

# When is a door not a door?

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*Gareth Iball*

*Leeds Teaching Hospitals*





# Checking shielding of CT rooms

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*Survey time...*



## How do we do it?

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- *Mobile x-ray unit*
- *Radioactive source*
- *Scatter from scanner*
- *Visual check*
- *A. N. Other?*
- *Not done*



## More questions...

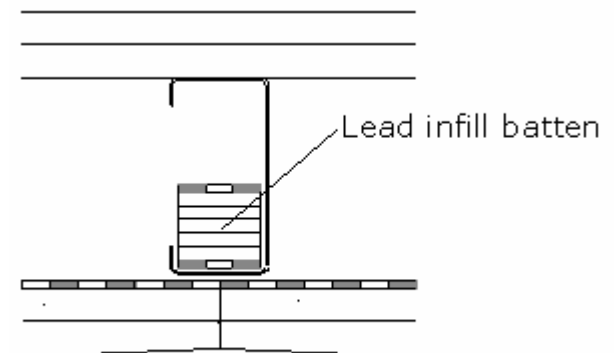
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- *Mobile or Radioactive source:*
  - *Patchwork method across all walls?*
  - *Just key points on main barriers?*
- *Scattered radiation:*
  - *Dose or dose rate?*
  - *Key points on main barriers?*
  - *Large areas of all walls?*

# Our experiences

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- *Most new rooms constructed from lead backed board rather than solid walls*
- *Potential for discontinuities at join of boards*
- *High IDR from MSCT*
  - *Wider beams*
  - *Faster tube rotation*
- *10 new MSCT in last 12 months*



Code 6 & 7 vertical joints



## How we do it

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- *Two body CTDI phantoms*
  - *Scan with abdo protocol*
  - *Pitch = 1*
  - *~1s rotation time*
  - *Yields long scan time*
    - *Time for reading on dose rate meter to stabilise*

# Measurement 1

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- *Use high sensitivity radiation counter*
  - *Mini 44A scintillation*
  - *Sweep across large areas*
  - *Look for uniformity in response & for hotspots*
  - *Experience with our meter tells us that full scale on Mini  $\sim 4.5\mu\text{Sv/hr}$*
  - *Mark any hotspots*



## Measurement 2

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- *Dose rate meter (e.g. Smartion)*
  - *Quantify dose rate at each hotspot*
  - *Quantify dose rate at standard point behind each barrier*
  - *Measure at operator's position etc*







## Measurement 3

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- *At each hotspot (with significant dose rate)*
  - *Attach CR cassette over hotspot*
  - *Perform 10+ scans to yield image*
  - *Use resultant image to determine size and position of hotspot*



## Some examples

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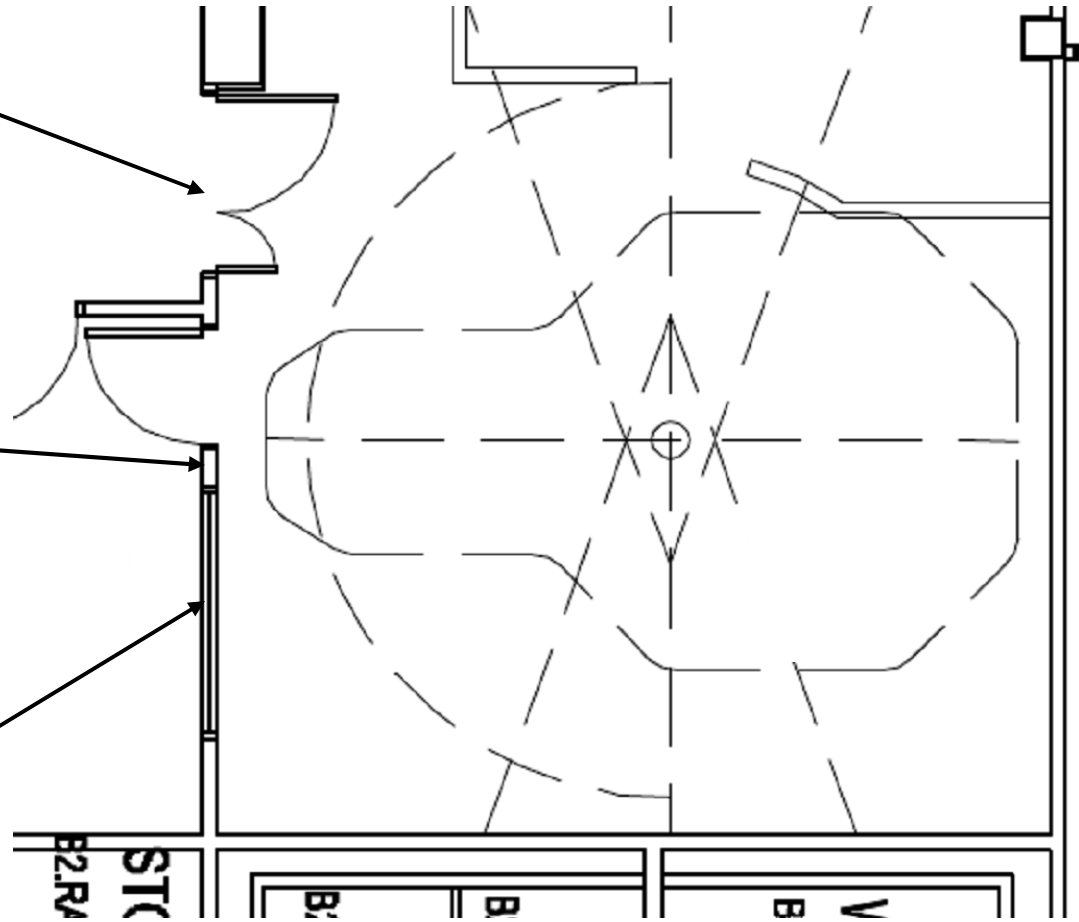
*All hospitals shall remain nameless...*

