

When is a door not a door?

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Checking shielding of CT rooms

Survey time...



How do we do it?

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

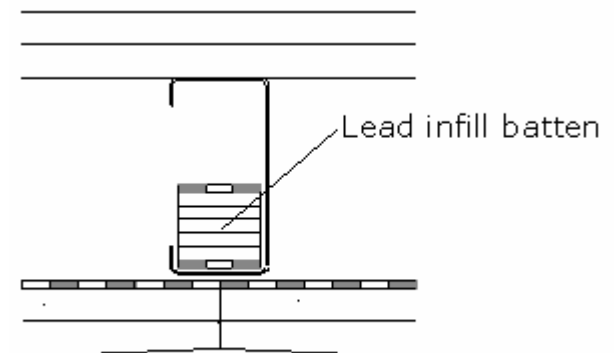


More questions...

- *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

- *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

- *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

- *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

- *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

- *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

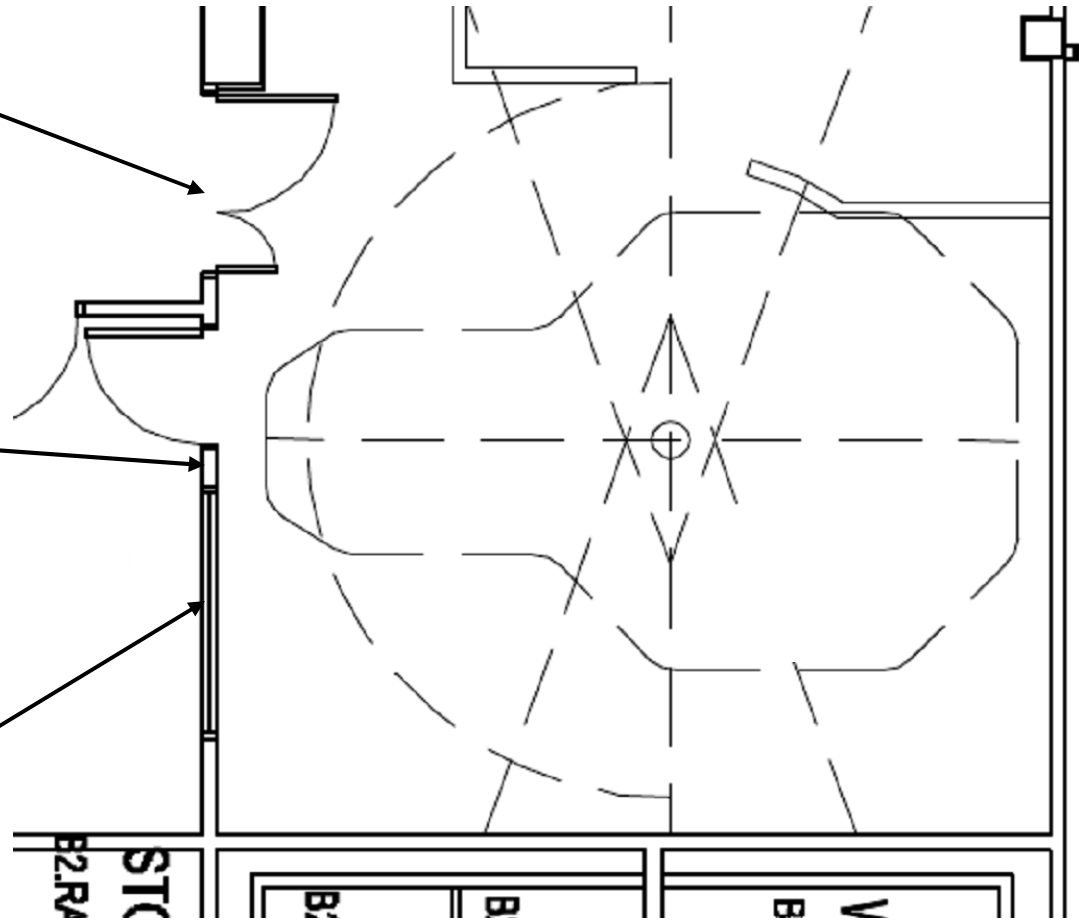
All hospitals shall remain nameless...

