

BACKGROUND

- Number of cancer patients has increased repeatedly over the last 10 years and the new reported cases were exceeded 12000 cases across Saudi in 2007 [1].
- Currently the number of PET and PET/CT facilities is limited and this can result in lack of access in certain regions and/or in unfavourable patient waiting lists.
- PET/CT facilities concentrated at 2 regions which are central and eastern area.
- There is a plan for building three PET/CT units in the western region.
- Most of the PET/CT facilities in Saudi consist of 3 injection room as most and one hot-WC.
- Workflow is inconvenient for staff members and patients (female).
- It is highly recommended by patients as well as staff members that we have a separate uptake unit for male and female. That could lead to reduce the occupancy of the unit which will affect our throughput aim.

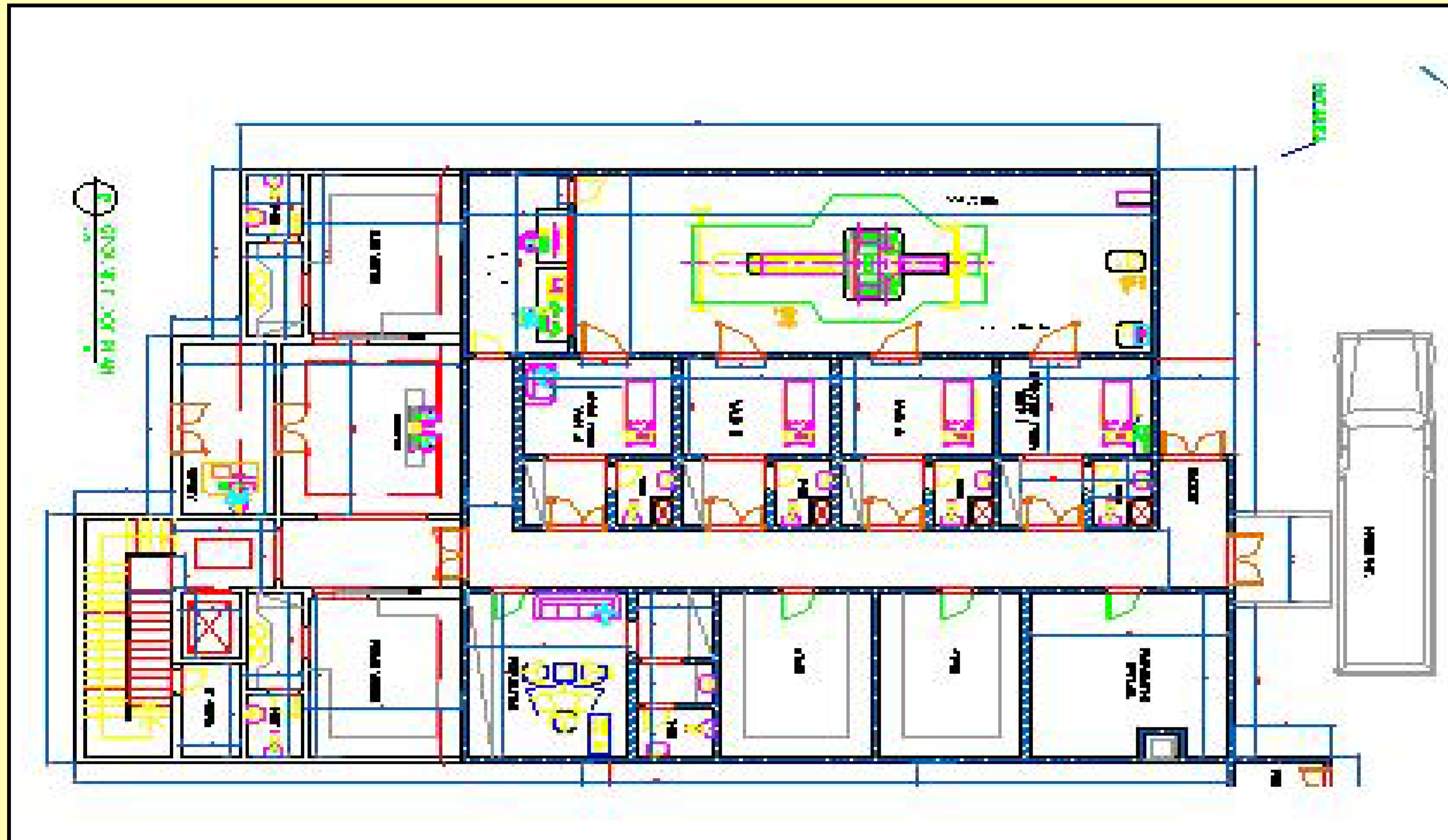


Figure 1: New PET/CT Layout

PURPOSE AND Calculations

- Our aim is to come out with a unit design which match the local culture and ethics.
- Ensure that calculated accumulated staff dose by MCNPX code is within the IRP99 recommendations[2].