# Room 1

18.2 $\mu$ Sv/hr –  
on door - F

26.8 $\mu$ Sv/hr –  
by door – A/B

14.8 $\mu$ Sv/hr –  
under window - X



# Points A & B

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# Nurse call button

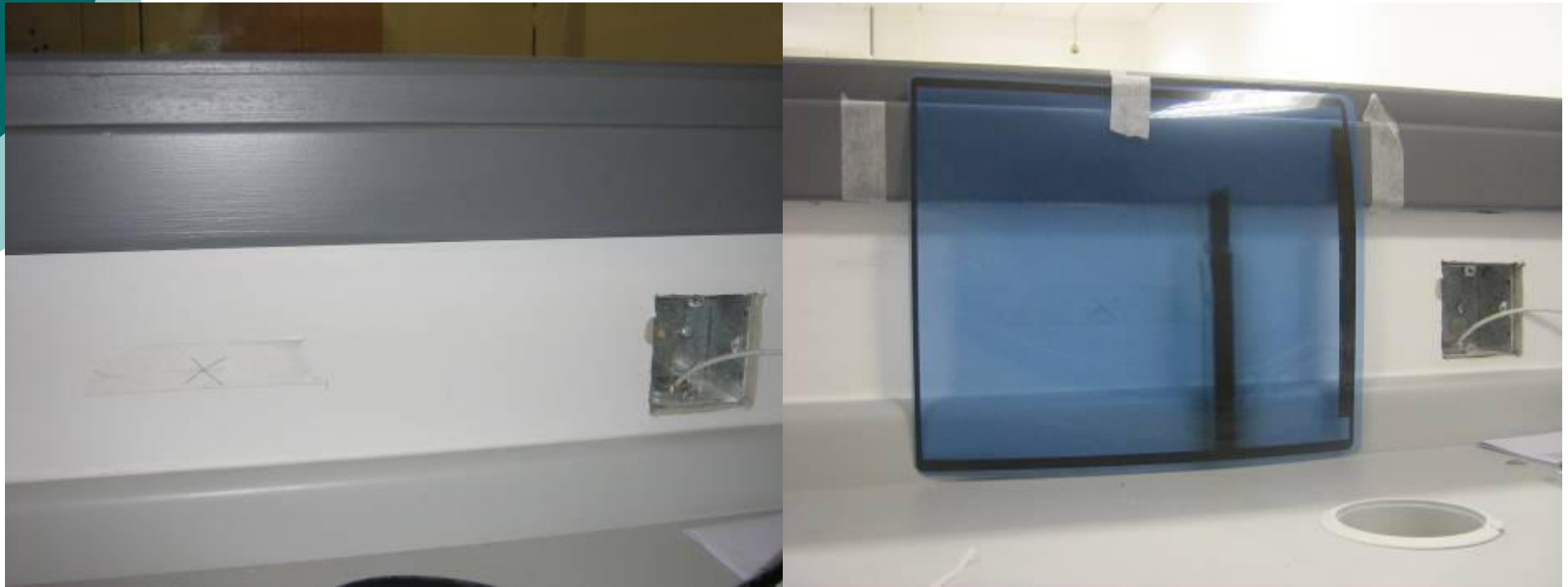
$26.8\mu\text{Sv/hr}$

$2.5\mu\text{Sv/hr}$