Room 1

18.2 μ Sv/hr –
on door - F

26.8 μ Sv/hr –
by door – A/B

14.8 μ Sv/hr –
under window - X



Points A & B



Nurse call button

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

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



Point X



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



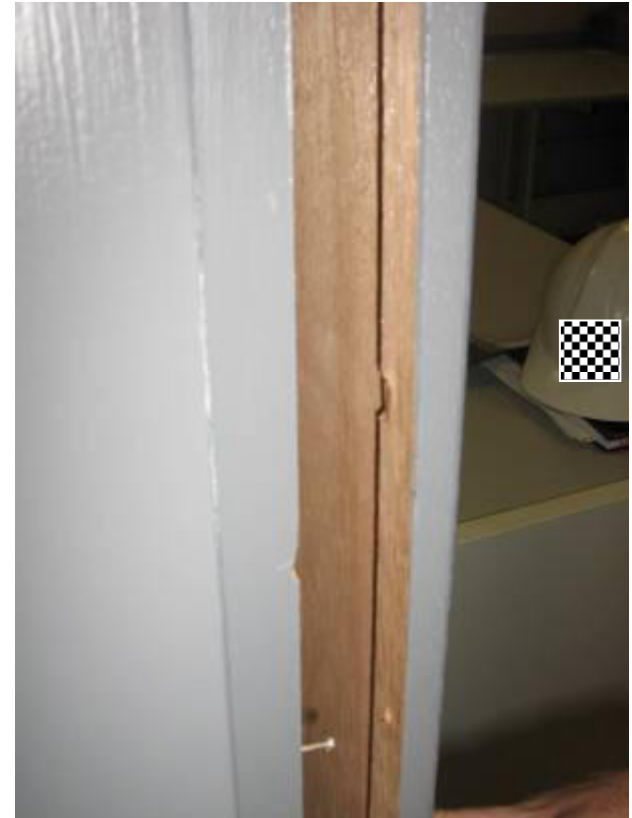
$3.6\mu\text{Sv/hr}$



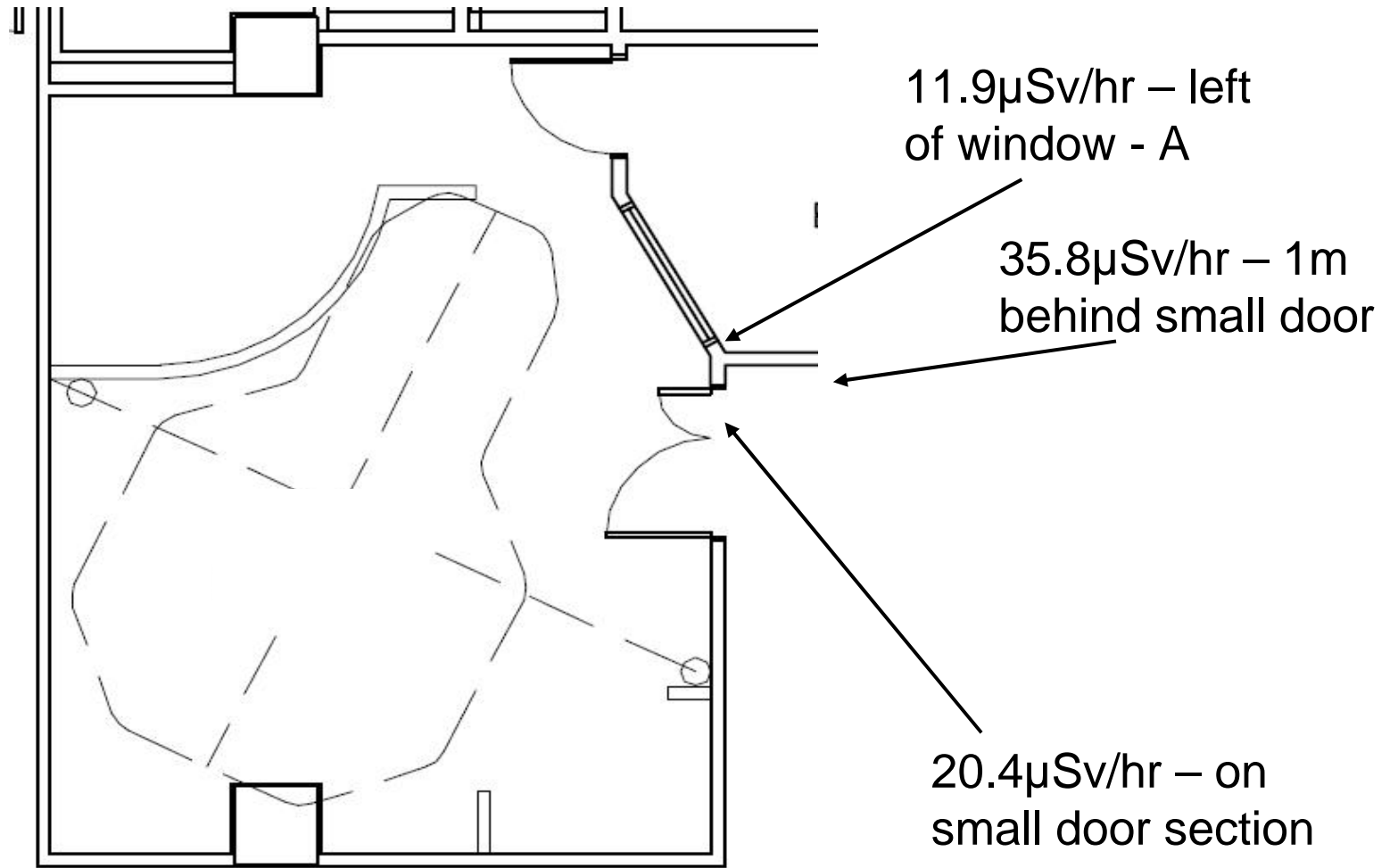
Point F



Other problems?



