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PURPOSE / OBJECTIVES

- Mycosis fungoides, a type of non-Hodgkin lymphoma that affects the skin, as shown in Figure 1, is effectively treated with Total Skin Electron Therapy (TSET).



Figure 1: Mycosis Fungoides, a type of skin cancer producing red patches.

- Previously, we used optically stimulated luminescence dosimeters (OSLD) for in-vivo dosimetry (IVD) during TSET.
- However, following an FDA recall of the OSLD nanodots (Sep 2023), we transitioned to thermoluminescent dosimeters (TLD) for IVD.
- This study aims to compare TLD and OSLD measurements in TSET treatment and assess the feasibility of using TLD measurements in institutions lacking a TLD reader.

MATERIAL & METHODS

- In this work, we treated a patient with a prescription dose of 16 Gy in 8 fractions, at 8 mm depth with 6 MeV electrons beam using a Varian Truebeam linac.
- The patient was positioned at 450 cm from the radiation source and a beam spoiler is placed near the patient upstream from the incident beam.
- As shown in Figure 2, TLDs and OSLDs were placed adjacent to each other at 14 anatomical sites during the first fraction for IVD.
- During treatment, the patient's eyes were shielded (3 mm tungsten coated with 1 mm aluminum) internally, and nails and toes were shielded (3 mm lead) externally.
- TLD100 were obtained from the University of Wisconsin-Madison Radiation Calibration Laboratory.
- TLDs were subsequently sent to Wisconsin for reading, while OSLD were read using the microSTARii reader.
- The IVD results were then compared with the prescribed dose.

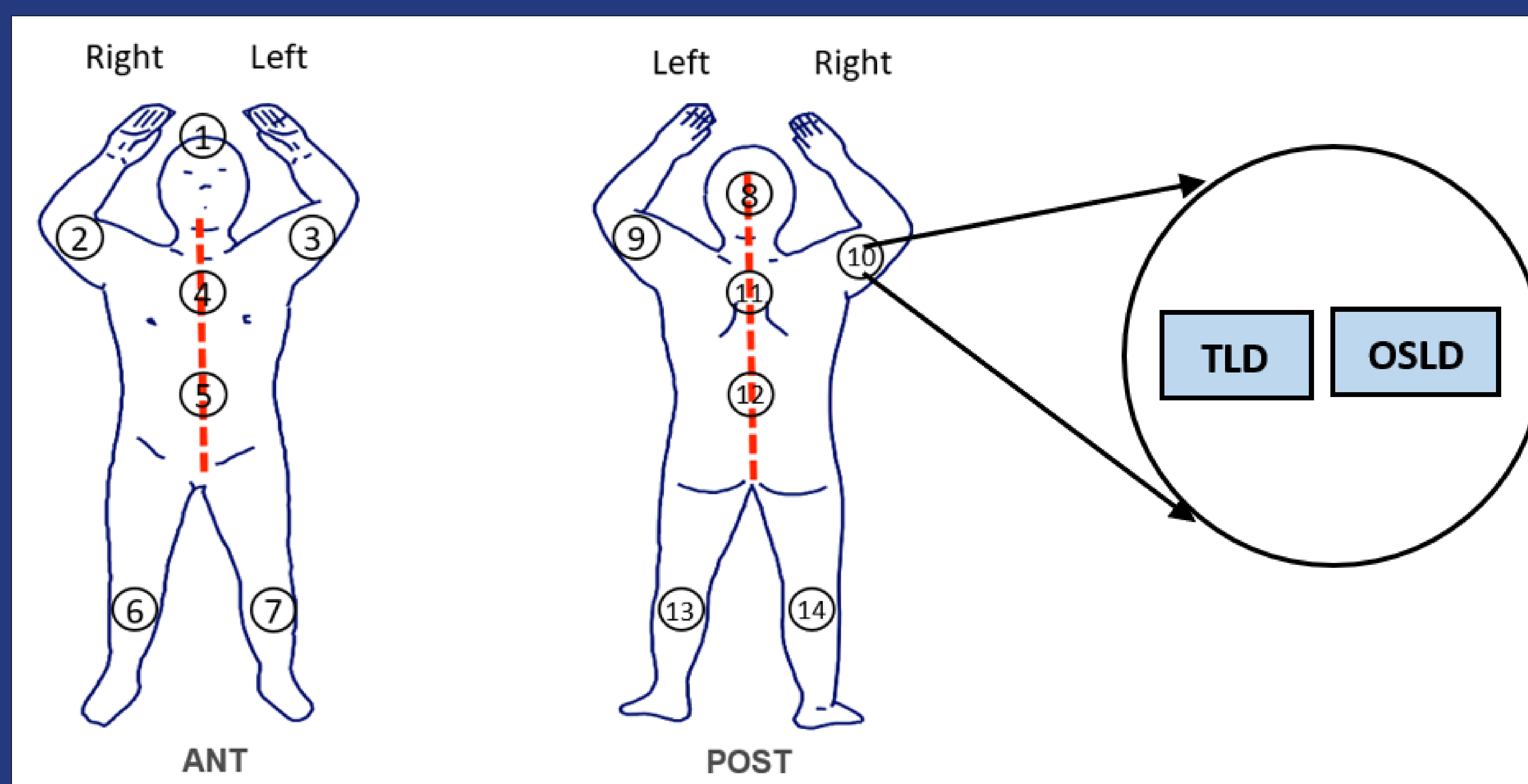


Figure 2: Positions of TLDs and OSLDs on the patient's body surface.