# Point X

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$14.8\mu\text{Sv/hr}$



$3.6\mu\text{Sv/hr}$



# Point F

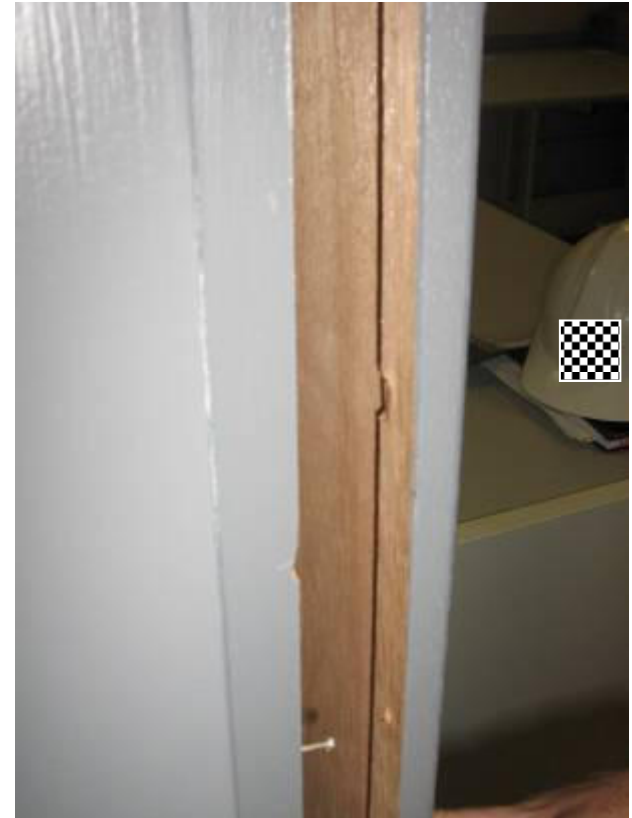
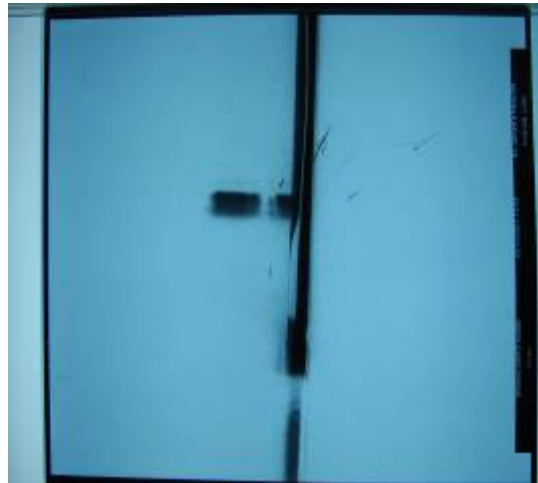
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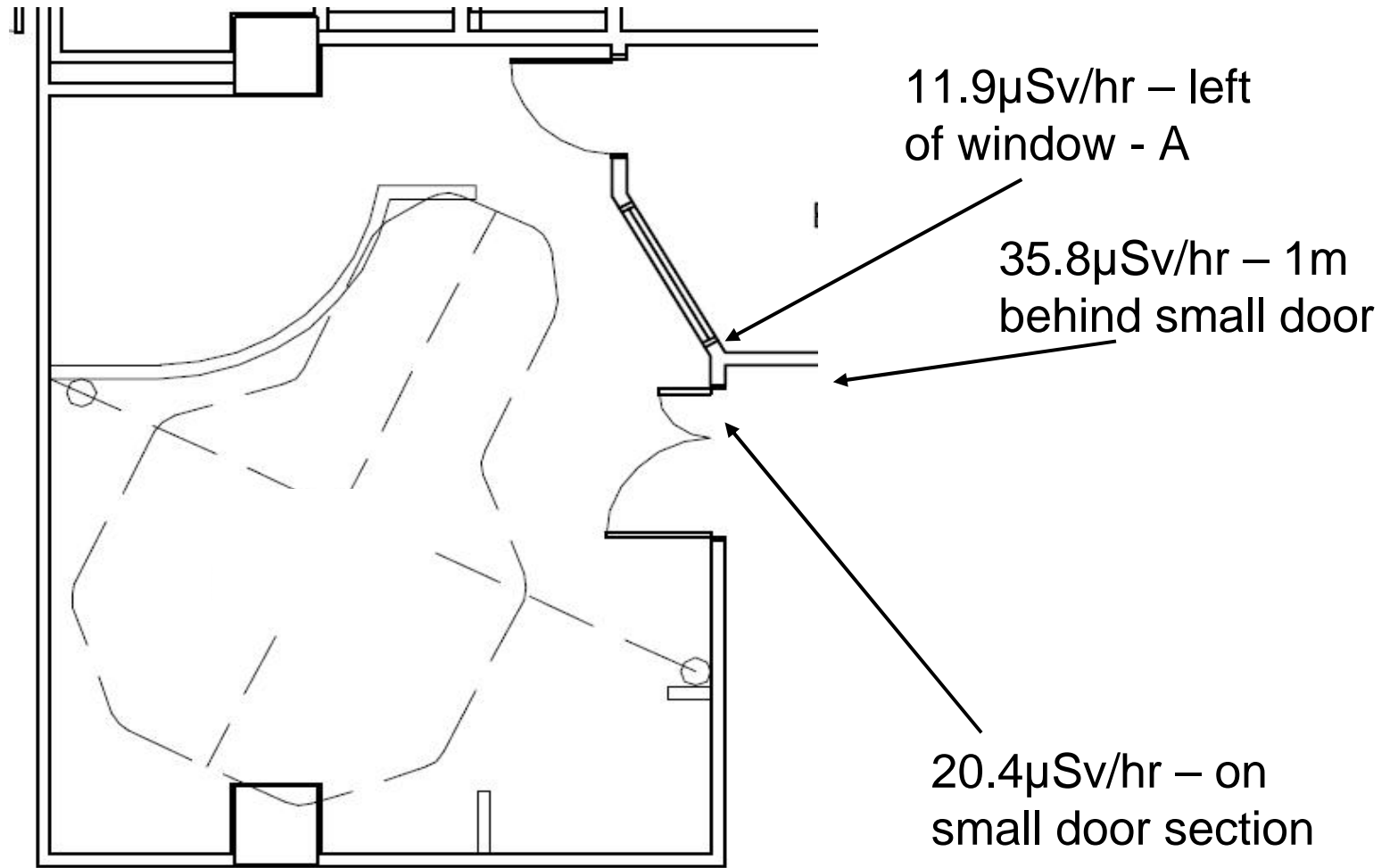


