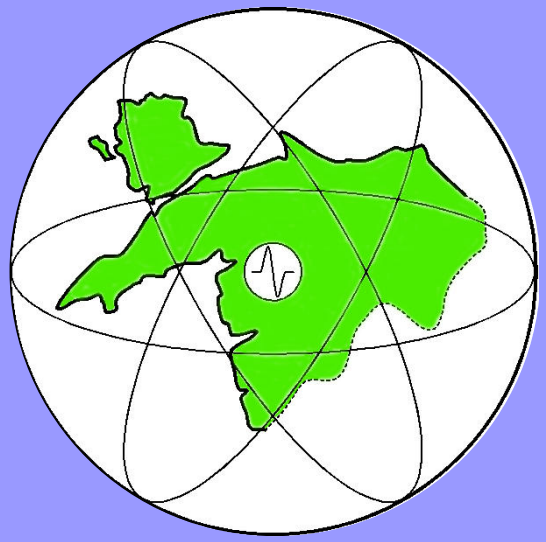
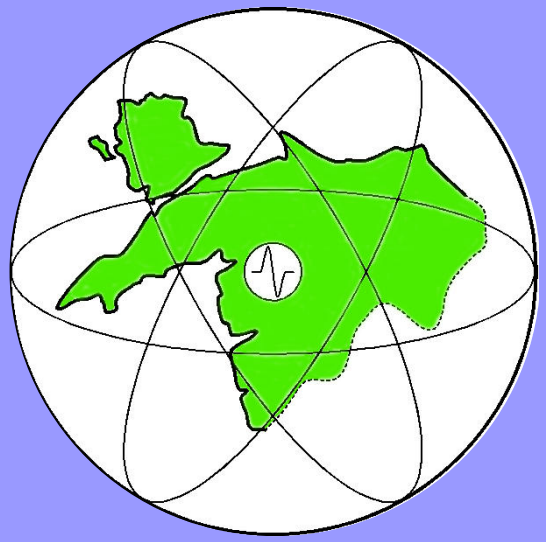
A simple anthropomorphic phantom used to demonstrate the effectiveness of CT dose modulation functions.



Lynn Bateman & Peter Hiles
North Wales Medical Physics

How can we test CT dose modulation?



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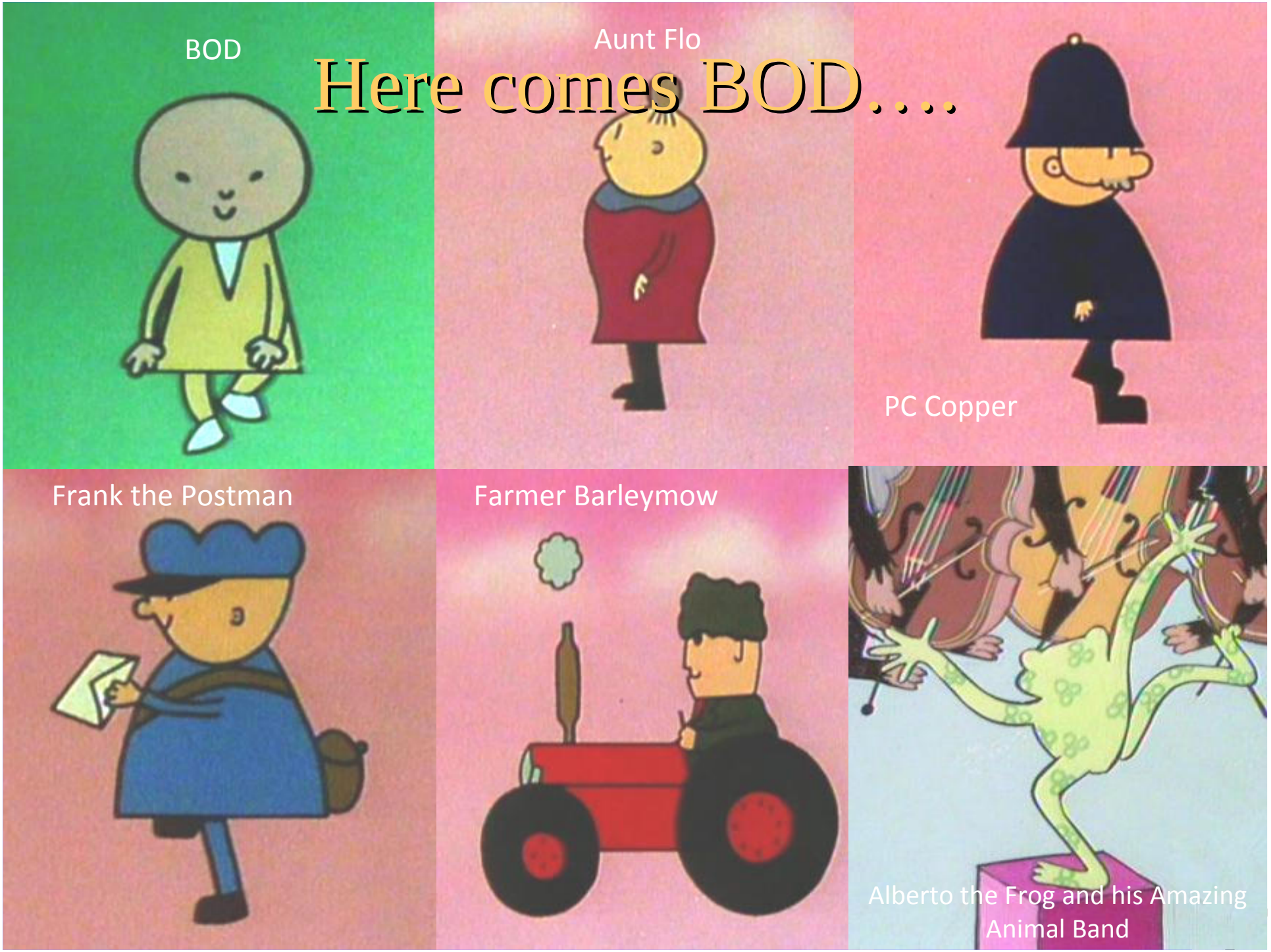
North Wales Medical Physics

