

Statscan Properties and principals

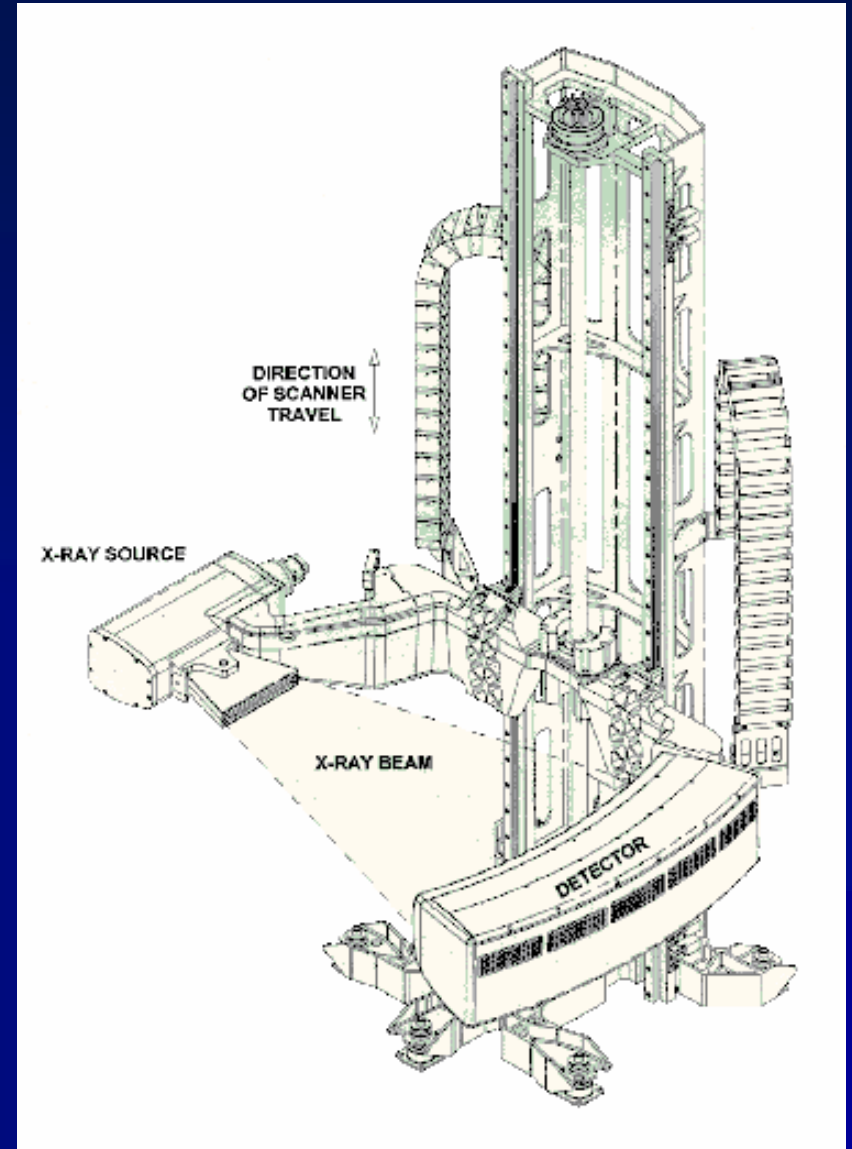
William C Greenway BS eng, MS eng,
MBA

CEO, Lodox Systems (Pty) Ltd.

President, Lodox NA LLC

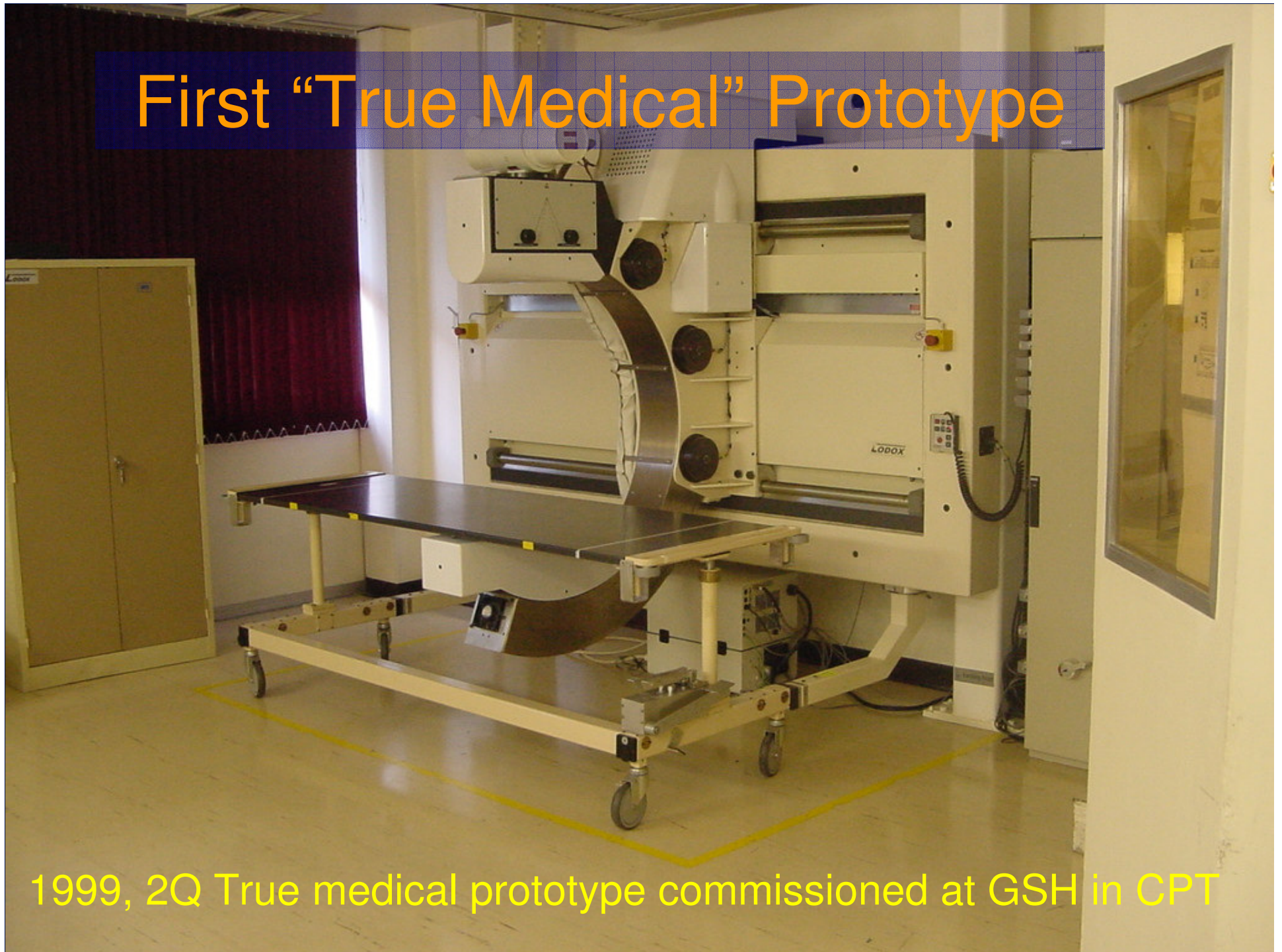


Scannex



1994, ~3Q Scannex prototype demonstrated successfully to medical fraternity

First “True Medical” Prototype



1999, 2Q True medical prototype commissioned at GSH in CPT

StatscanTM 



**StatScan:
critical
imaging
technology**

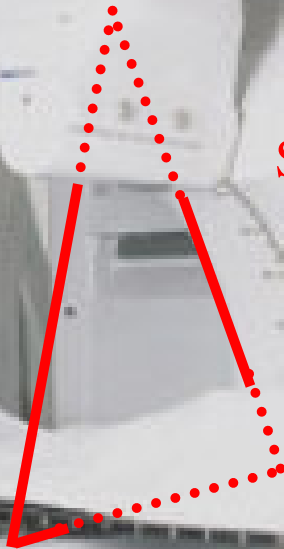
**2003, 2Q First system
shipped to UMMS in
Baltimore**

Principles of operation.....