Room 2



Point A



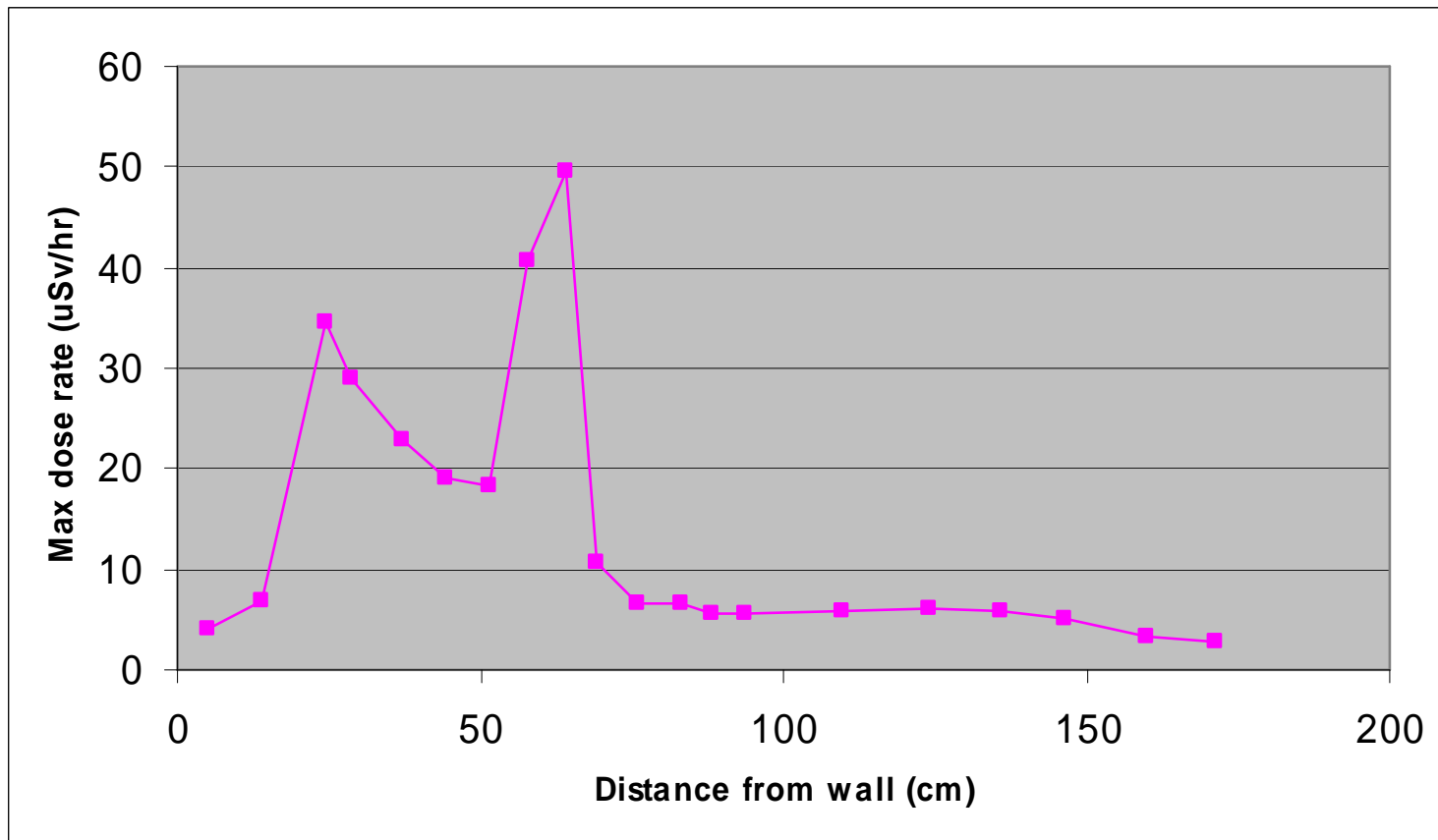