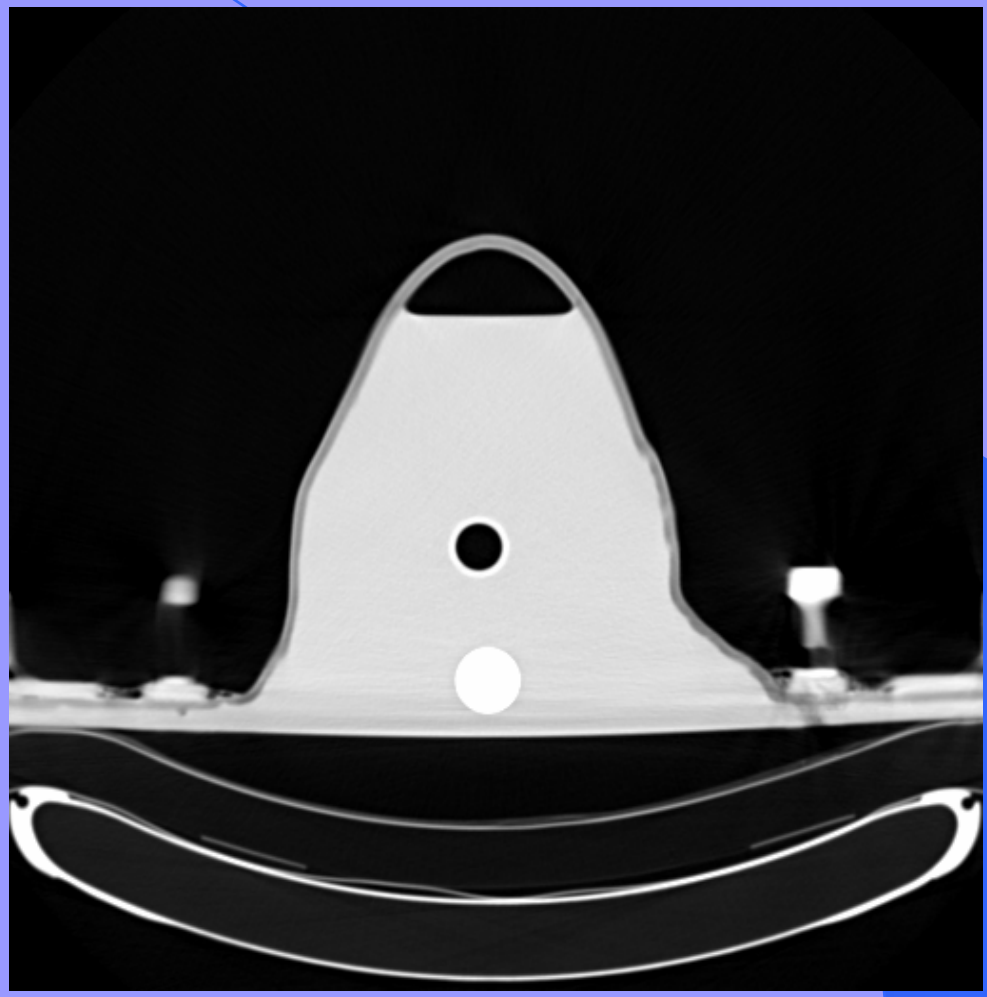
Dose Modulation in CT

- All manufacturers offer some sort of dose modulation (AEC)
- As we have heard (I hope!)– all have differing approaches
- Traditional CT Phantoms have circular cross sections
- New phantom required to ensure systems are working as specified and to compare different scanners and/or protocols

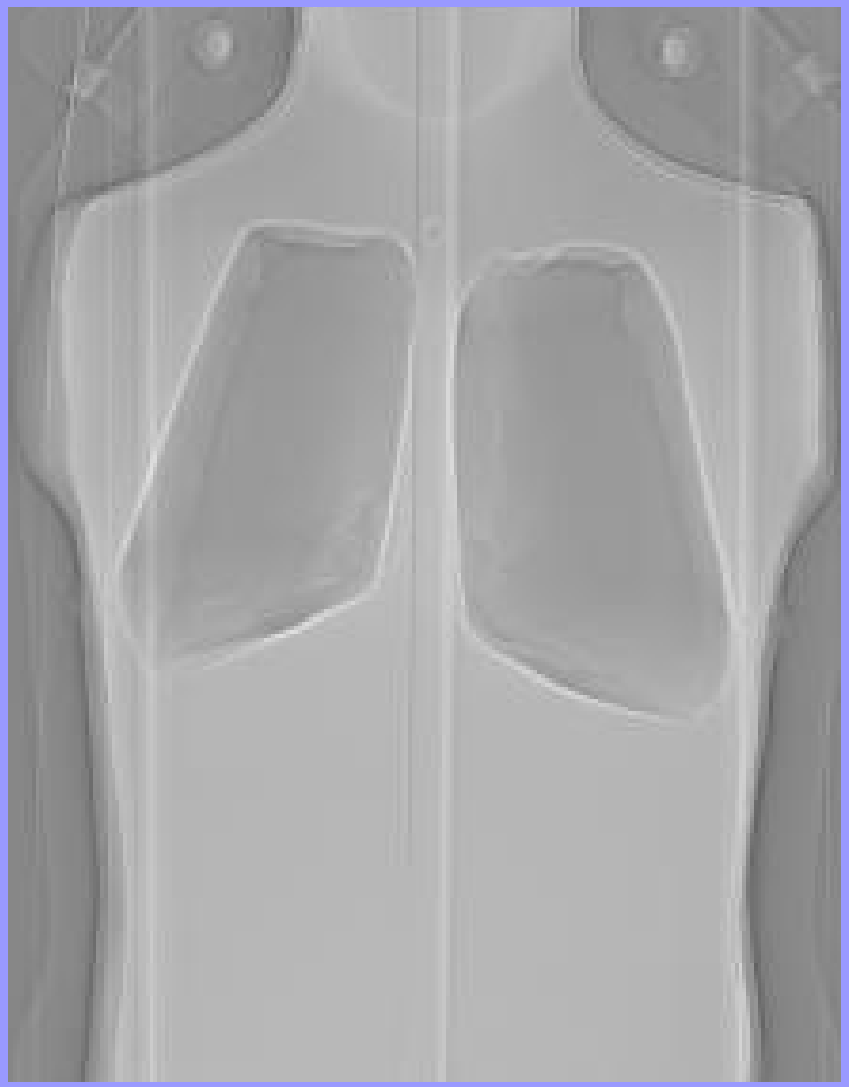
Here comes BOD….