X-ray tube



X-rays

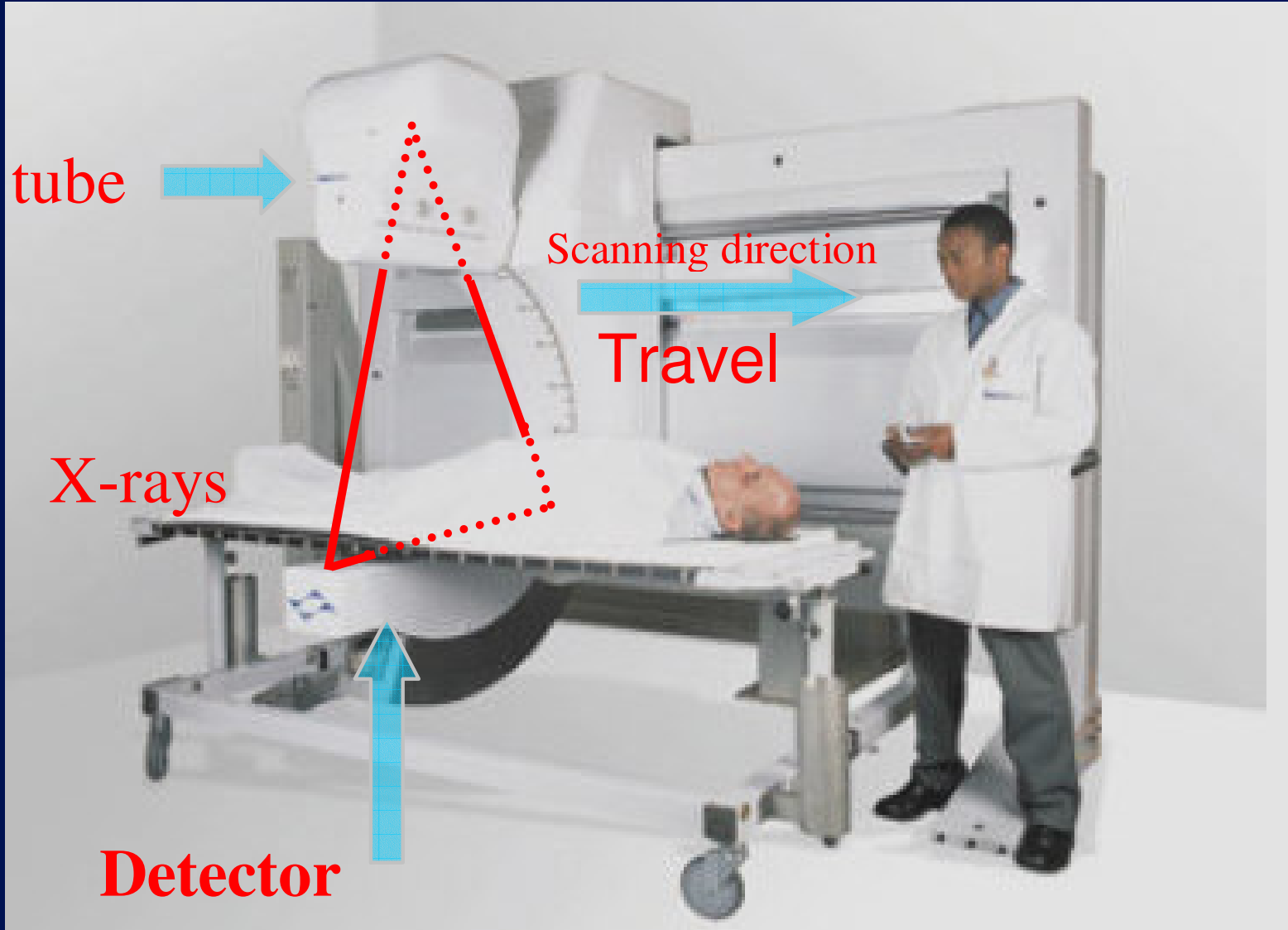


Scanning direction

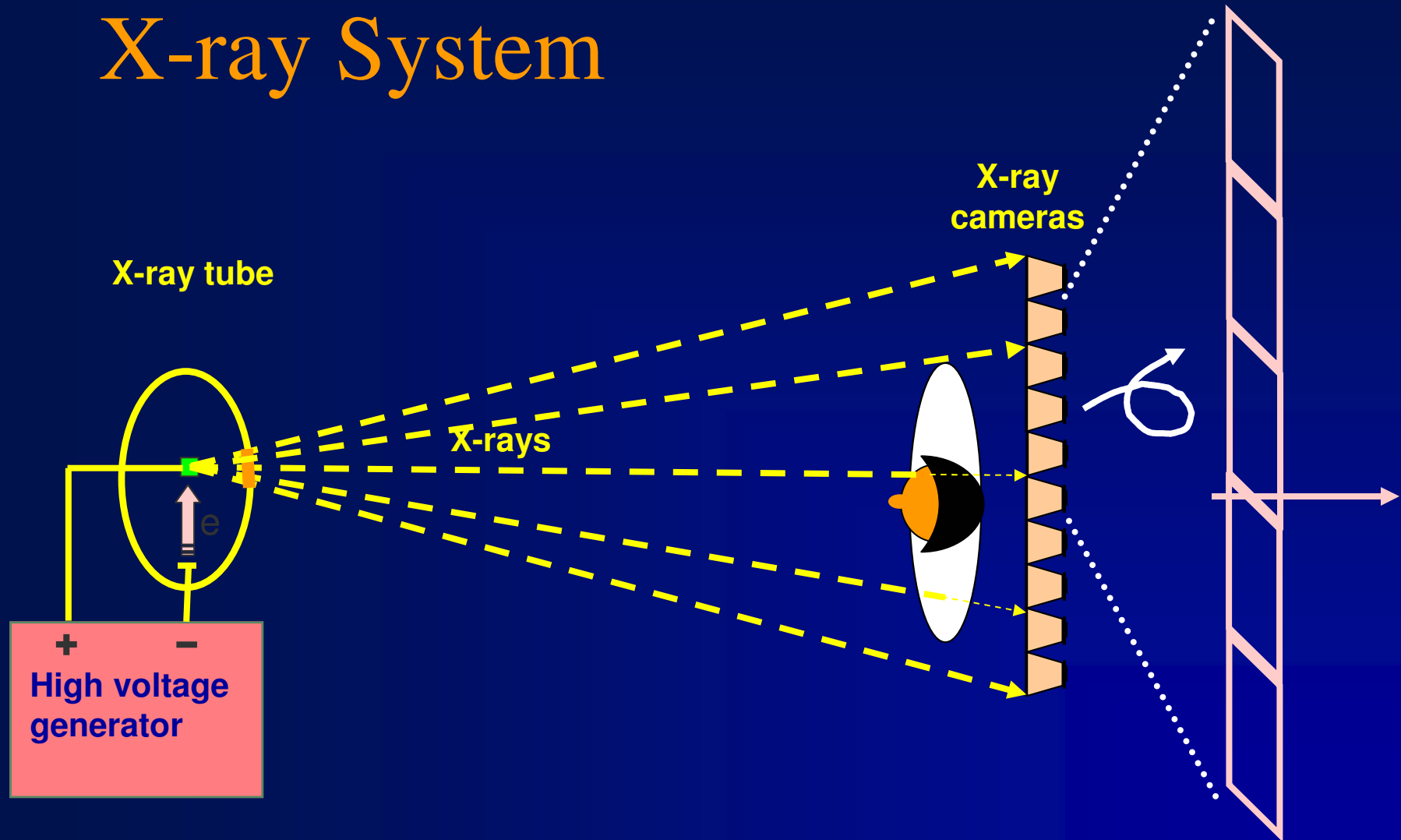


Travel

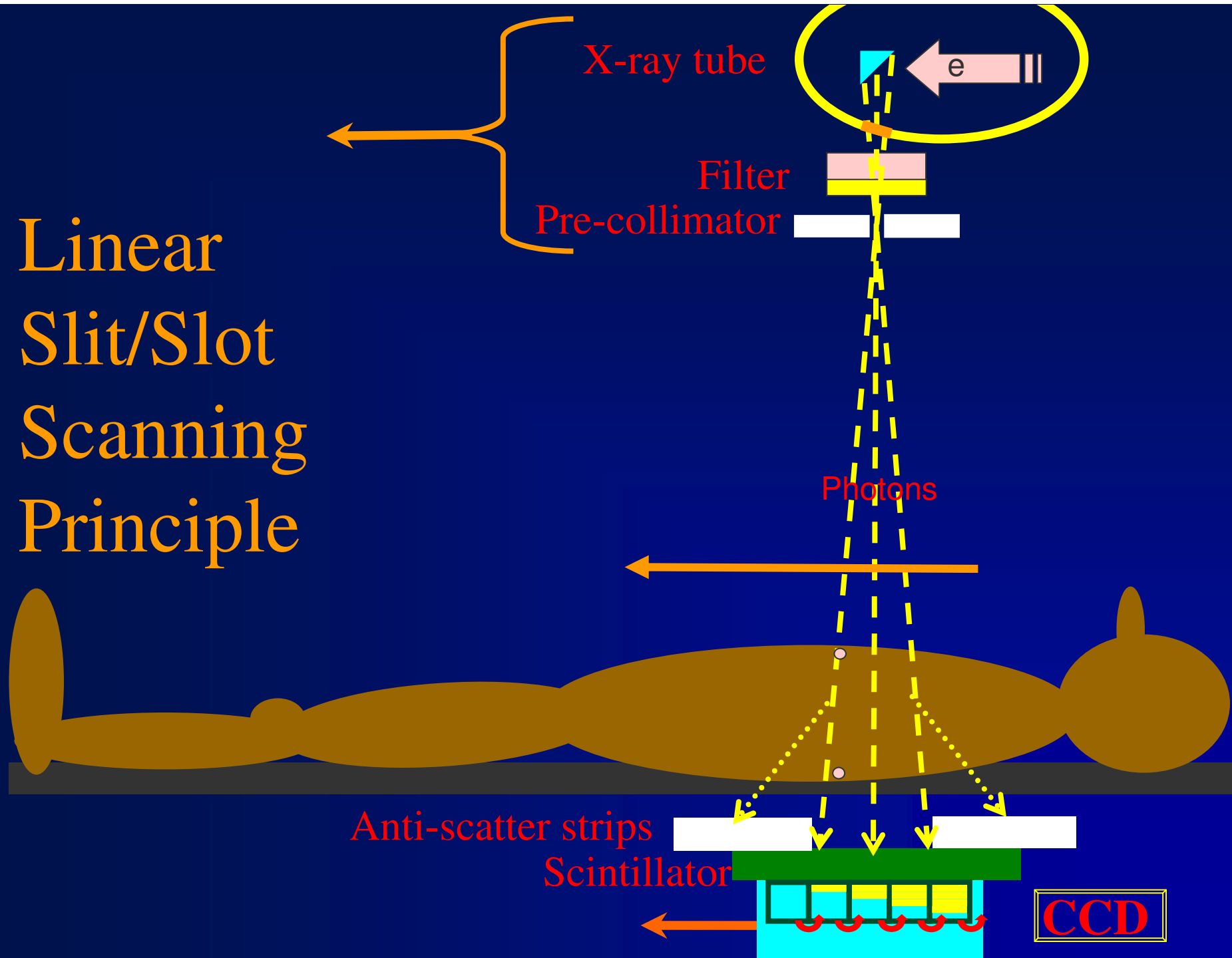
Detector

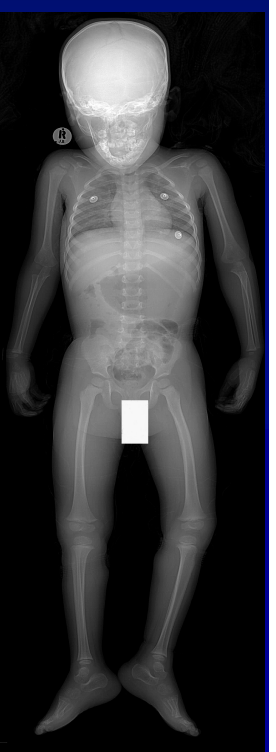
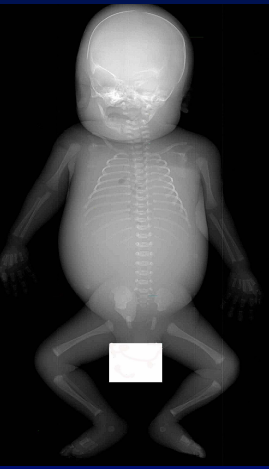
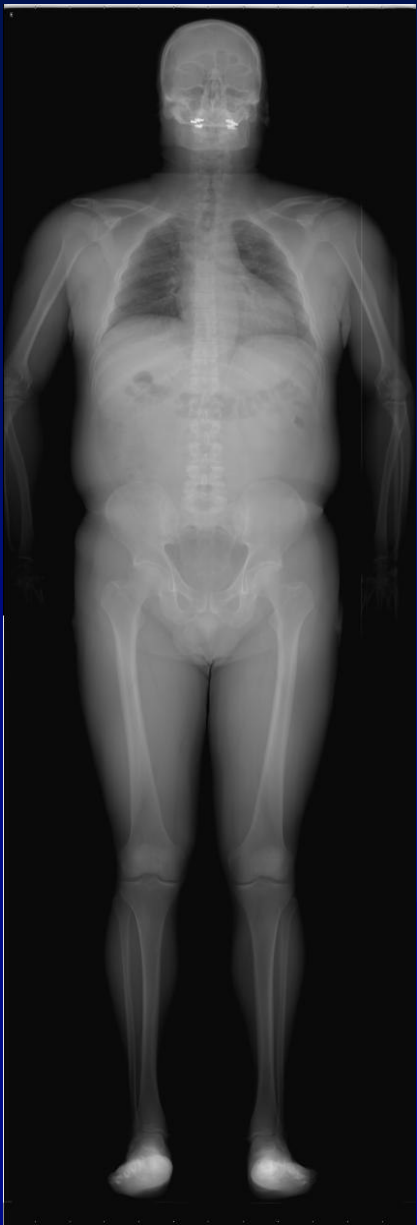
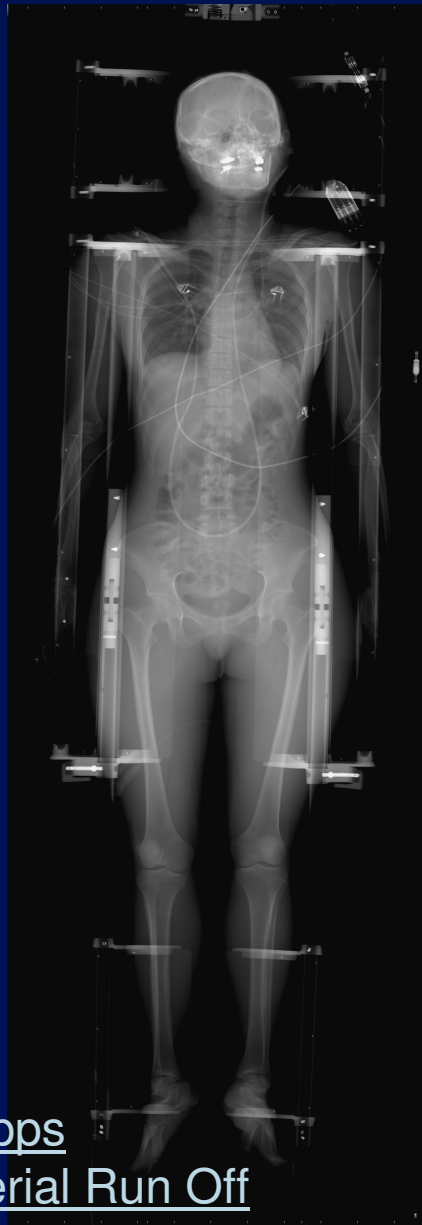
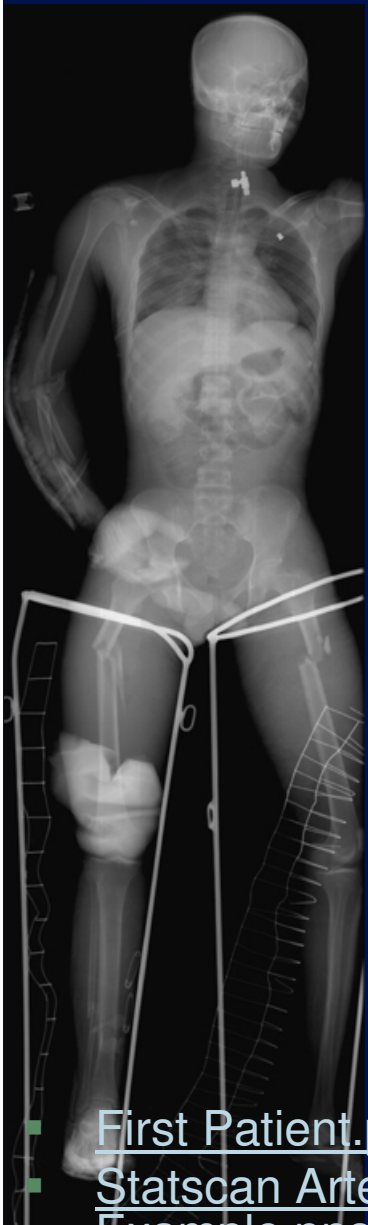


X-ray System



Linear Slit/Slot Scanning Principle





■ [First Patient.pps](#)

■ [Statscan Arterial Run Off](#)

■ [Example.pps](#)

Doses for Diagnostic Equivalence

Procedure	Guidance Dose *	Statscan™ Dose **	Statscan™ Dose Comparison % of conventional	Ratio
Spine	15000	1640	11%	9.1
Abdomen AP	5000	409	8%	12.2
Pelvis	5000	409	8%	12.2
Skull	2500	210	8%	11.9
Full Body AP	1500	150	10%	10.0
Extremity	450	60	13%	7.5
Chest AP	200	142	71%	1.4