Doors



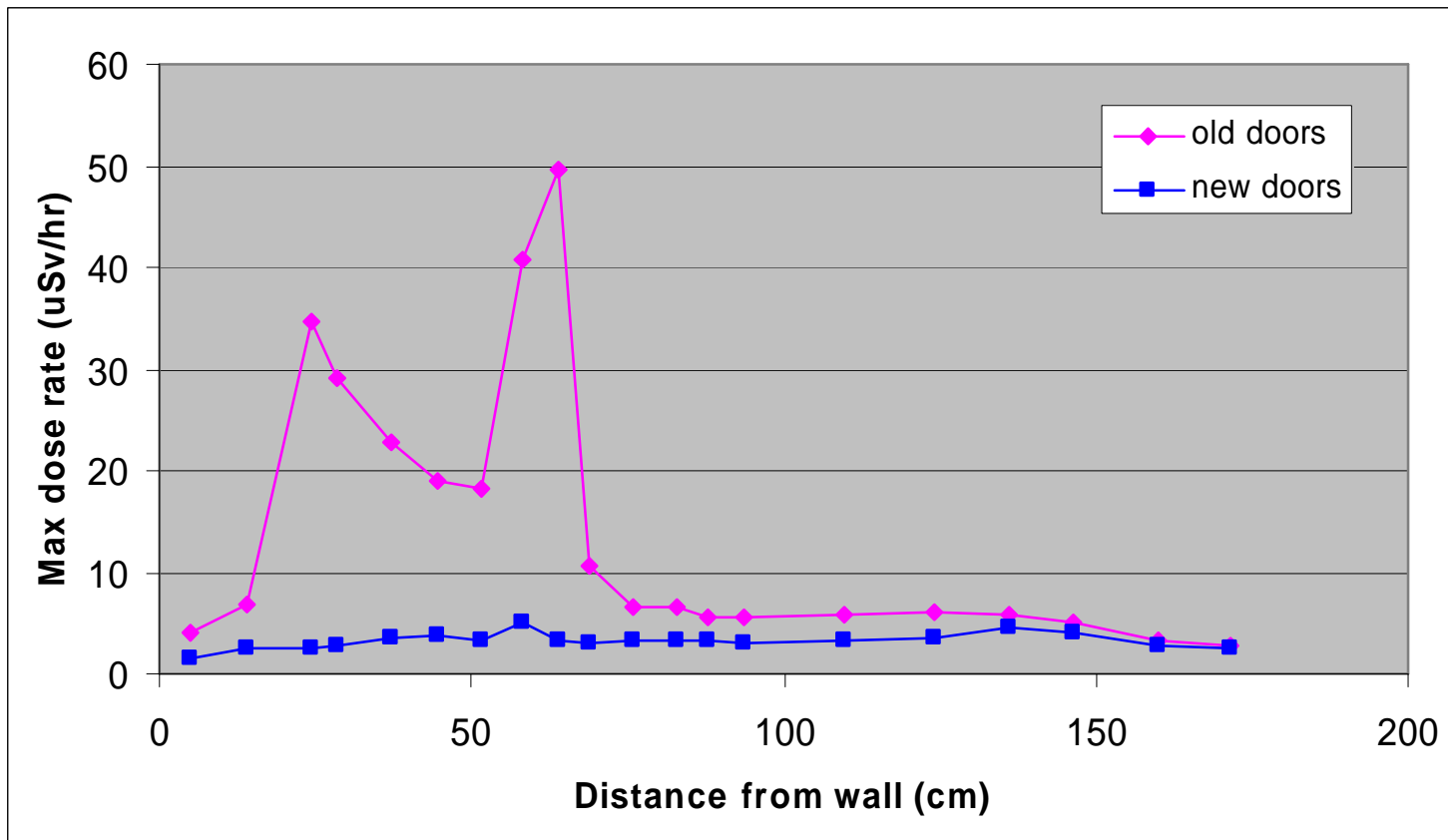