# Other problems?

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# Room 2



# Point A

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# Doors

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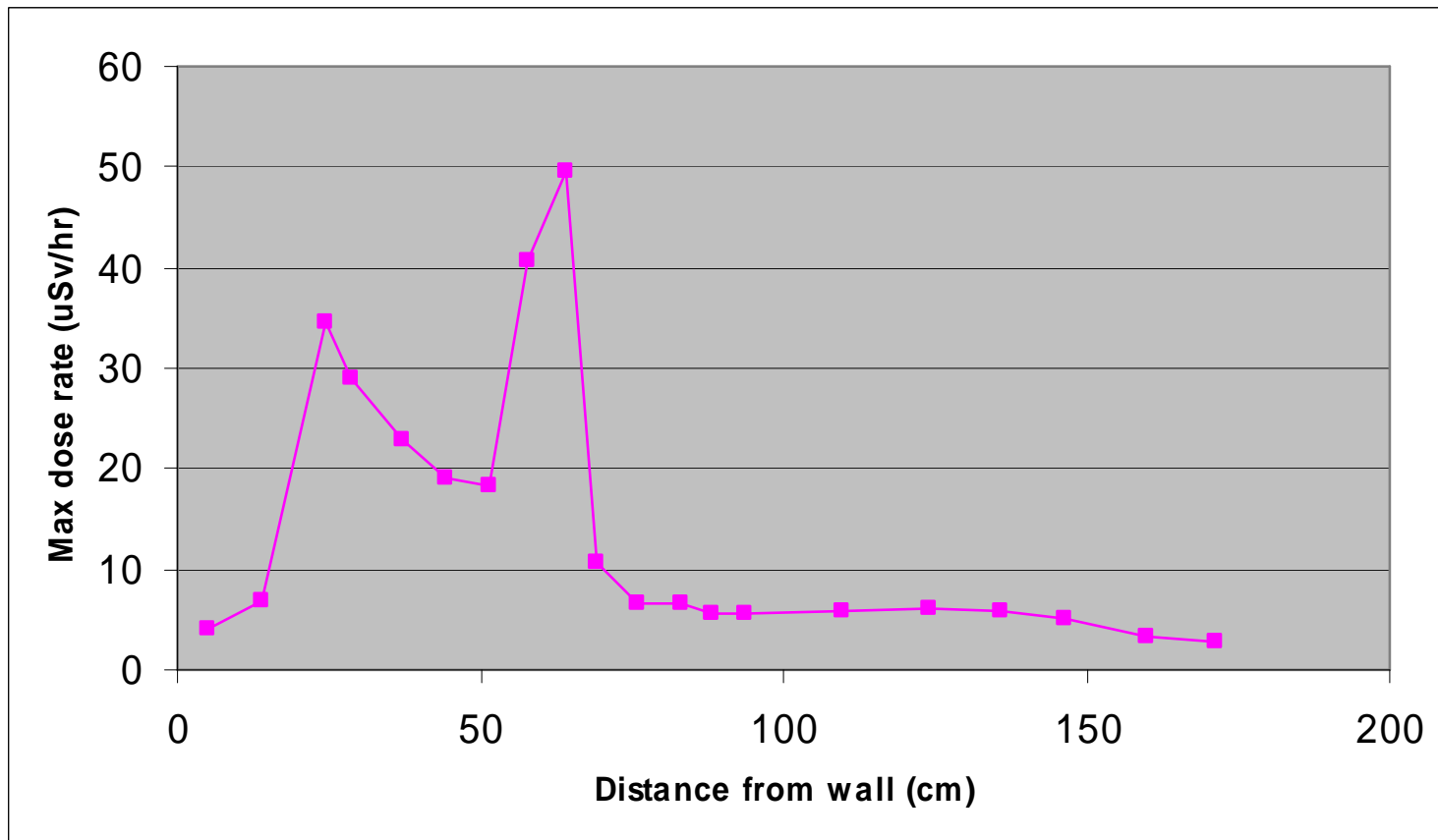
# Doors again