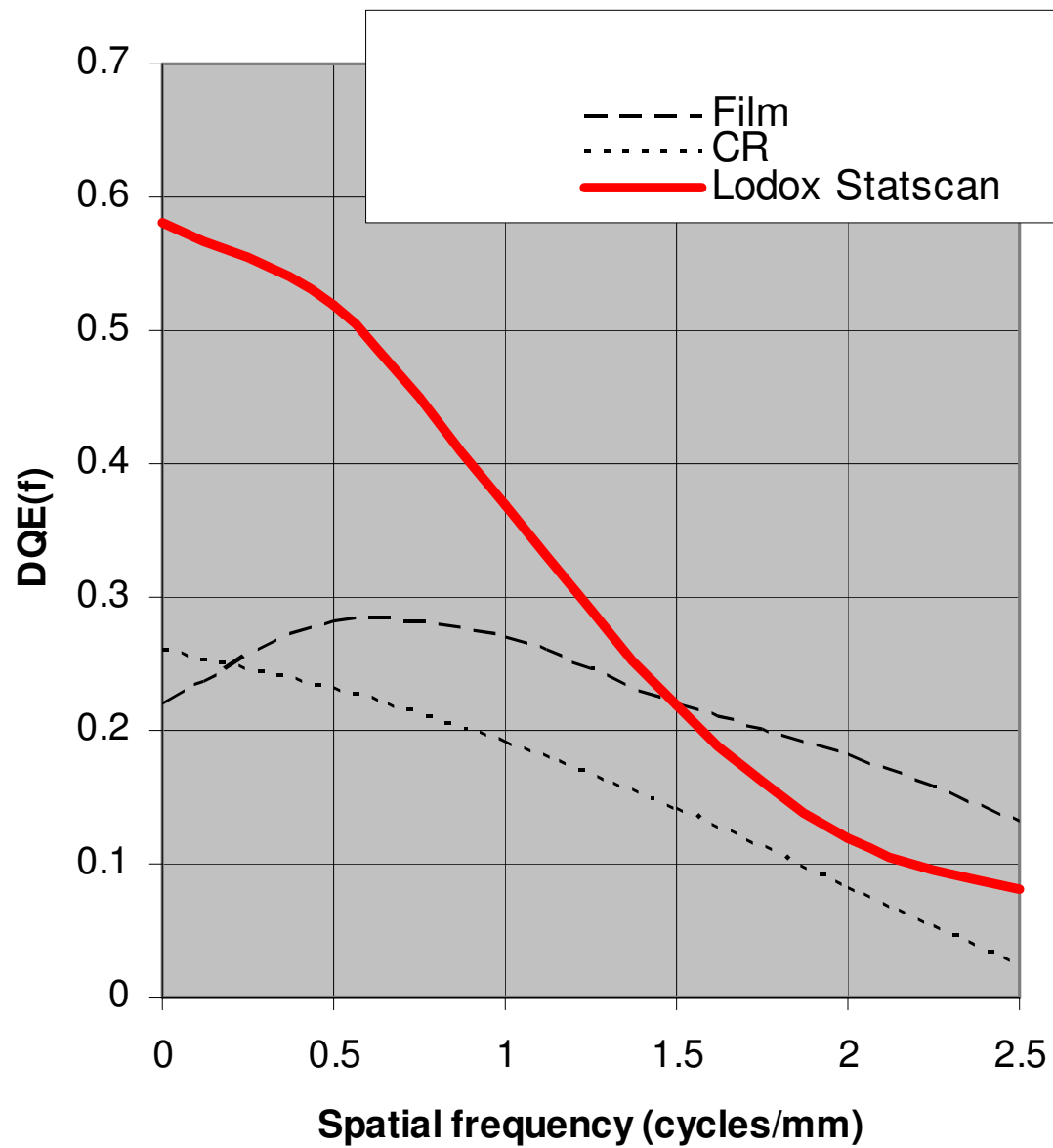
Dynamic Range

Binning size	Speed	mA	Raw counts	Fundamental dynamic range
1x1	0.25	160	5600	5600
	0.5	160	3020	3020
2x2	0.25	40	3000	6000
	0.25	80	6000	12000
	0.5	80	3000	6000
	0.5	160	6000	12000
	1	40	710	1420
	1	80	1550	3100
	1	160	3000	6000
4x4	0.5	40	2950	11800
	0.5	80	6000	24000
	1	80	3120	12480
	1	160	6000	24000
6x6	0.5	40	4200	25200
	0.5	80	6000	36000
	1	80	4600	27600
	1	160	6000	36000
8x8	1	40	3100	24800
	1	80	6000	48000

Logarithmic scaling compresses the gray scales to about 16384 levels

DQE

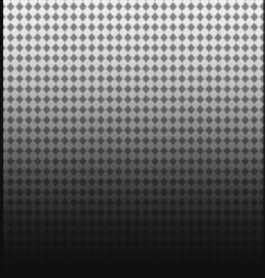




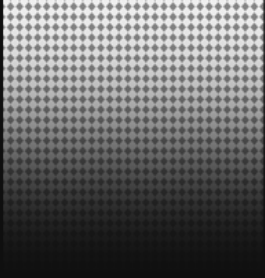




Lodox DQE Comparison



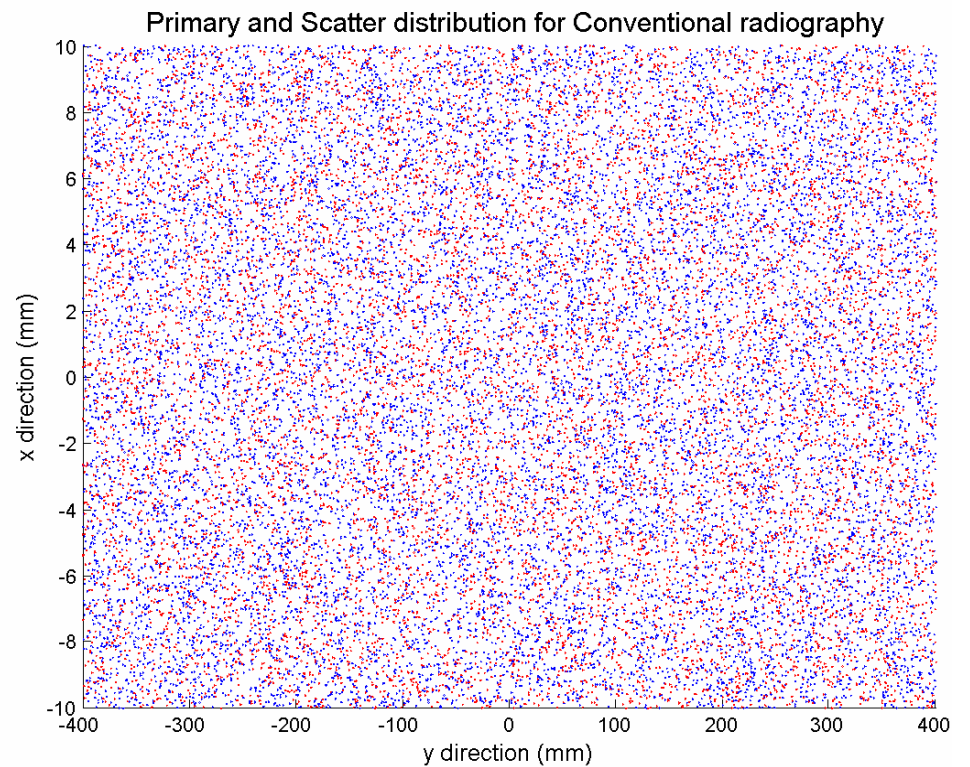
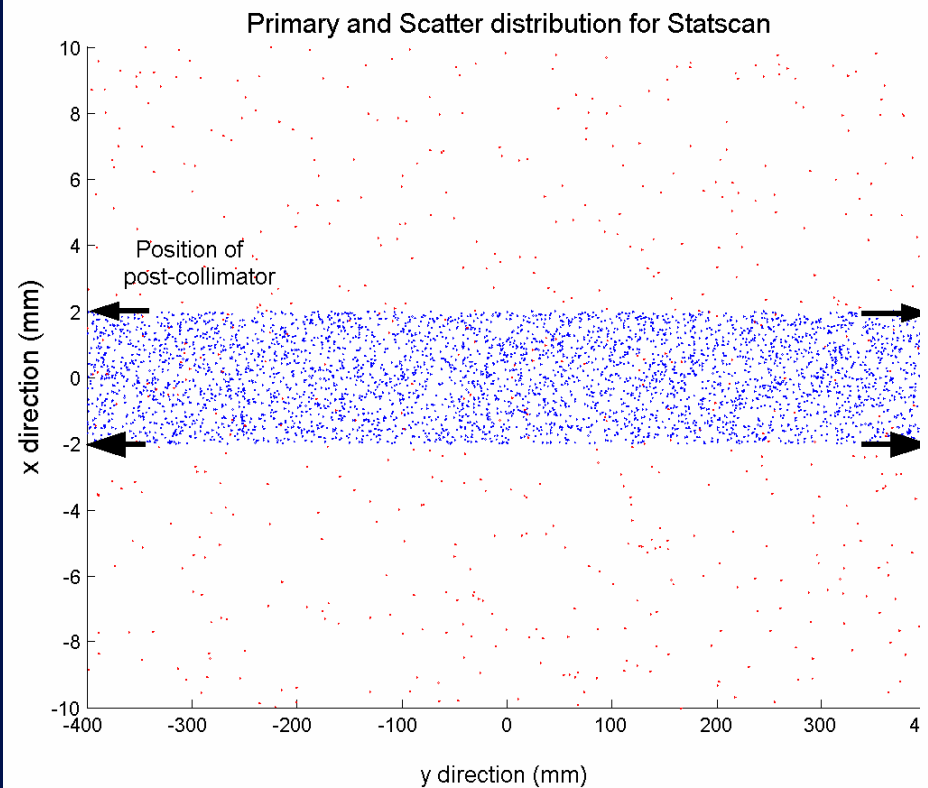
Spatial Resolution

SPATIAL RESOLUTION MODE:	ULTRA	VERY HIGH	HIGH	STANDARD	BASE
Binning Size	1x1	2x2	4x4	6X6	8x8
Nominal Pixel Size (mm)	0.06	0.12	0.24	0.36	0.48
Limiting Spatial Resolution LSR (lp/mm)	8.33	4.17	2.08	1.39	1.04
Relative Signal to Noise ratio per Binned (Super)Pixel	1	2	4	6	8
Fundamental Dynamic Range of Available Grayscales	6000	12000	24000	36000	48000