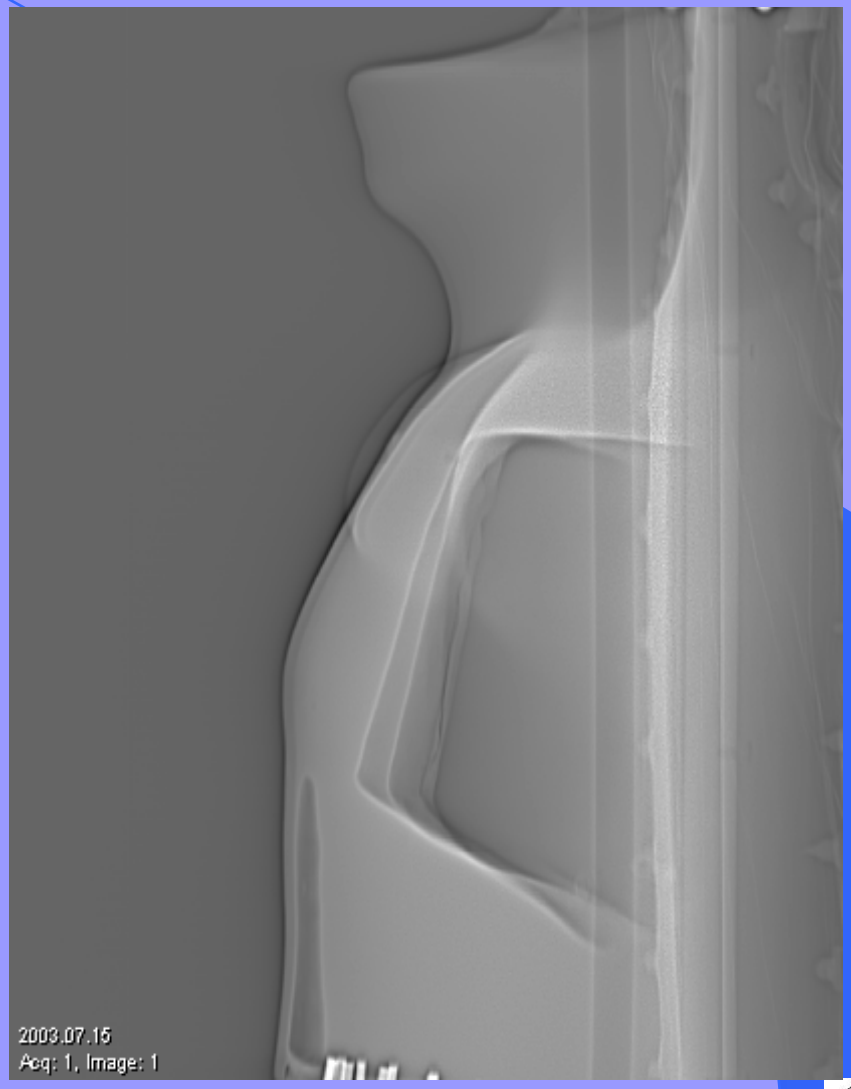


An introduction to BOD - North Wales



An introduction to BOD - North Wales





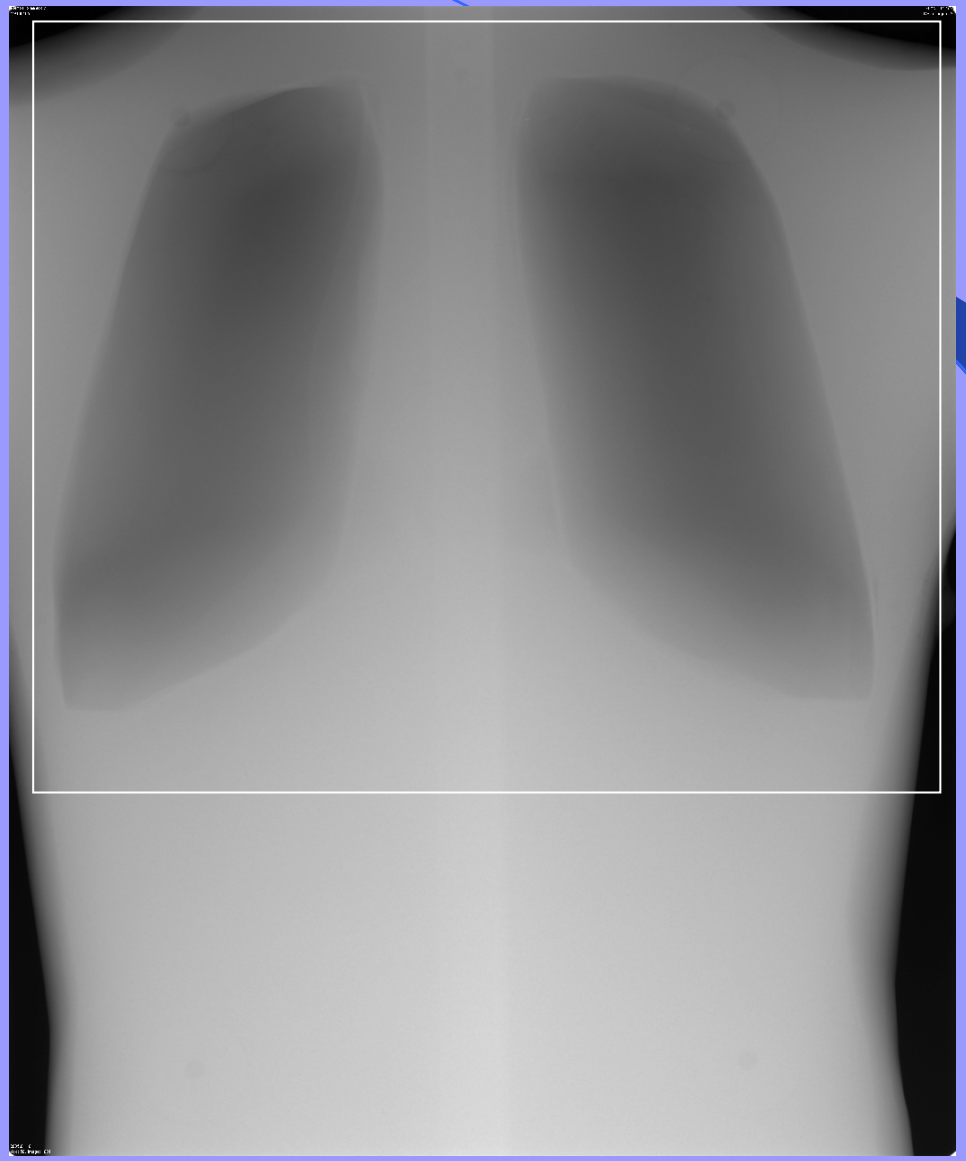
Which parameters are adjusted on your system?