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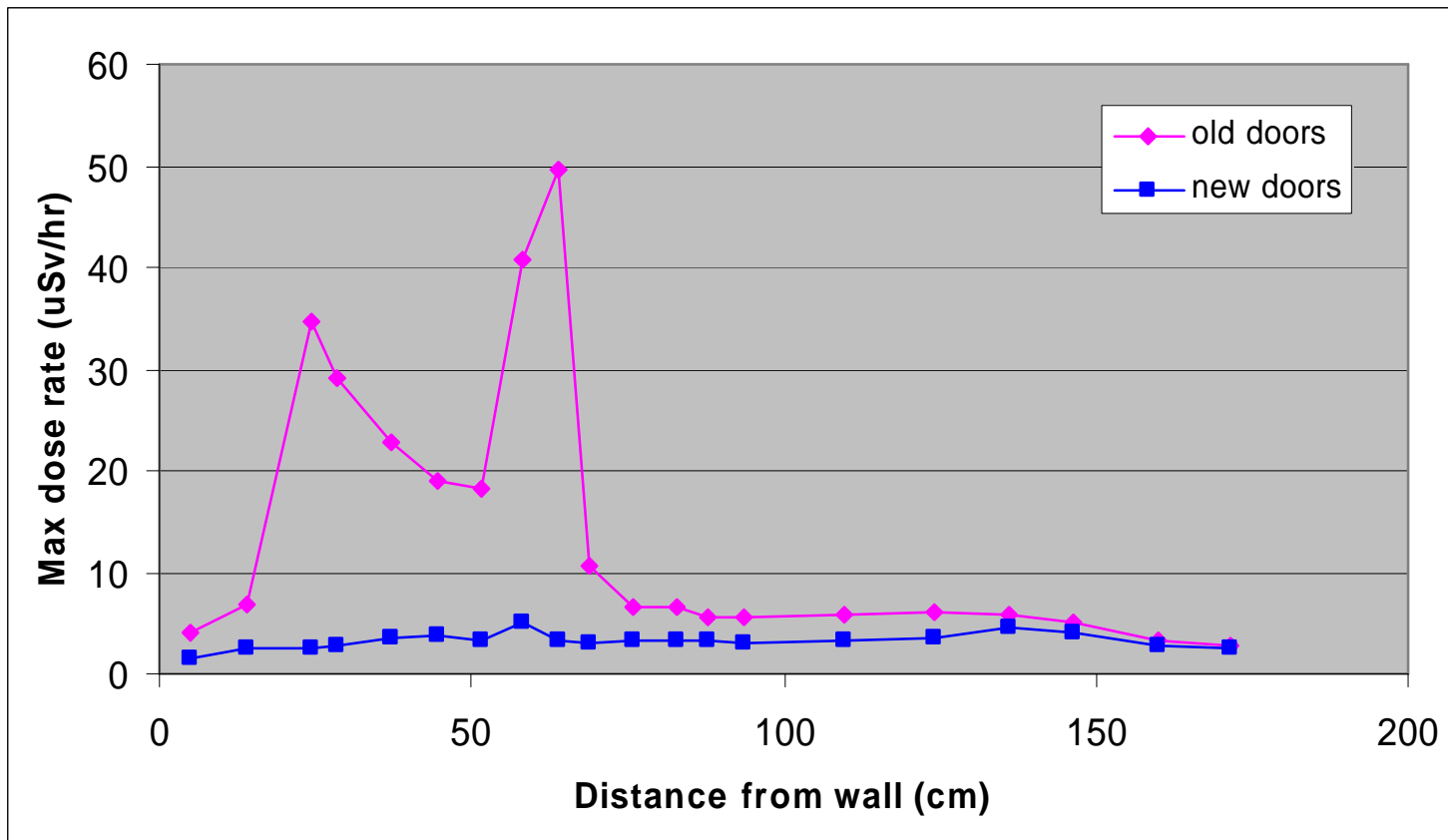