Doors again



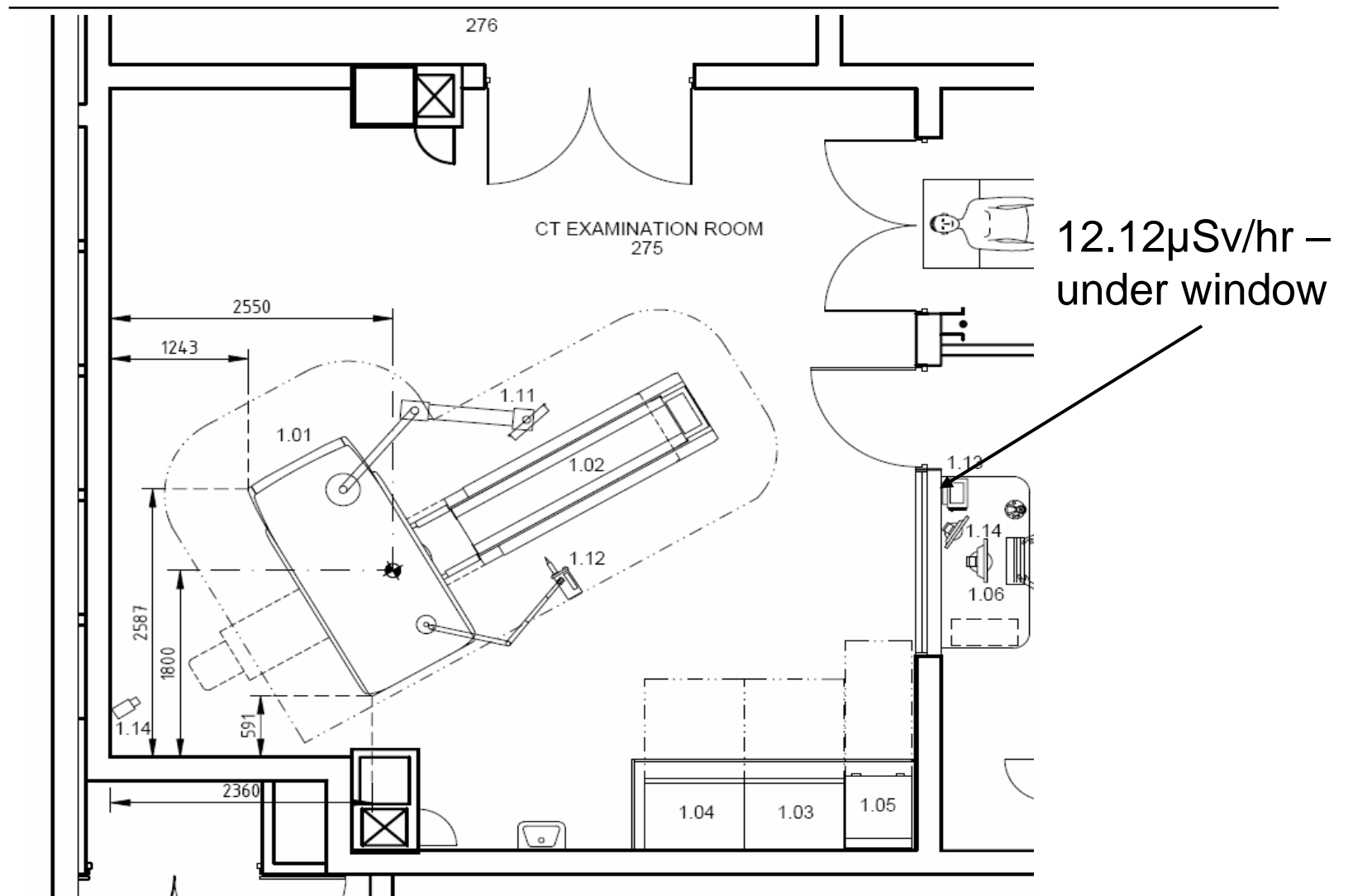
Ouch...