- Whilst all systems are aiming to obtain images at a defined noise level this is achieved by adjusting the mA
  - per patient
  - per projection
  - per rotation

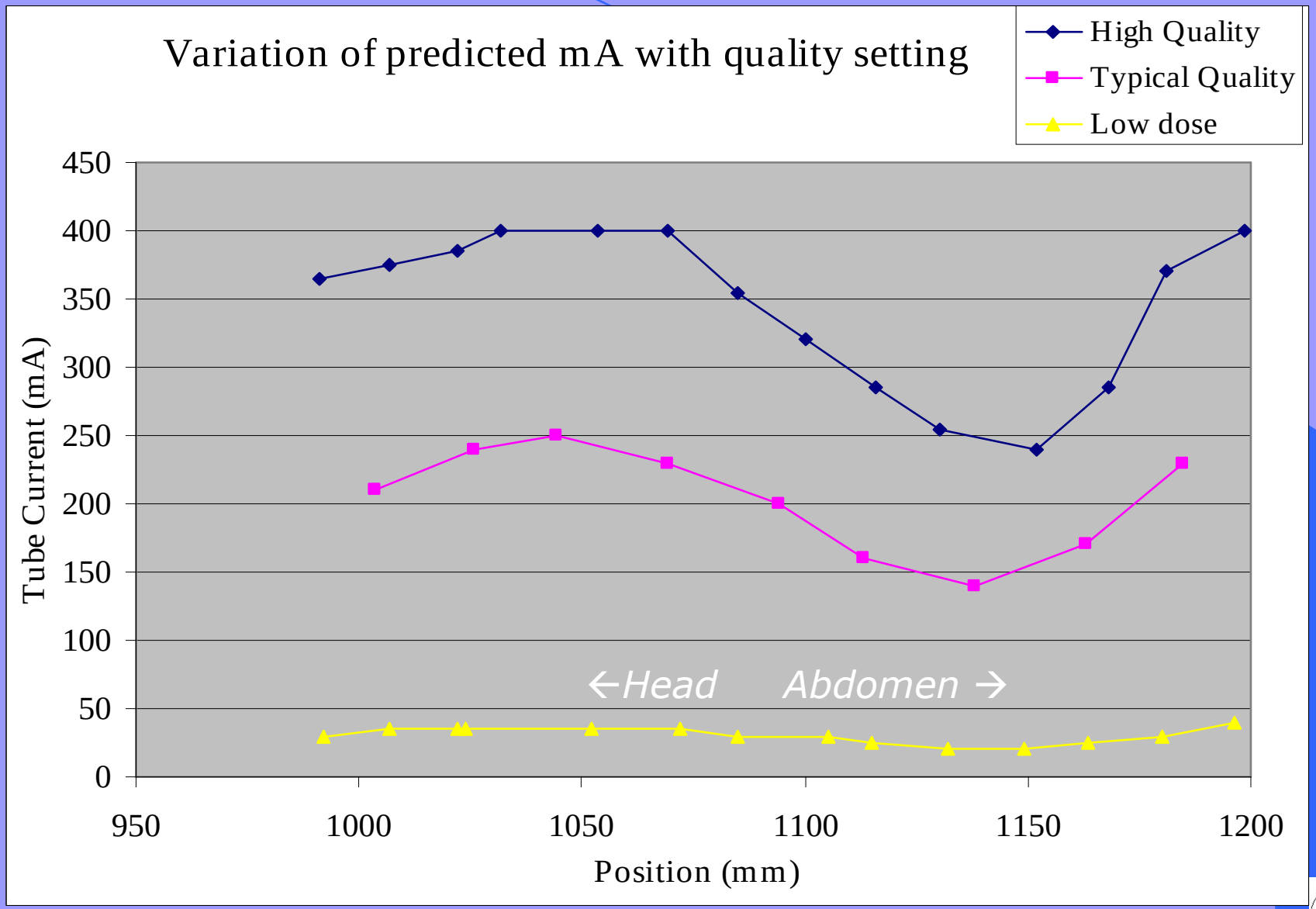
Know your target

- SD level
- Reference Image
- Reference mAs

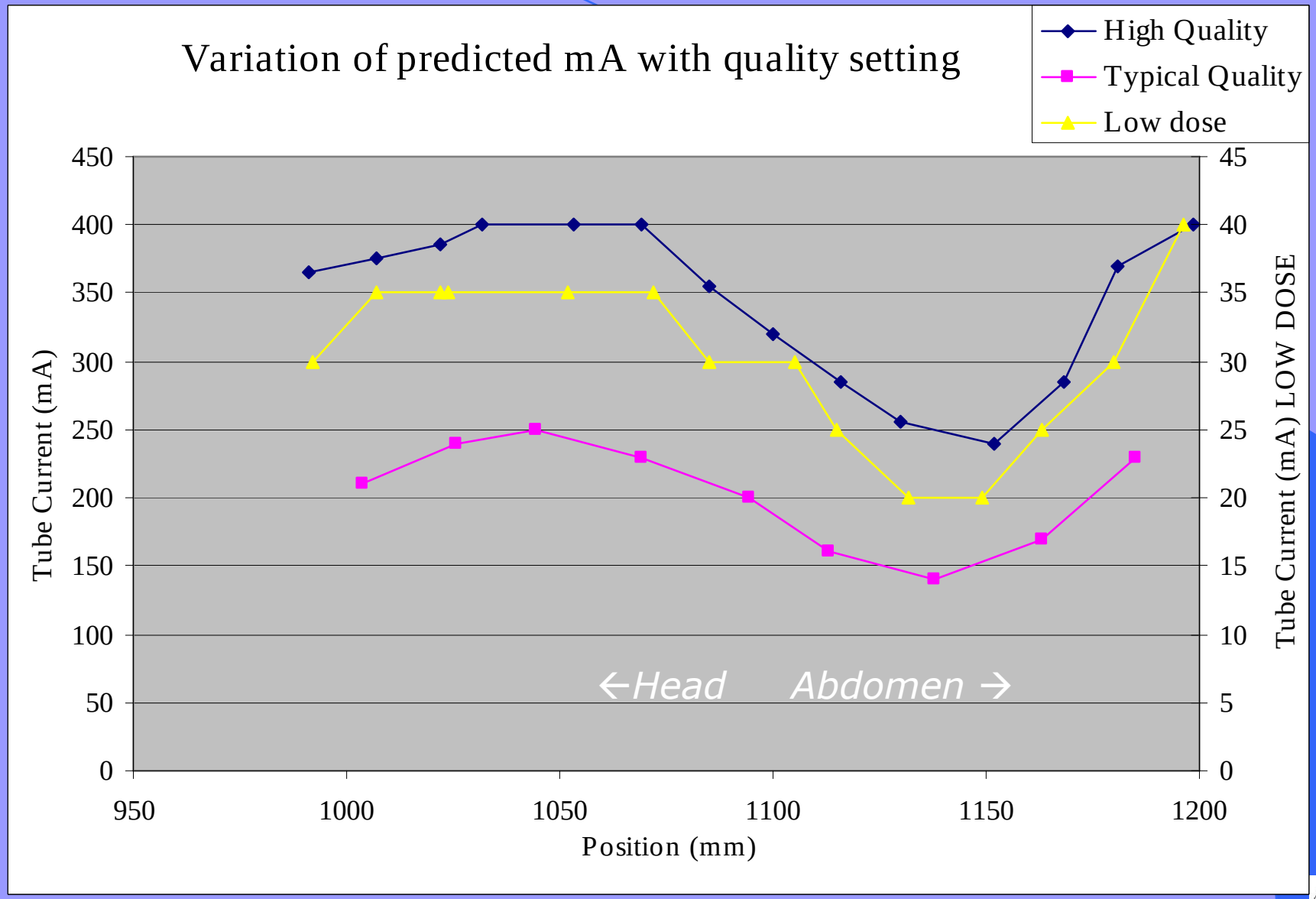