# Ouch...

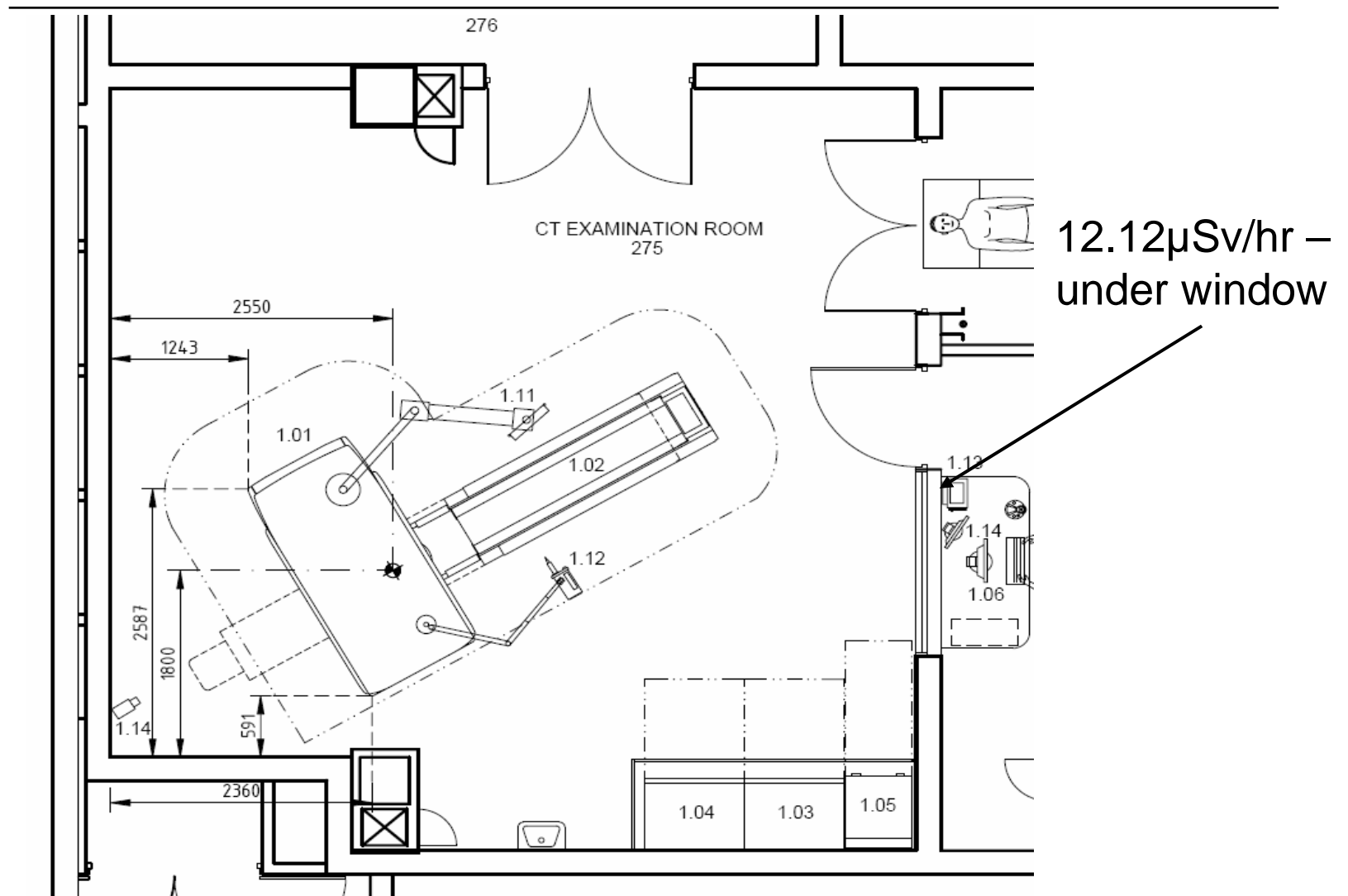
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# Time for new doors...