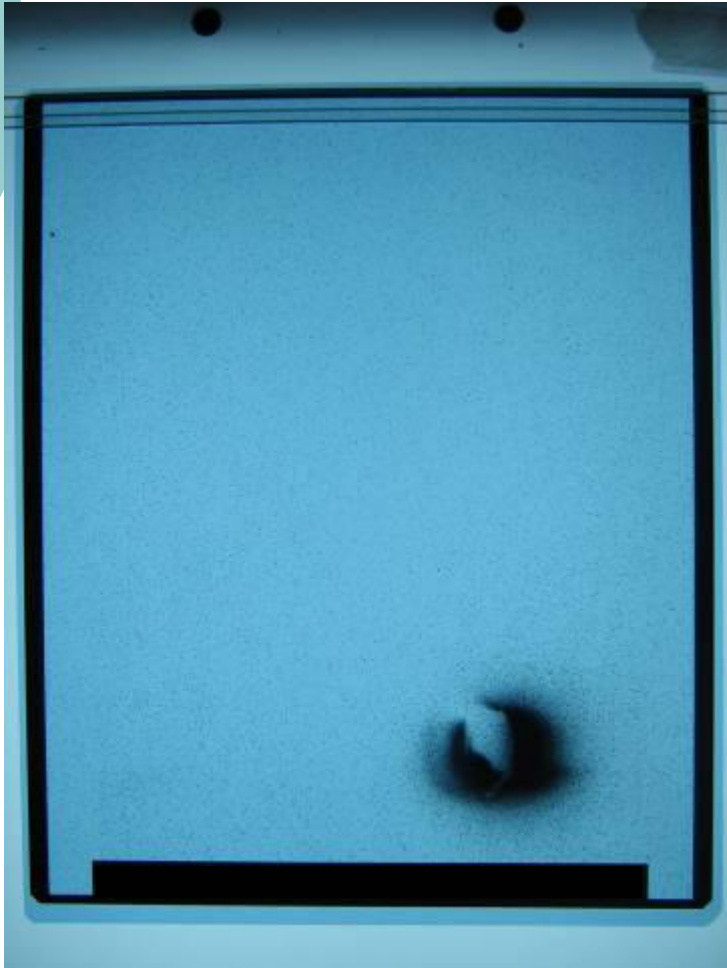
Time for new doors...