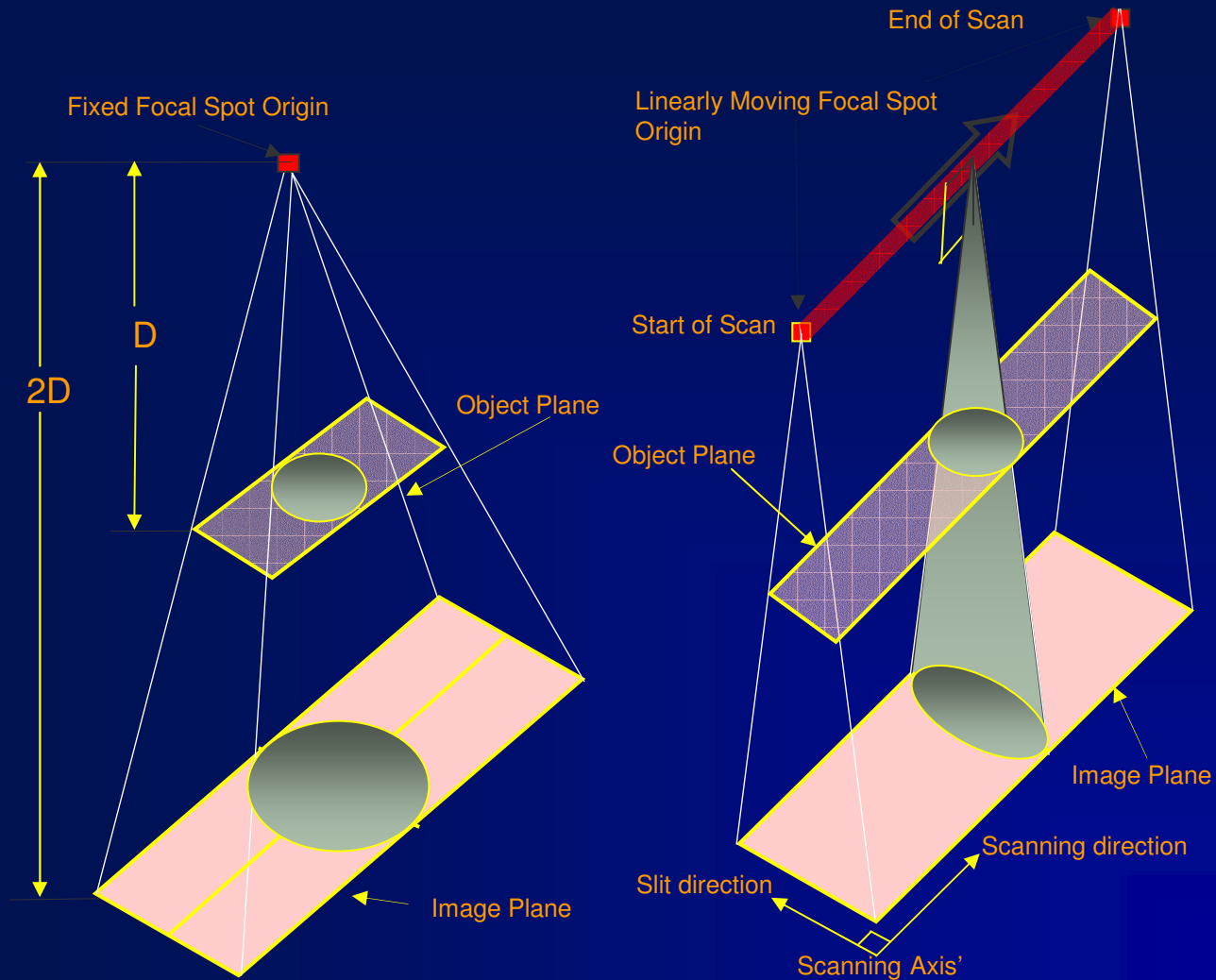
Relationship between Contrast, Spatial Resolution & Pixel Size

For a particular x-ray radiation exposure setting						
		Spatial Resolution Setting on Statscan				
		Ultra	Very High	High	Standard	Base
Imaged Object's "X-ray Opaqueness"	Thick					
	Thin					
		Bad		Medium		Good
		Discernable Contrast Resolution				

Comparative Primary to Scatter By Monte Carlo Simulation



LODOX Breaks the Inverse Square Law!



Full-Field

Area of Image = $4 \times$ Area of Object

$$I_{\text{image}} = I_{\text{out}} / D^2$$

StatScan

Area of Image = $2 \times$ Area of Object

$$I_{\text{image}} = I_{\text{out}} / D$$

The Affect of the Distance Relationship on the Dose

For a fixed dose at the detector of 1 unit:

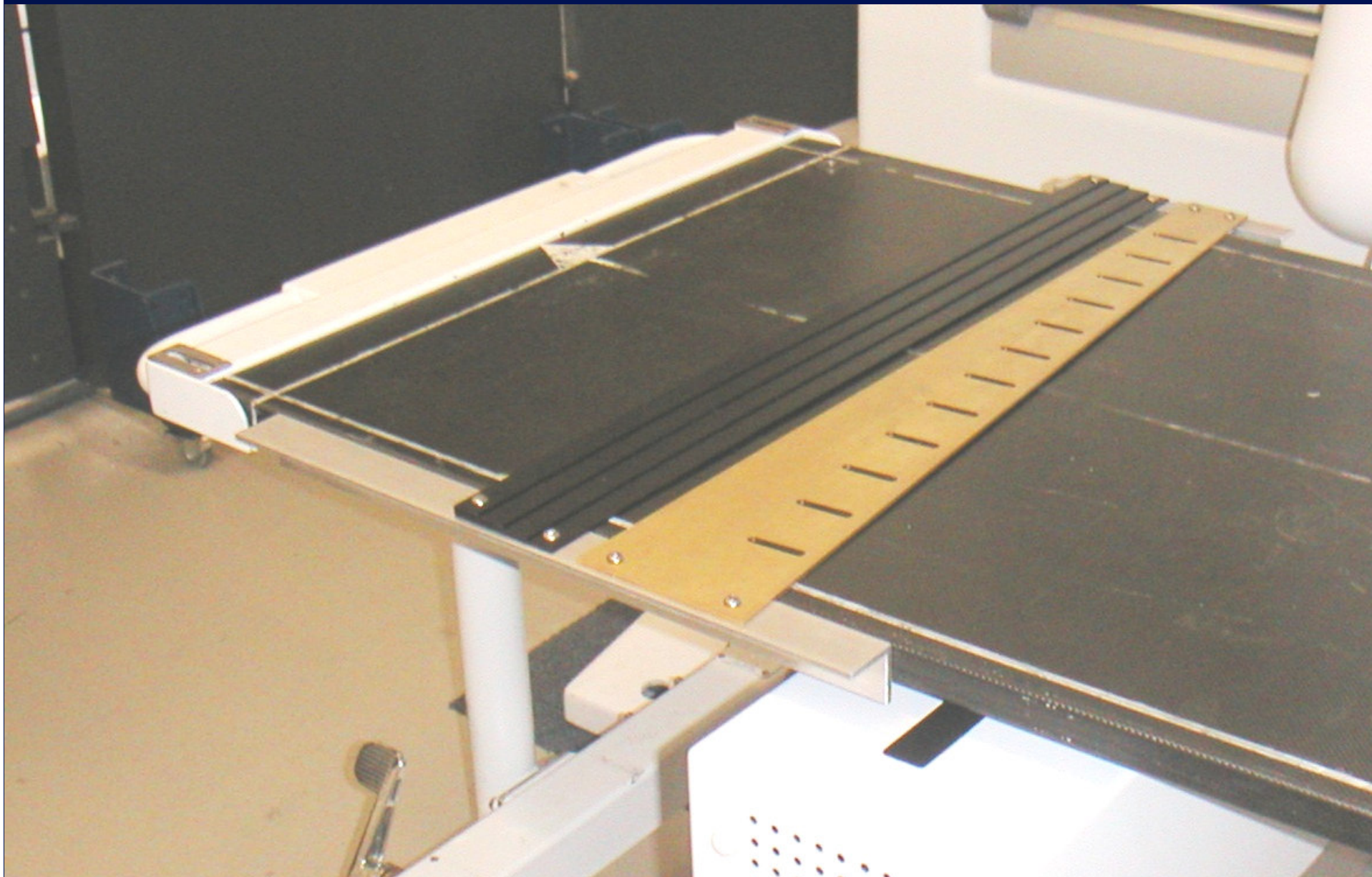
	SID:	Full Field											Statscan	
		1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2	1.3	
Equivalent skin entrance distance from the detector:	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	0.1	1.23	1.21	1.19	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.11	1.08	
	0.2	1.56	1.49	1.44	1.40	1.36	1.33	1.31	1.28	1.27	1.25	1.23	1.18	
	0.3	2.04	1.89	1.78	1.69	1.62	1.56	1.51	1.47	1.44	1.41	1.38	1.30	
	0.4	2.78	2.47	2.25	2.09	1.96	1.86	1.78	1.71	1.65	1.60	1.56	1.44	
	0.5	4.00	3.36	2.94	2.64	2.42	2.25	2.12	2.01	1.92	1.84	1.78	1.63	
	0.6	6.25	4.84	4.00	3.45	3.06	2.78	2.56	2.39	2.25	2.14	2.04	1.86	

