CTDIw/100 mAs of 9.4mGy*	Ratio Displayed /Expected CTDIvol
PATIENT 1	120	500	0.35	3518	120	7.99	200	0.211	440	85.5	11.7	1099.1	68.7	1.25
PATIENT 2	120	450	0.35	3574	111	7.94	226	0.197	450	82.8	10.4	1118.1	75.2	1.10
PATIENT 3	120	450	0.35	4175	141	9.28	200	0.197	450	78.2	9.8	1306.3	75.1	1.04
PATIENT 4	120	500	0.35	3431	116.4	7.92	200	0.197	433	75.3	9.8	1072.7	72.3	1.04
PATIENT 5	120	600	0.35	4126	120	8.11	233	0.197	509	95.6	10.6	1289.2	85.0	1.13

Patient group 3

PATIENT GROUP 3																
PATIENT / DATA	kVp	Protocol mA	Rotation time (sec)	Total mAs	Scan length (mm)	Exposure time (sec)	FOV (mm)	Pitch	Actual mA used (calculated from Total mAs/Exposure time)	Displayed CTDIvol (mGy)	CTDIw/100mAs calc from actual mAs***	Displayed DLP (mGy.cm)	ImPACT predicted CTDIvol from assumed CTDIw/100 mAs of 9.4mGy*	Ratio Displayed /Expected CTDIvol	E in mSv	
CTA scans 6th Aug 2007								M								
1	120	400	0.35	2682	120	7.74	183	0.197	347	60.1	9.8	837.5	57.9	1.04	16	
2	120	400	0.35	2769	111	7.61	200	0.197	364	69.5	10.8	864.5	60.8	1.14	16	
3	120	550	0.35	4086	117	7.95	242	0.197	514	95.6	10.5	1277.6	85.8	1.11	24	
CTA scans 7th Aug 2007																
4	120	400	0.35	2785	111	7.61	200	0.197	366	69.5	10.7	869.2	61.1	1.14	17	
5	120	450	0.35	2652	120	6.47	200	0.197	410	71.1	9.8	827.7	68.5	1.04	16	
6	120	350	0.35	2796	118	7.99	200	0.197	350	58.5	9.4	841.2	58.4	1.00	16	
7	120	400	0.35	2956	121	8.16	189	0.197	362	62.9	9.8	924.1	60.5	1.04	18	
8	120	450	0.375	3000	108	7.5	171	0.211	400	69.5	9.8	938.5	66.8	1.04	18	
													=average	1.07	18	

Point of importance.