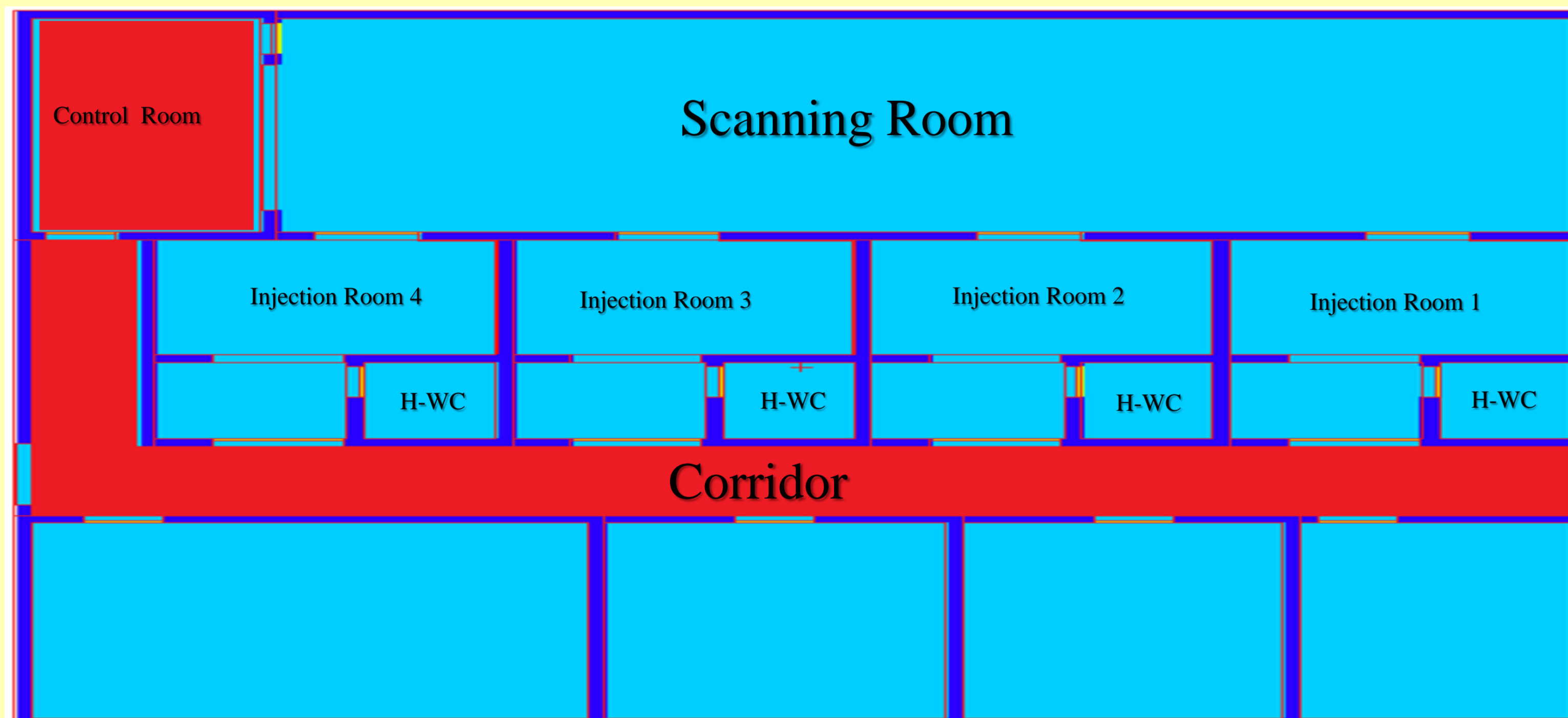


Figure 2: Locations of Measurements

METHODS & Assumptions

- MCNPX code was used to calculate the effective dose rate.
- Simulated walls material was concrete type BA.
- Lead material was used as an additional layer to all wood doors.
- TVL thickness were used in both material concrete and lead.
- Hot-lab has a shielded point source with 5 GBq activity.
- Injection and scanner rooms have point source with 400, 350, 250 MBq activity respectively.