Does it work?



Does it work?


Variation of predicted mA with quality setting
High Quality
Typical Quality
Low dose
Tube Current (mA)
450
400
350
300
250
200
150
100
50
0
950
1000
1050
1100
1150
1200
Position (mm)
←Head
Abdomen →

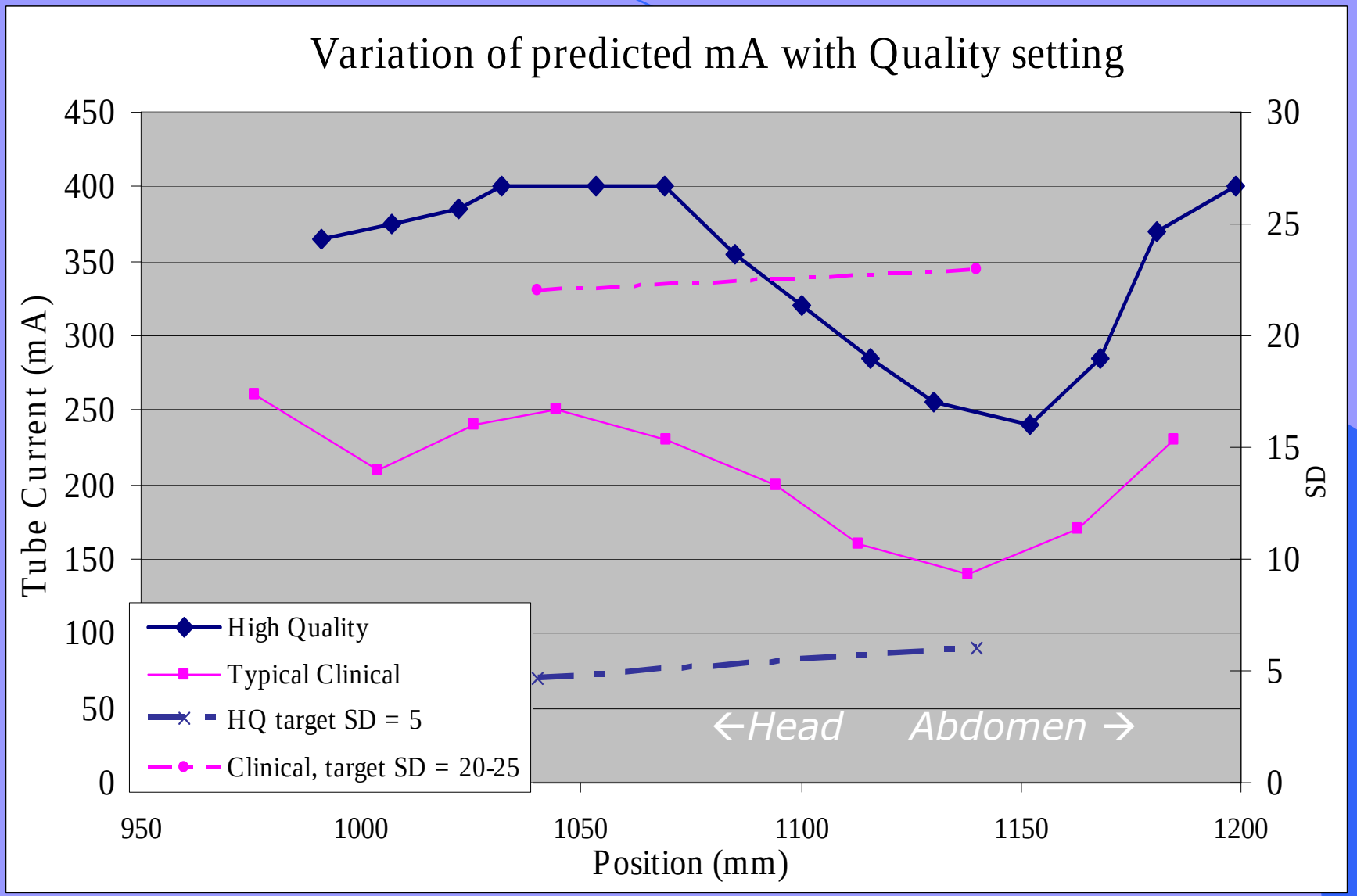
Does it work?