Room 3



What's this from?



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

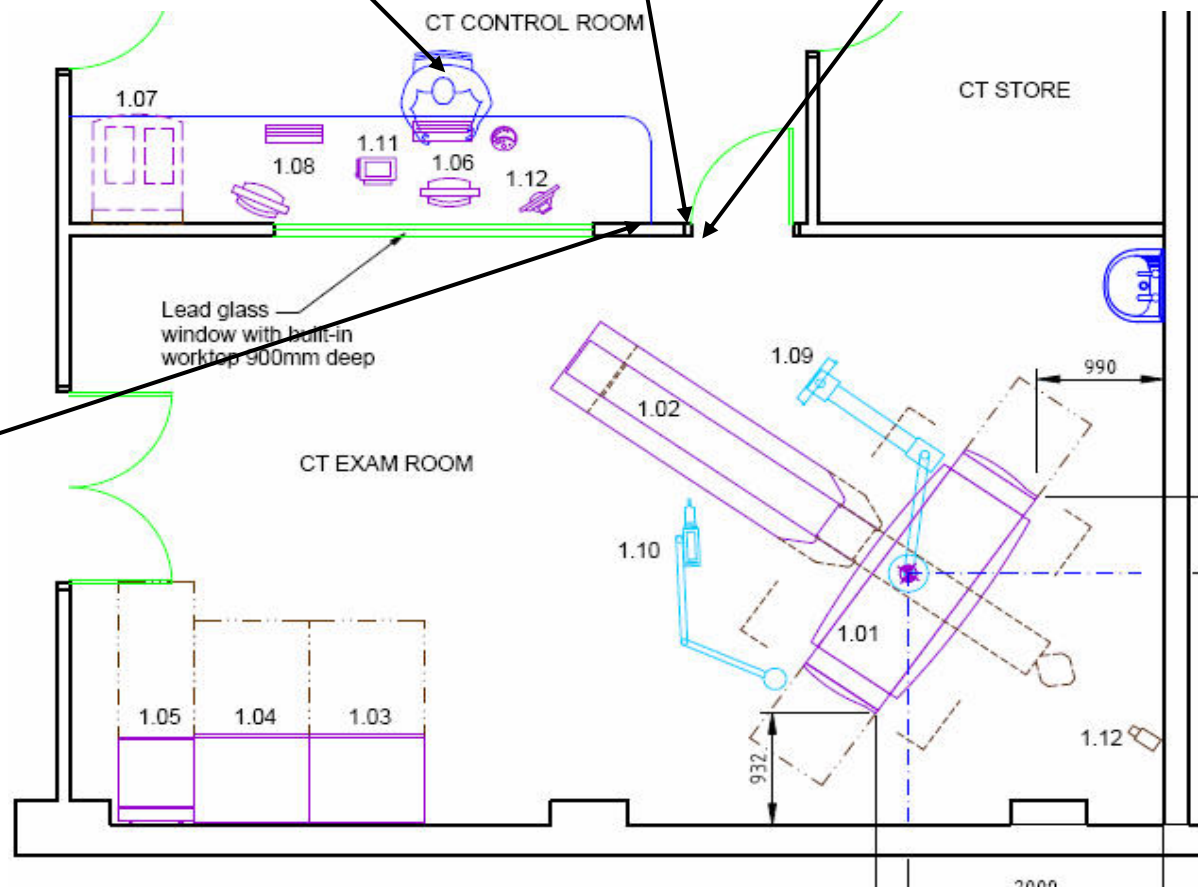
Room 4

65 μ Sv/hr –
operator's seat

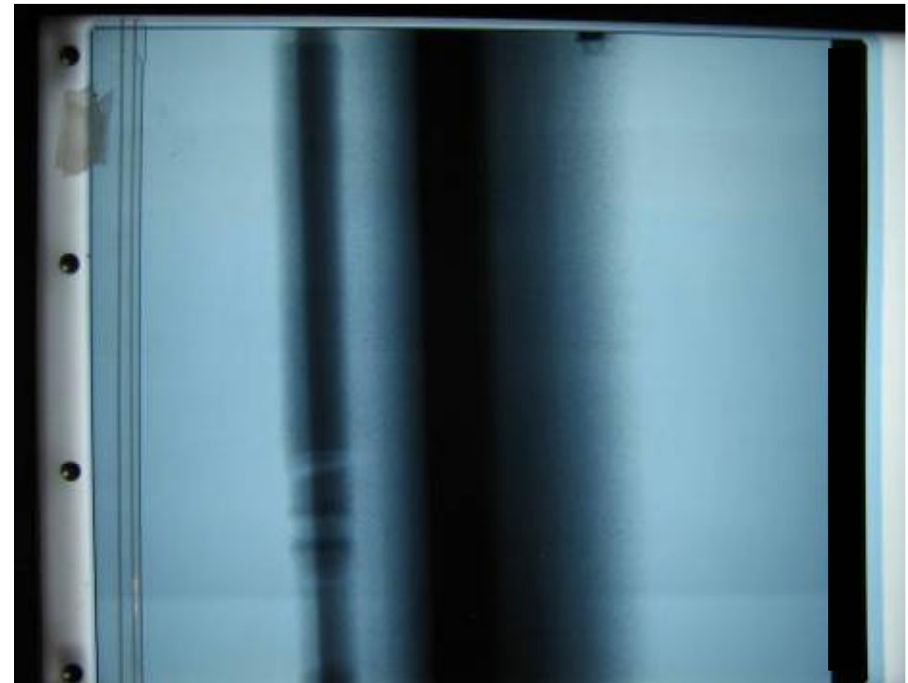
272 μ Sv/hr –
on door frame

11.9 μ Sv/hr –
above door frame

27.6 μ Sv/hr –
on trunking



Major problem!



Steps 1 & 2

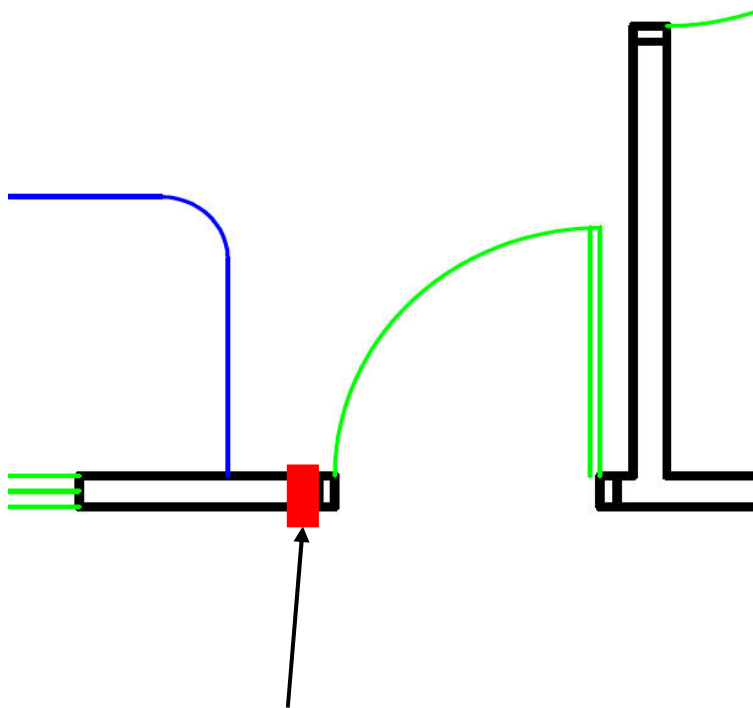


18.4 μ Sv/hr



9.7 μ Sv/hr

Finally found it!



- *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

- *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?

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





Superintendent:

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

Company Rep:

"I'm on my way..."