Staff Comments

Comments of the staff during the PET/CT procedures:

- 1) Ensure that the patient have easy access to the W.C and scanning room.
- 2) Usually there is a delay specially when there are elder people or kids.

RESULTS

- The average dose in the control room is 3.74×10^{-5} mSv/h with relative error 0.03 and the average dose along the corridor is 3.81×10^{-5} mSv/h with relative error 0.04. Both average dose rate are less than the individual dose p.a.

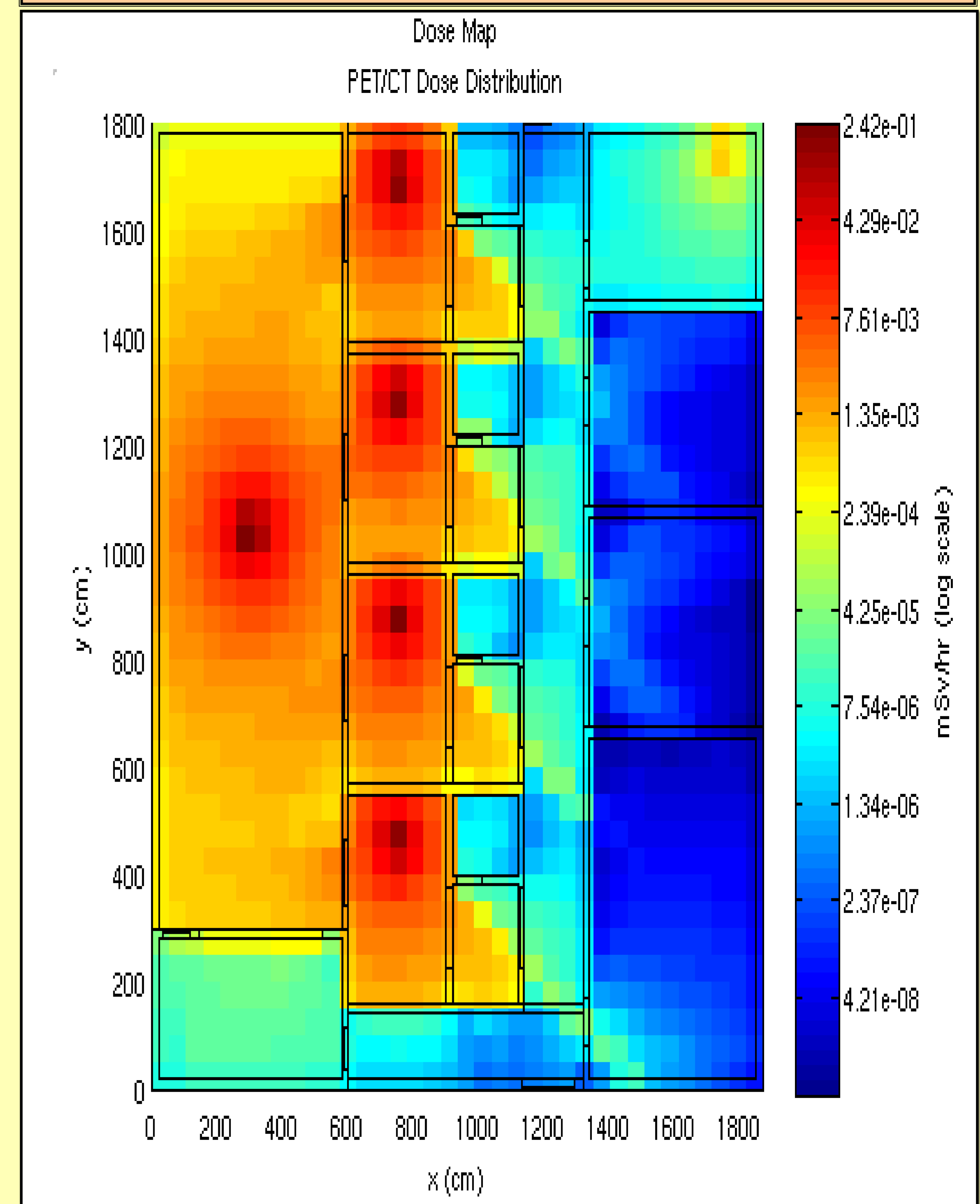


Figure 3: Effective dose distributions in the simulated facility during PET/CT procedures