Variation of predicted mA with quality setting
High Quality
Typical Quality
Low dose
Tube Current (mA)
Tube Current (mA) LOW DOSE
450
400
350
300
250
200
150
100
50
0
45
40
35
30
25
20
15
10
5
0
950
1000
1050
1100
1150
1200
Position (mm)
←Head
Abdomen →

Does it work?

Solid lines = mA

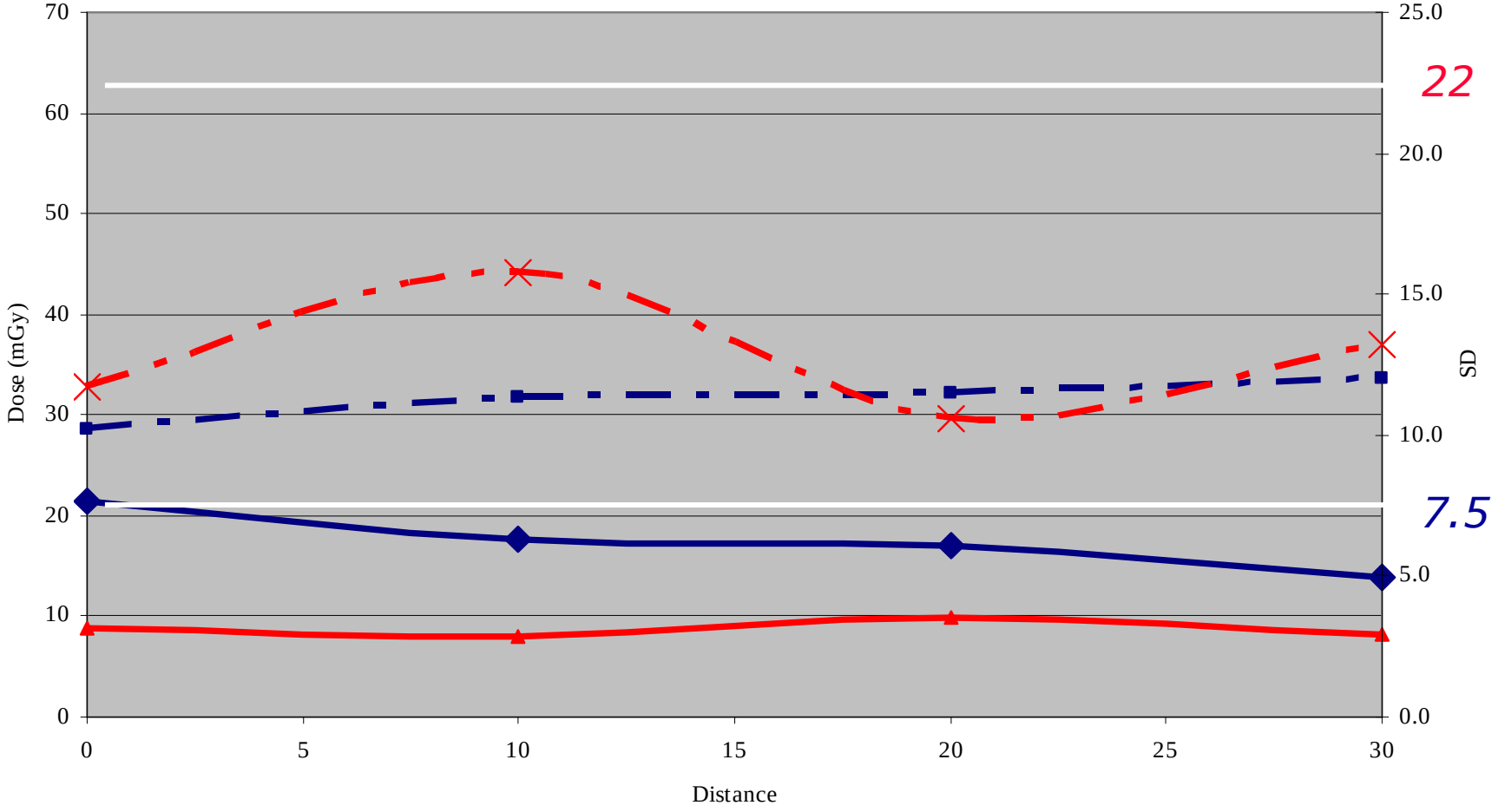
Dashed lines = SD



Phantom Results

Solid lines = Dose

Dashed lines = SD



← *Head*

Abdomen →