Statscan's Dose Advantage

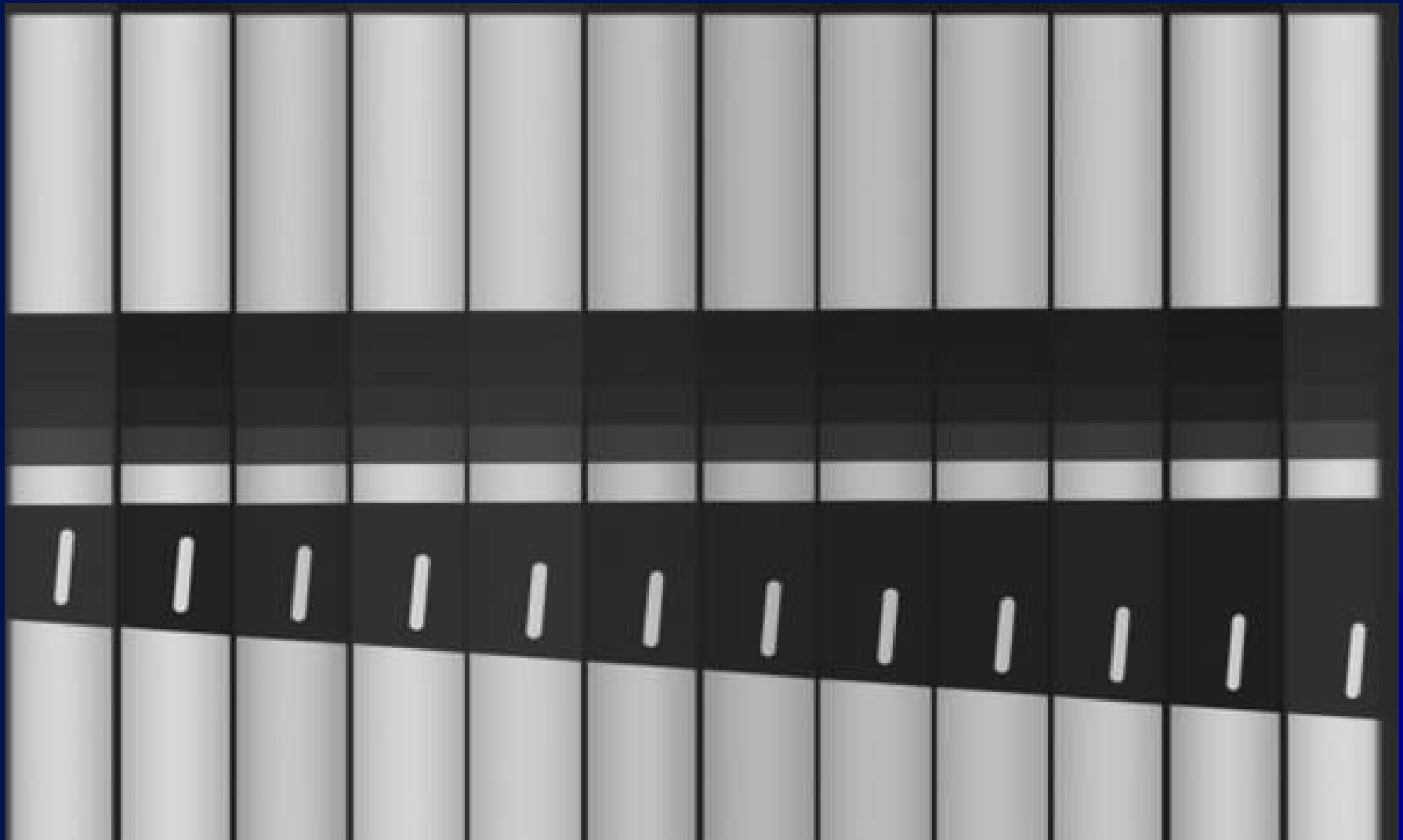
The Quantification of Statscan's Dose Advantage

Dose reduction reason:	Digital			Linear Slit Scanning			High Primary to Scatter Ratio			Statscan's Dose Advantage Multiple		
OTHER MODALITY:	Best	Expect	Worst	Best	Expect	Worst	Best	Expect	Worst	Best	Expect	Worst
General Full-Field Screen Film Radiology	3.0	2.0	1.5	3.0	2.0	1.5	3.0	2.0	1.5	27.0	8.0	3.4
(Chest Only)	3.0	2.0	1.5	1.2	1.1	1.1	1.2	1.1	1.0	4.3	2.4	1.7
General Digital Full-Field Radiology	1.1	1.0	0.9	3.0	2.0	1.5	3.0	2.0	1.5	9.9	4.0	2.0
(Chest Only)	1.1	1.0	0.9	1.2	1.1	1.1	1.2	1.1	1.0	1.6	1.2	1.0
Analog Slit Scanning	3.0	2.0	1.5	2.0	1.5	1.1	1.0	1.0	1.0	6.0	3.0	1.7
Non-Linear Digital Slit Scanning	1.1	1.0	0.9	2.0	1.5	1.1	1.0	1.0	1.0	2.2	1.5	1.0