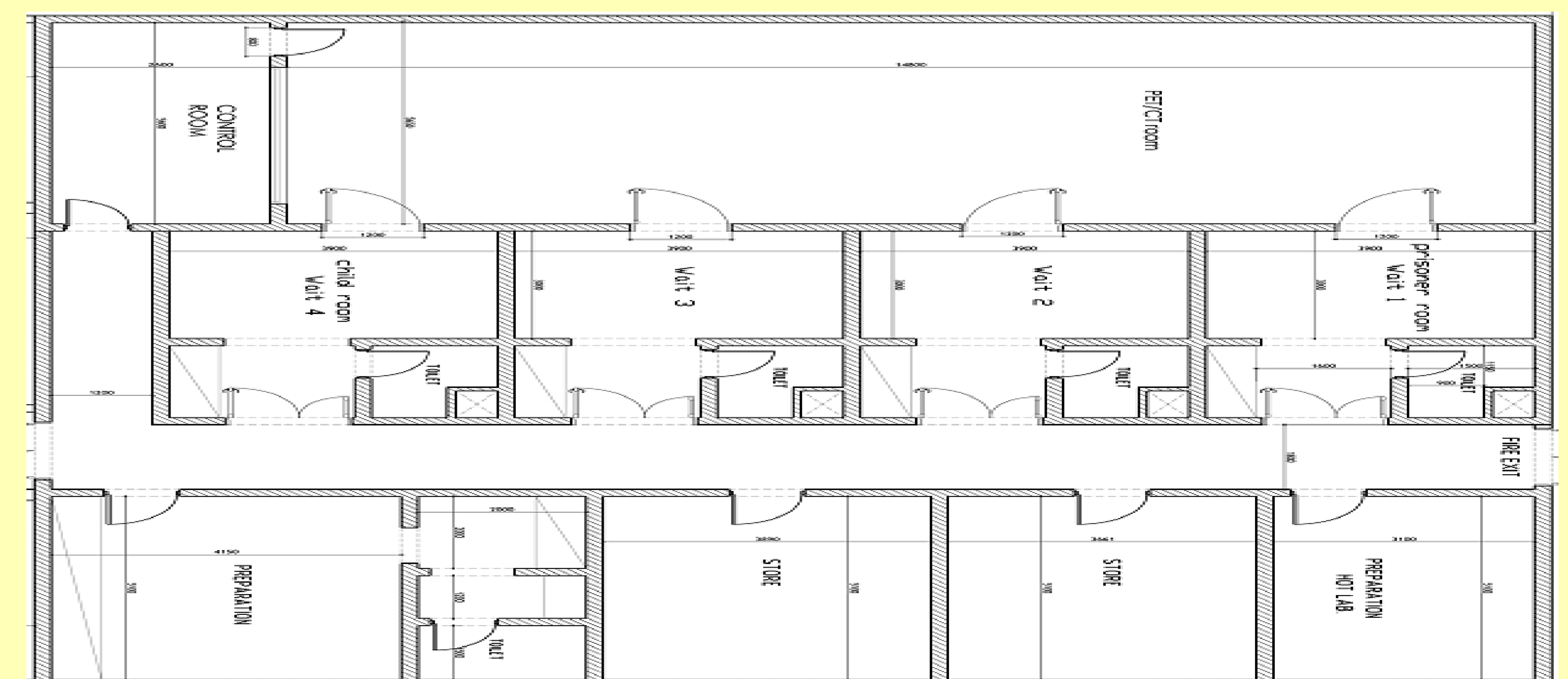


Figure 4: Simulated facility

CONCLUSIONS AND RECOMMENDATIONS

- The design matches the culture morals in our society, without reducing the occupancy of the unit.
- The design accommodates future expansion (adding another PET/CT Scanner, mobile PET/CT facility, without any additional constriction works), however, the simulation excluded the extension unit.
- The design aims to simultaneously serve both female and male patients without interrupting workflow.
- Staff doses can be maintained below the classification level (6 mSv p.a.)

REFERENCES & Acknowledgments

¹SAUDI CANCER REGISTRY (SCR), CANCER INCIDENCE REPORTS (2007)
² THE IONISING RADIATIONS REGULATIONS 1999 , ISBN 0 11 085614 7