Changing clinical practice

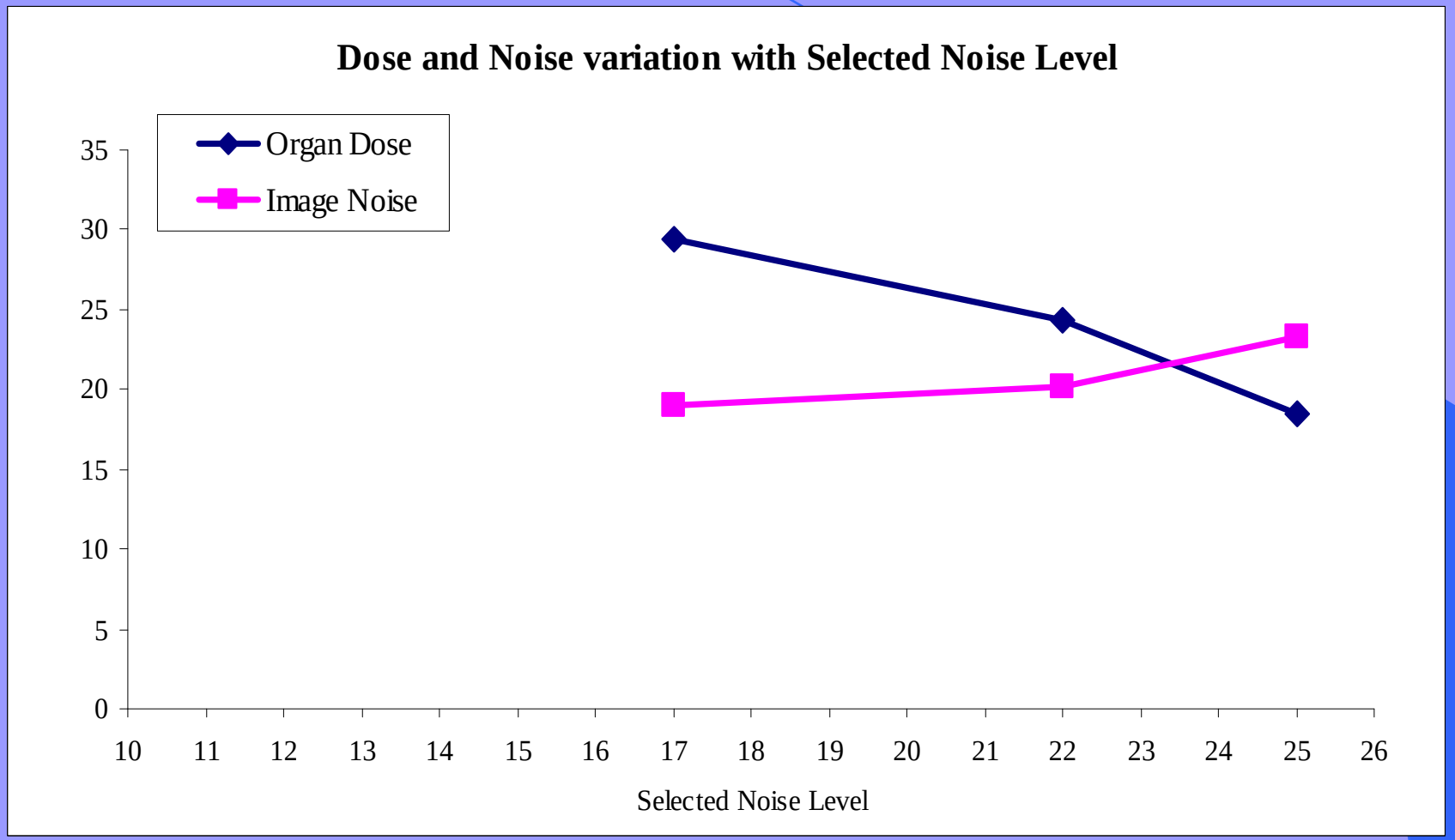
- Local user was unsure how their AEC software worked.
- Result of a dose audit
  - Request came for us to carry out measurements to show the effects.

Changing clinical practice

Target SD	Measured Dose (mGy)	DLP (mGycm)	CT# water	Measured SD	SD Variation from Target
	0.6 cc ion chamber				
17	29.4	940	0.9	19.0	12%
22	24.3	766	0.8	20.2	-8%
25	18.5	600	1.8	23.3	-7%