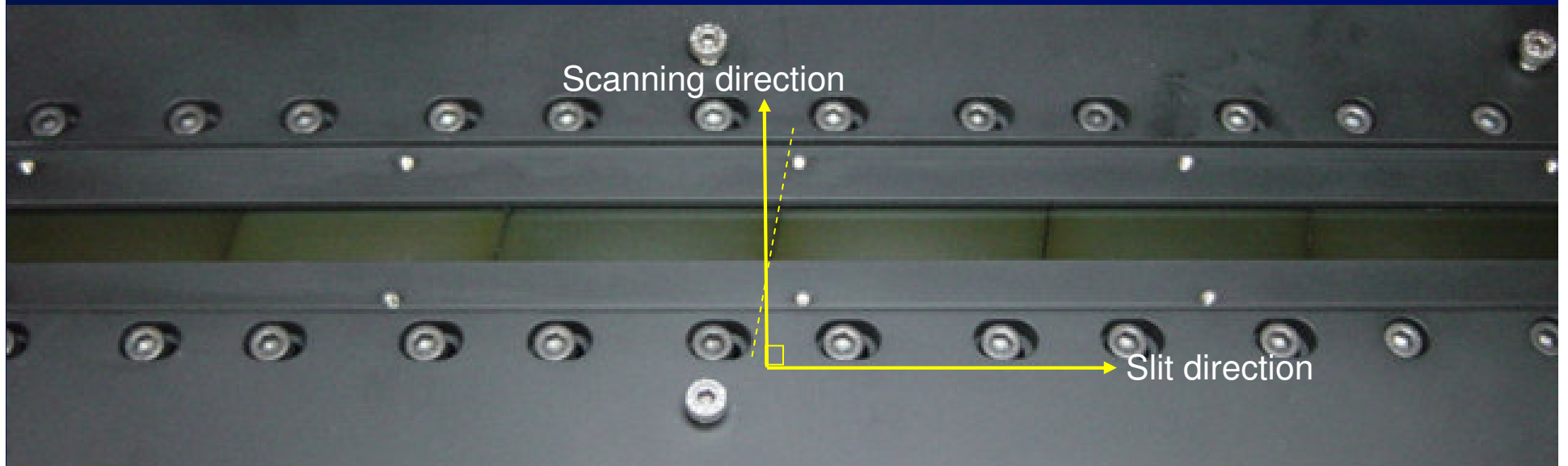
Image Quality Tool



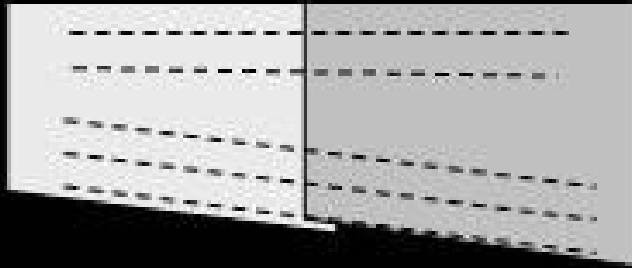
Uncorrected Image



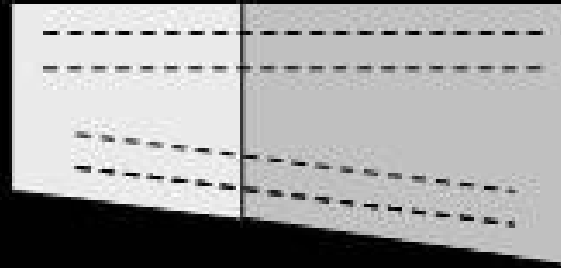
Inter-Camera Overlaps



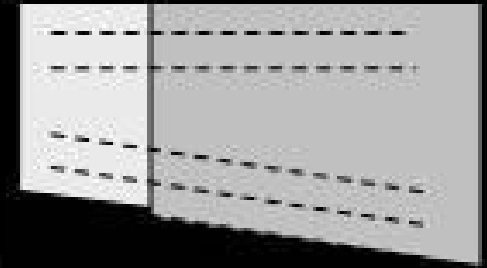
Optimum Overlap of Cameras



Too Much



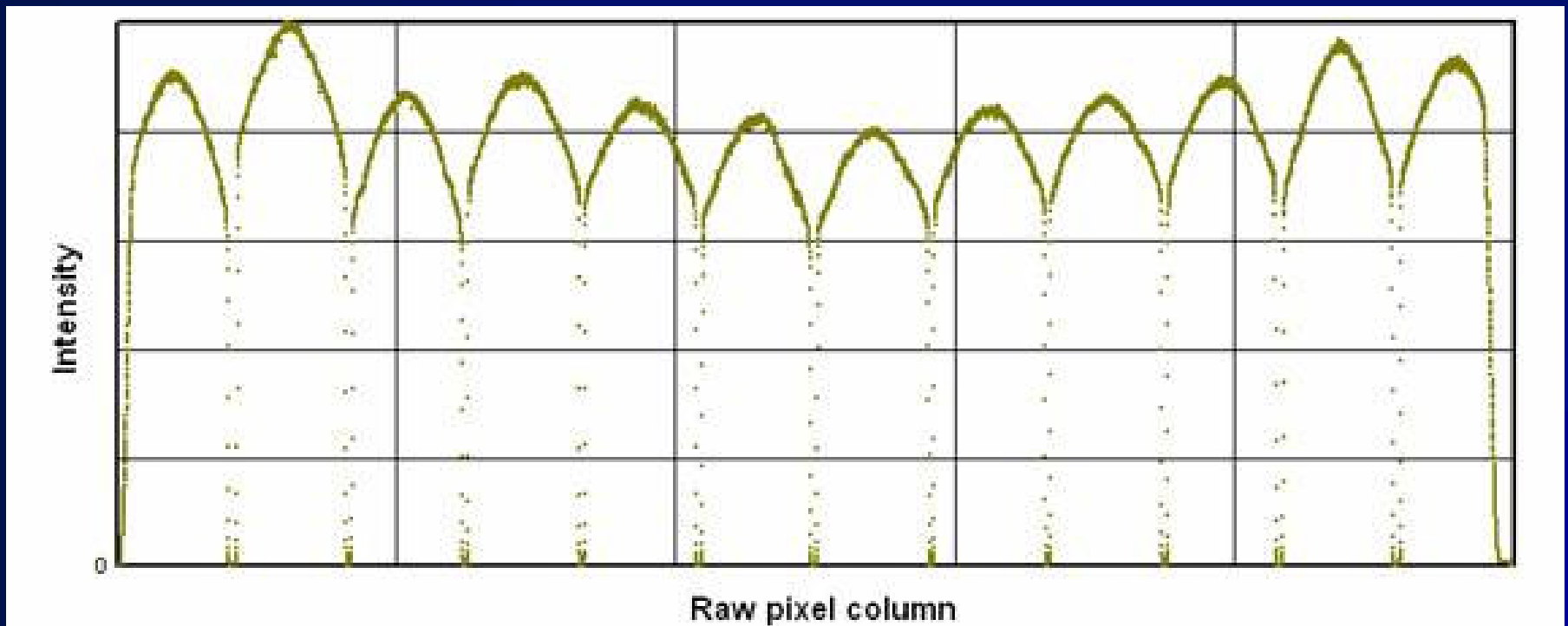
Correct



Too Little

Typical Gain Correction Curve

Done for each kVp value:



Final Corrected Image

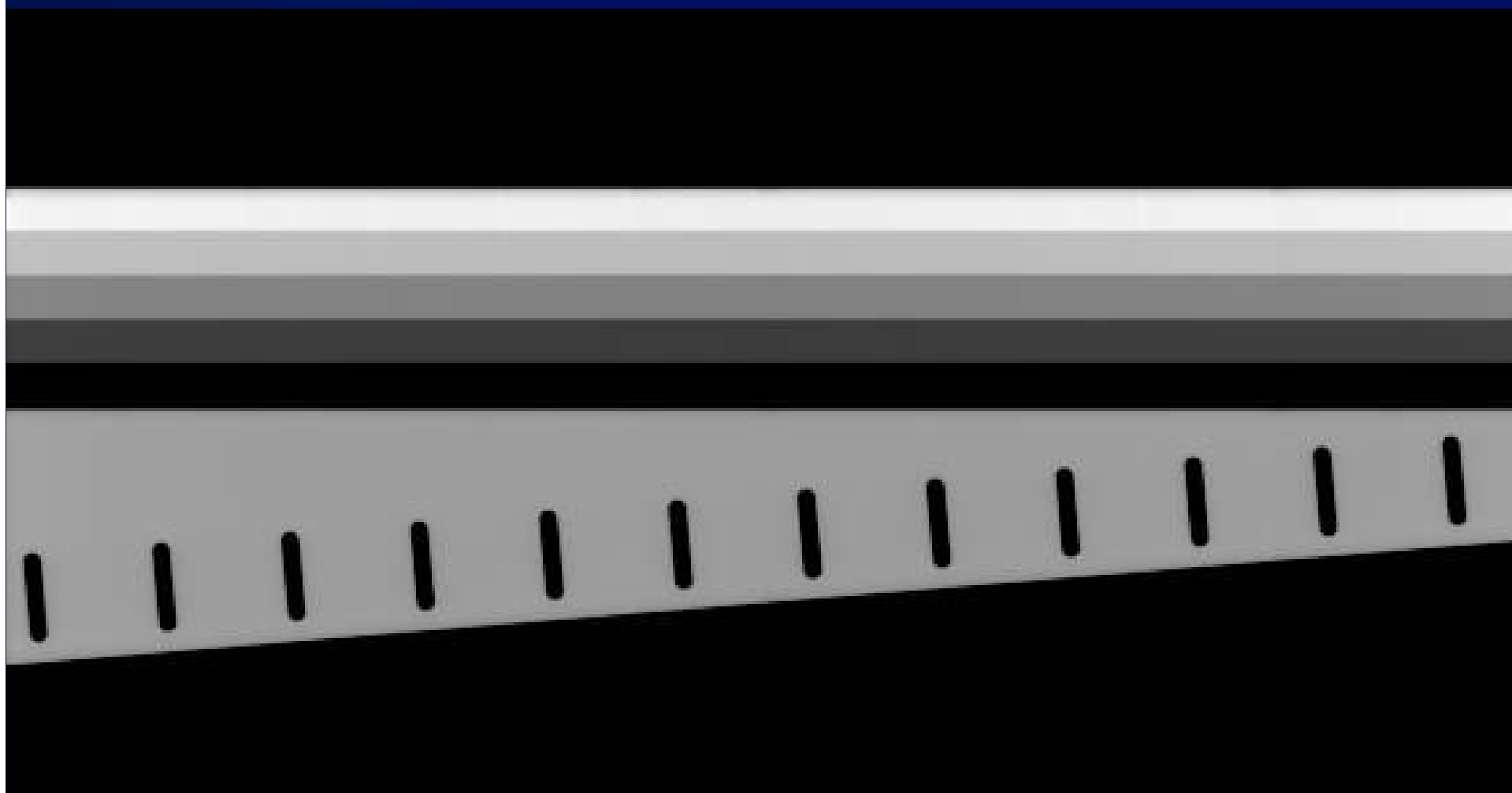


Image Quality QC

For each steel step thickness for each column:

- Standard Deviation
- Average

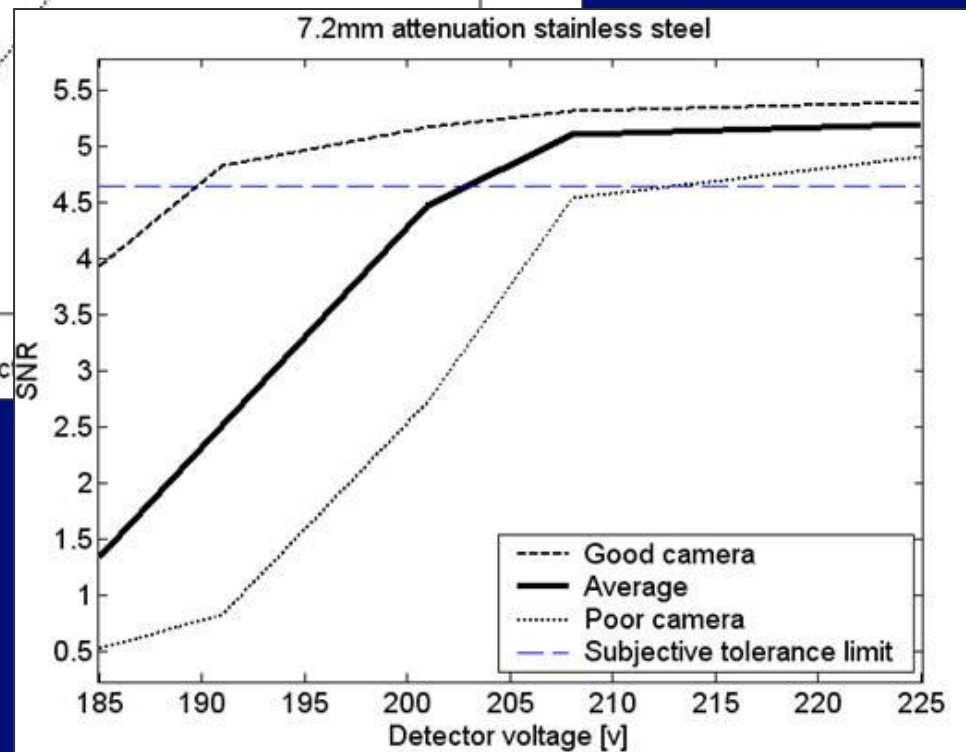
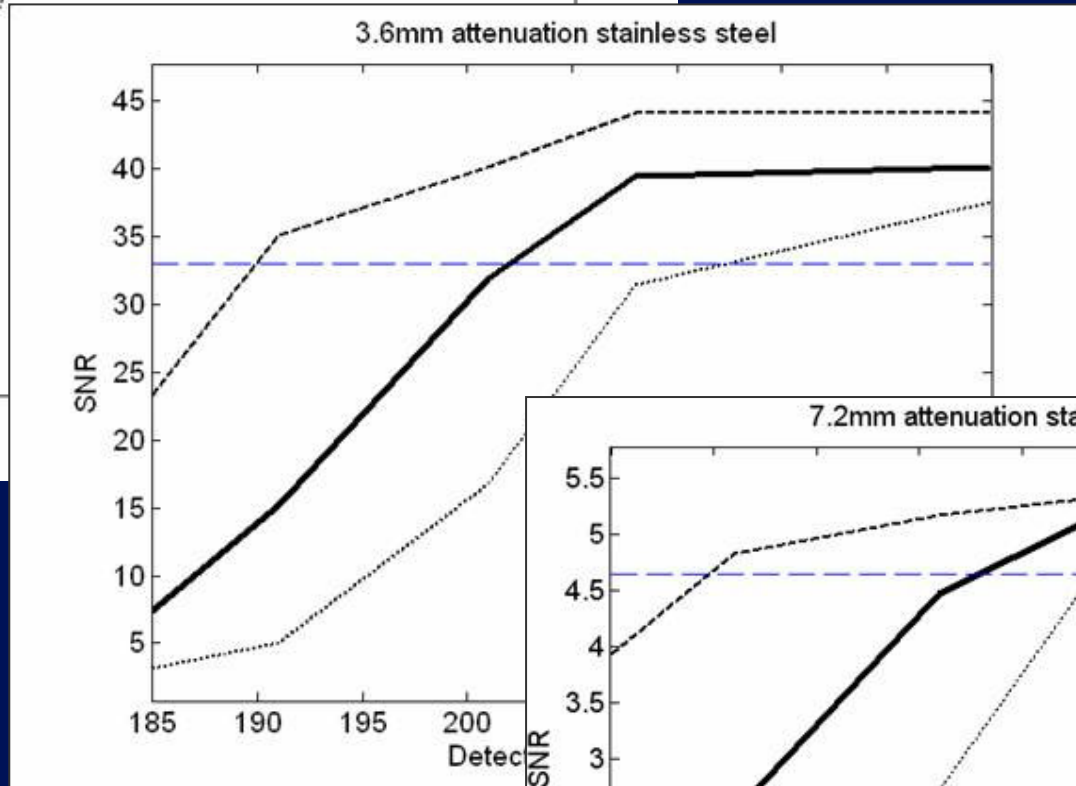
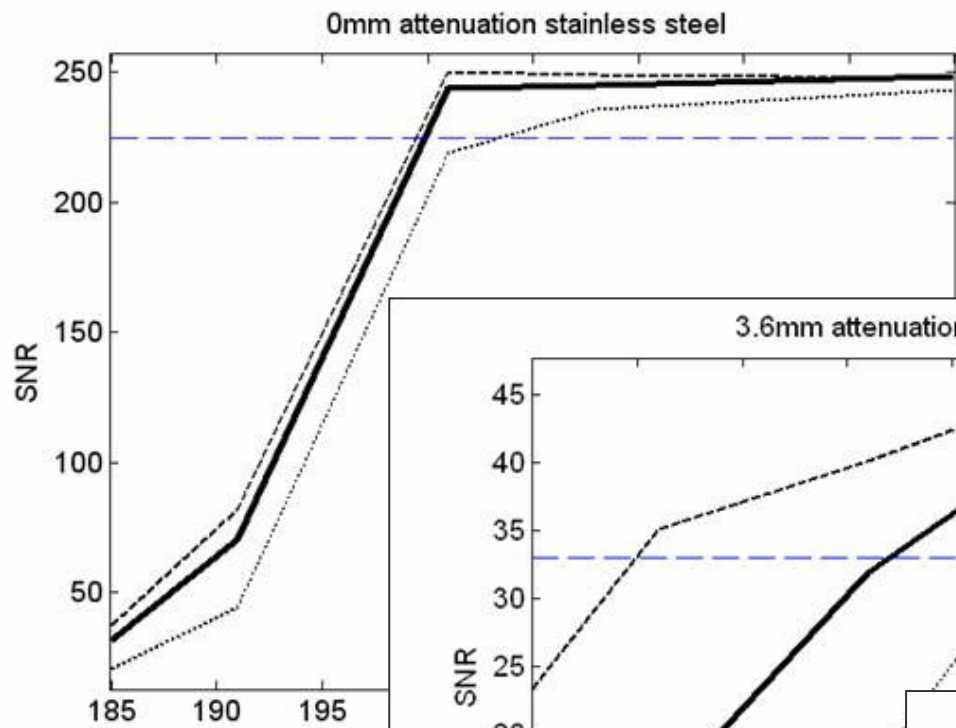
For Each Camera:

- MTF (modulation transfer function)
- NPS (noise power spectrum)
- NDQE (notional detective quantum efficiency)

Some Examples:

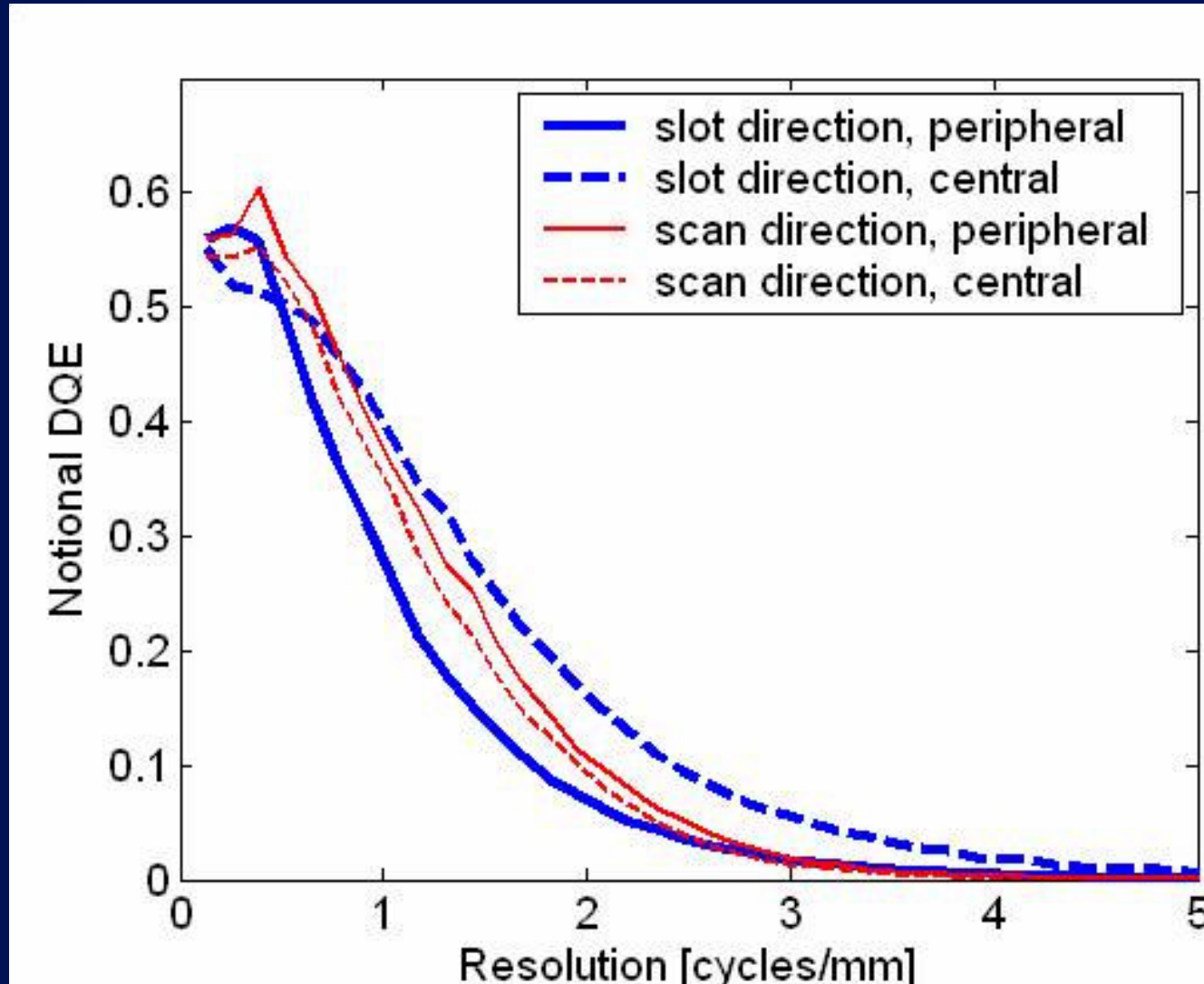
SNR

Performance



Notional DQE

Shown averaged for groups of cameras



Thank-you for your time....

Any ?'s