Figure 3: The patient was treated using a modified Stanford technique.

- Modified Stanford technique with 6 dual fields (evenly spaced), as shown in Figure 3, was used for the patient treatment.
- A combined dual electron field with gantry angles of 70° and 110° relative to the horizontal (90°), were used to cover the extended SSD of 450 cm and the height of the patient.

RESULTS

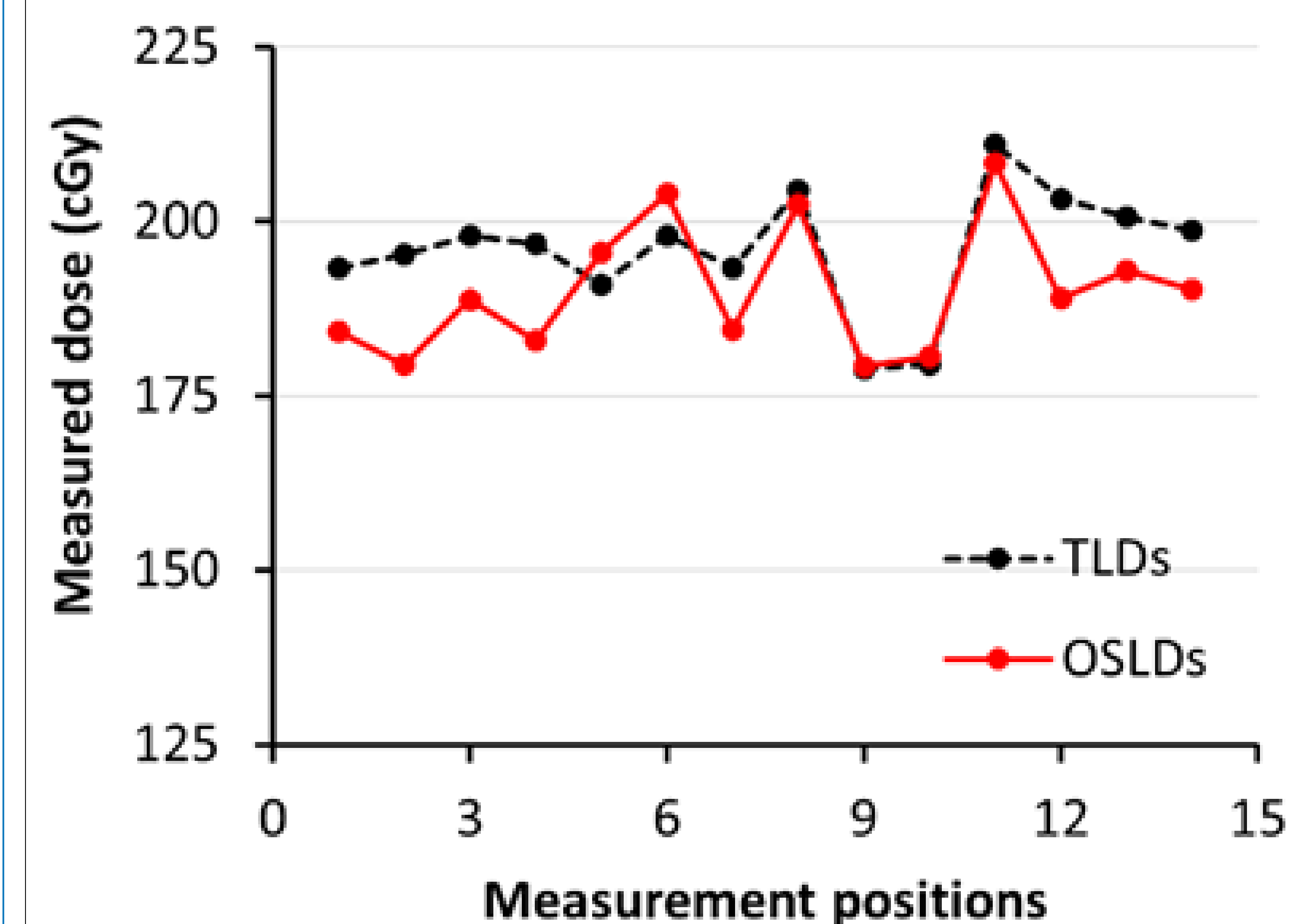


Figure 4: Absorbed dose response of TLD and OSLD

- The TLD measurements exhibited an average variation of $(-2.08 \pm 4.37)\%$ from the prescribed dose, ranging between -10.57% and 5.50% .
- This indicates a relatively uniform dose distribution across the body surface.
- In comparison, OSLD measurements showed a larger average variation of $(-4.93 \pm 4.72)\%$, ranging from -10.43% to 4.16% .
- Both measurements indicate a slight underdosing compared to the prescribed dose at a depth of 8 mm.

SUMMARY / CONCLUSION

- Our measurements suggest that TLDs offer superior dosimetric accuracy compared to OSLDs in TSET.
- Utilizing TLDs for IVD is feasible and reliable, even without direct access to a TLD reader, supporting their broader adoption for IVD in clinical settings.
- Future work will extend these findings by exploring alternative dosimeters, such as radiochromic films and MOSFET for IVD.

QUESTIONS?

- Please feel free to reach out if you have any questions related to this work: atiwari@iuhealth.org