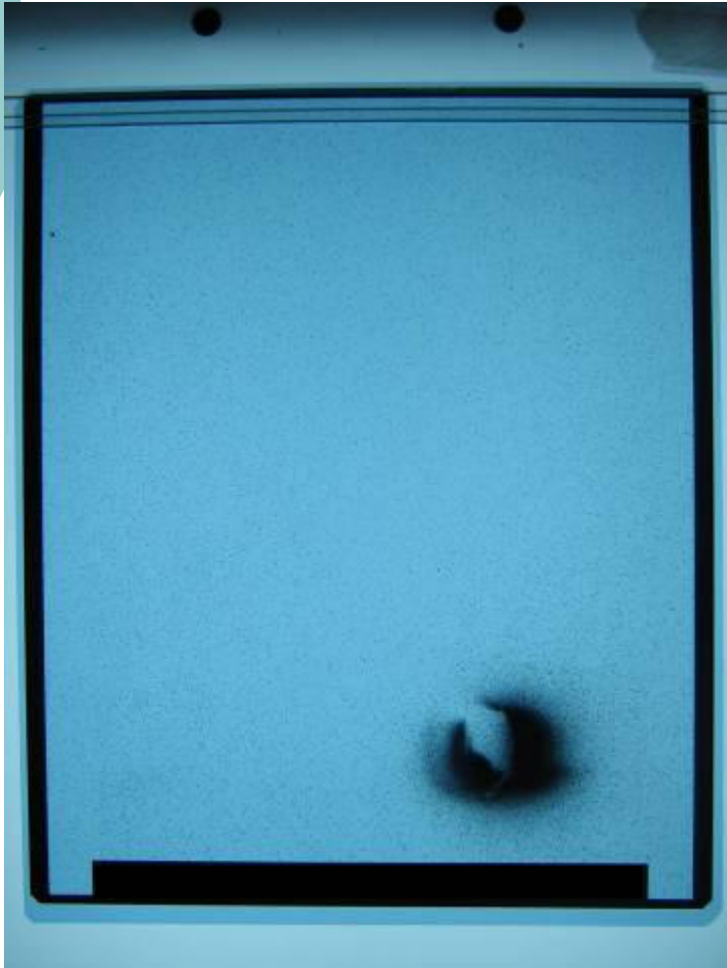
# Room 3





## What's this from?

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- *Hotspot £2 coin size*
- *Emergency stop from old scanner*
- *Backfilled with plaster not concrete*
- *Added lead over area to make good*
- *Dose now  $<1.6\mu\text{Sv/hr}$*