Measurements taken in upper abdomen

Changing clinical practice

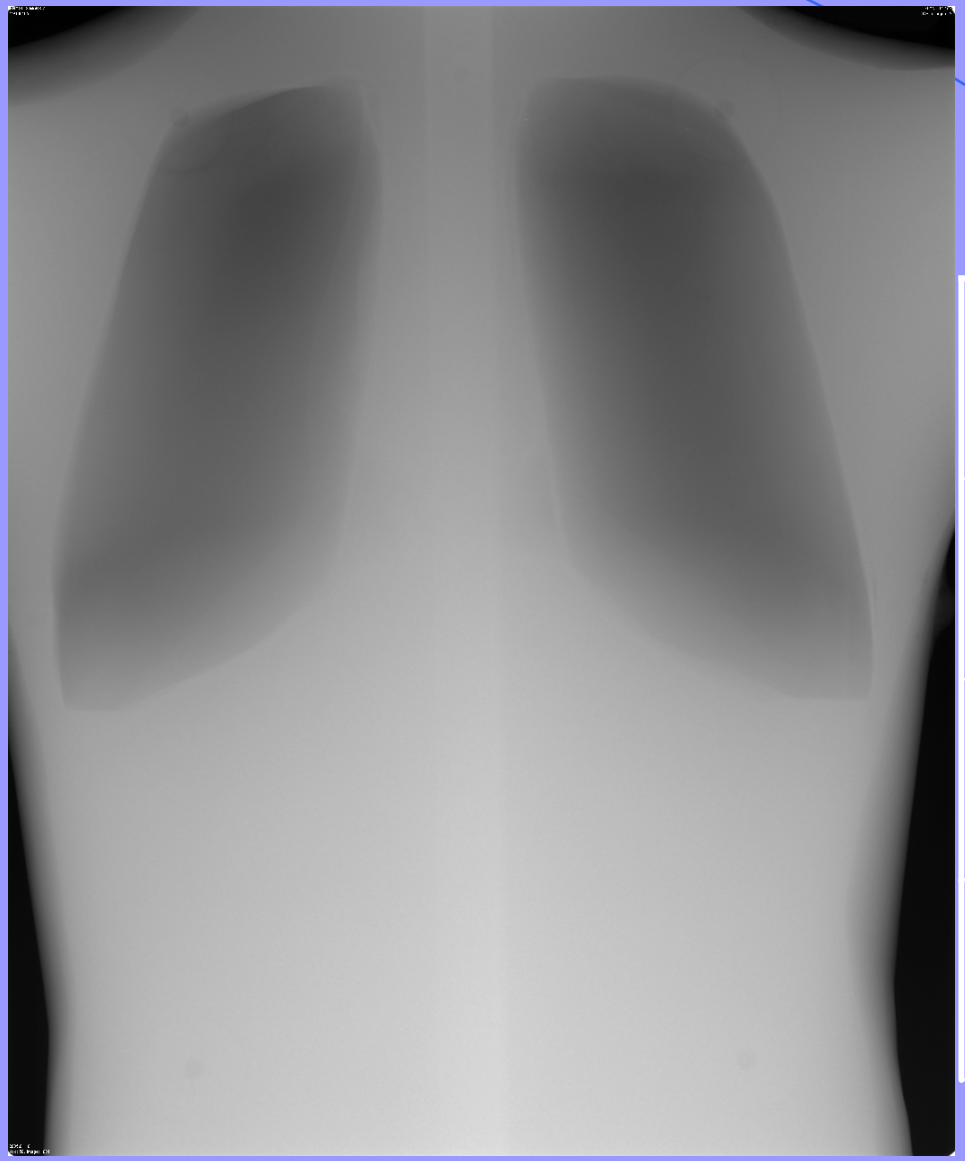


Changing clinical practice

Exam	Local DLP (mGy cm)	DLP compared to pre change	%NDRL	NDRL
	1st Audit		1st Audit	DLP (mGy cm)
Head	1009		108%	930
Chest	810		140%	580
Chest/Abdo	1211		209%	580
CAP	1371		146%	940
Abdo/Pelvis	869		155%	560

Physics evaluation of AEC system

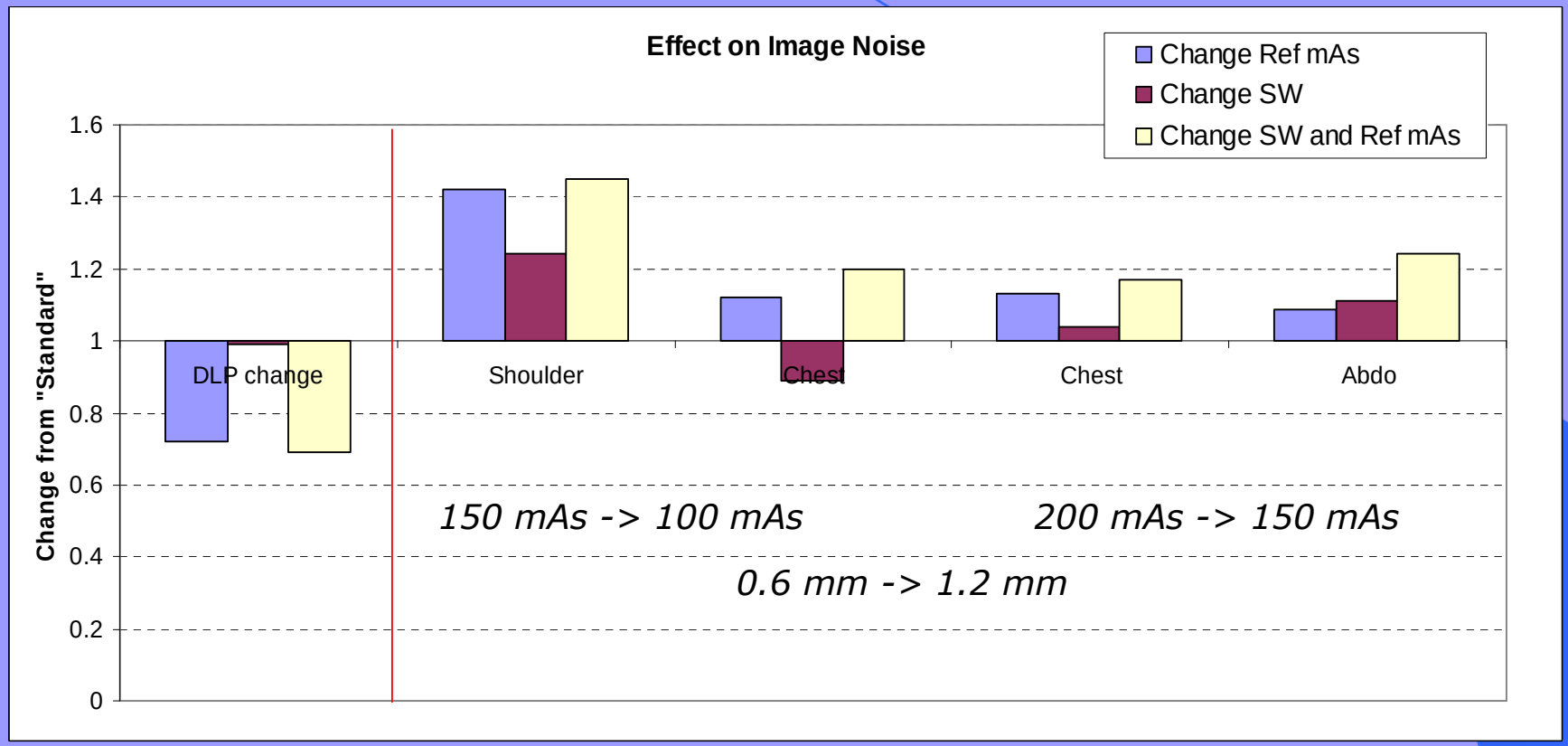
Changing clinical practice



Request from another local user department to assess the impact of proposed protocol changes.

	Current	Proposed
Eff mAs Chest	150 mAs	100 mAs
Eff mAs abdo	200 mAs	150 mAs
SW	0.6	1.2

Changing clinical practice



The Future

- Split phantom into two to improve manageability
- Refine shoulders
- Different sized phantoms
- Work outside of CT!