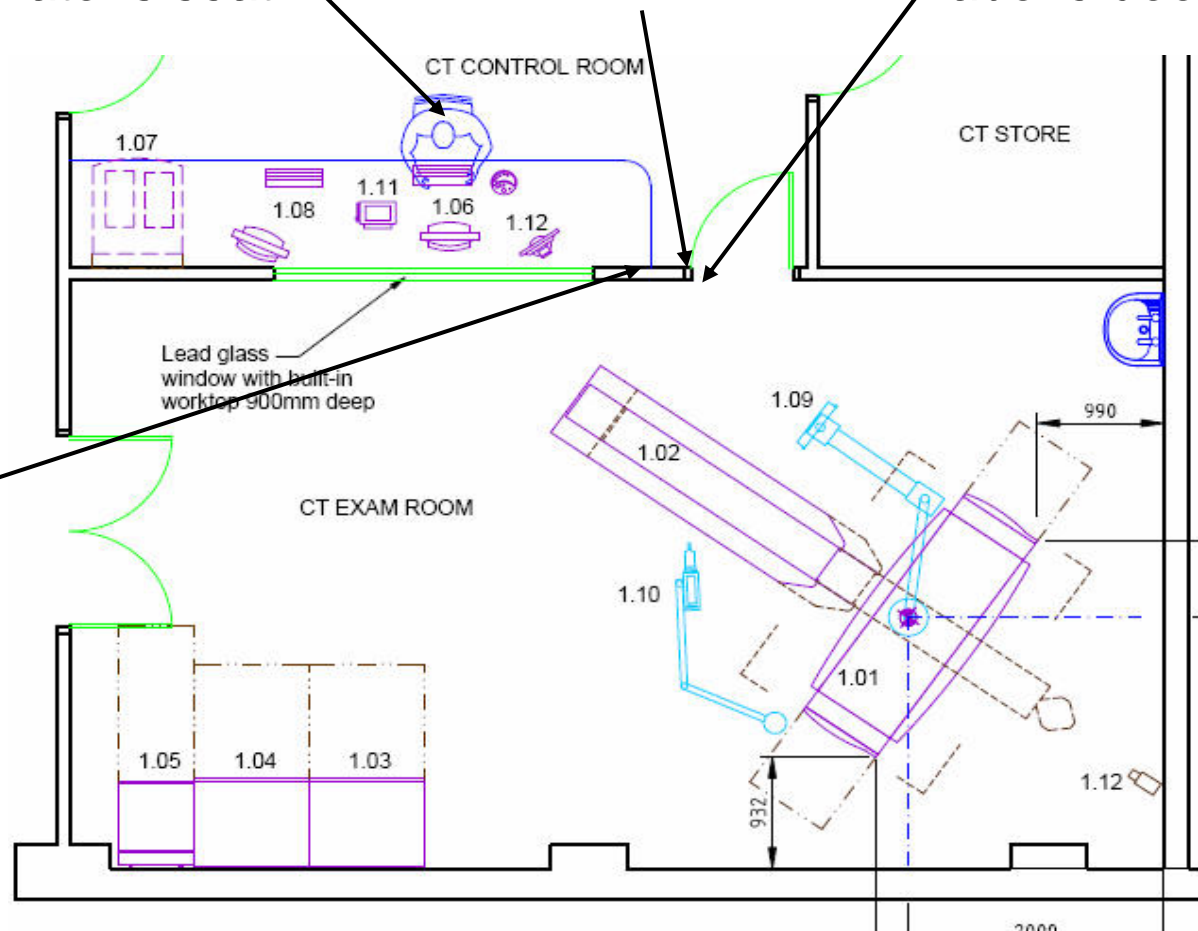
# Room 4

65 $\mu$ Sv/hr –  
operator's seat

272 $\mu$ Sv/hr –  
on door frame

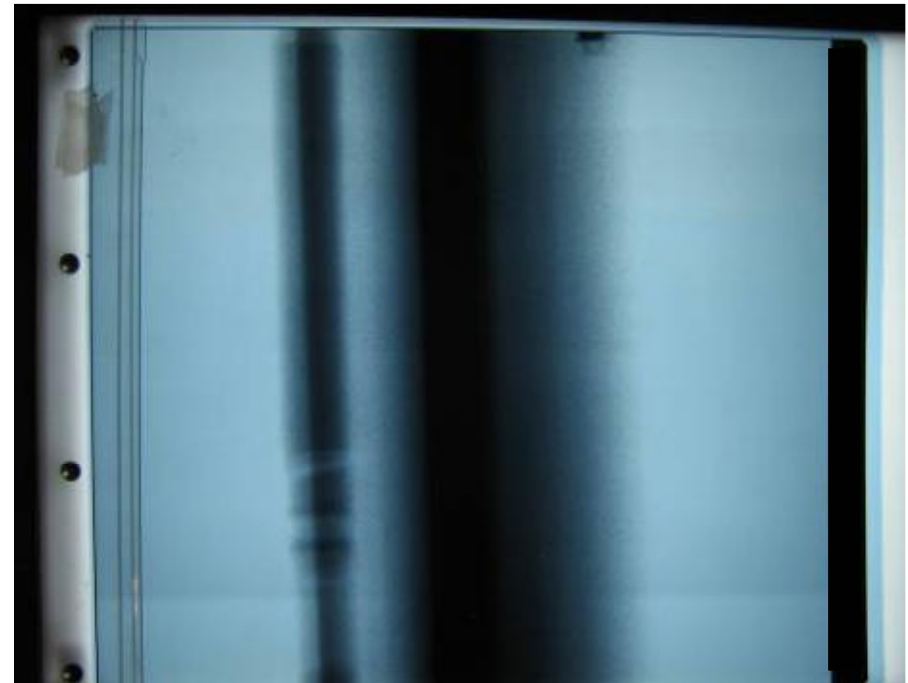
11.9 $\mu$ Sv/hr –  
above door frame

27.6 $\mu$ Sv/hr –  
on trunking



# Major problem!

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## Steps 1 & 2

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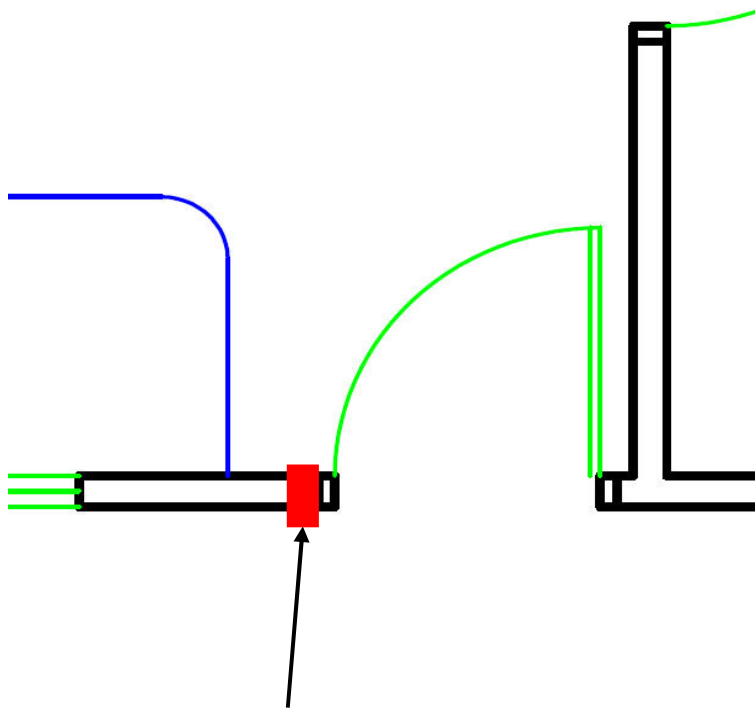
18.4 $\mu$ Sv/hr



9.7 $\mu$ Sv/hr

# Finally found it!

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- *Added lead behind whole of door frame*
- *Down to  $3.6\mu\text{Sv/hr}$  on door frame*
- *$1.5\mu\text{Sv/hr}$  at operator's position*
- *Time for a well earned cuppa!*

*No lead behind this door frame!!*



# Summary

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- *Important to check shielding!*
- *Visual check cannot find all faults*
- *Simple method for finding hotspots*
- *Make sure you state your design conditions/dose constraints early on!*
- *Worry about every other room you've not checked in this way...*

# When is a door not a door?

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*When it's supposed to have lead in it!*





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*Superintendent:*

*"John, Gareth is here  
testing the doors..."*

*Company Rep:*

*"I'm on my way..."*