



INNOVATION

A novel SRS planning method that combines dynamic trajectories with MLC binary target collimation has been proven better than VMAT [1]. This study optimizes its delivery on a C-arm linac.

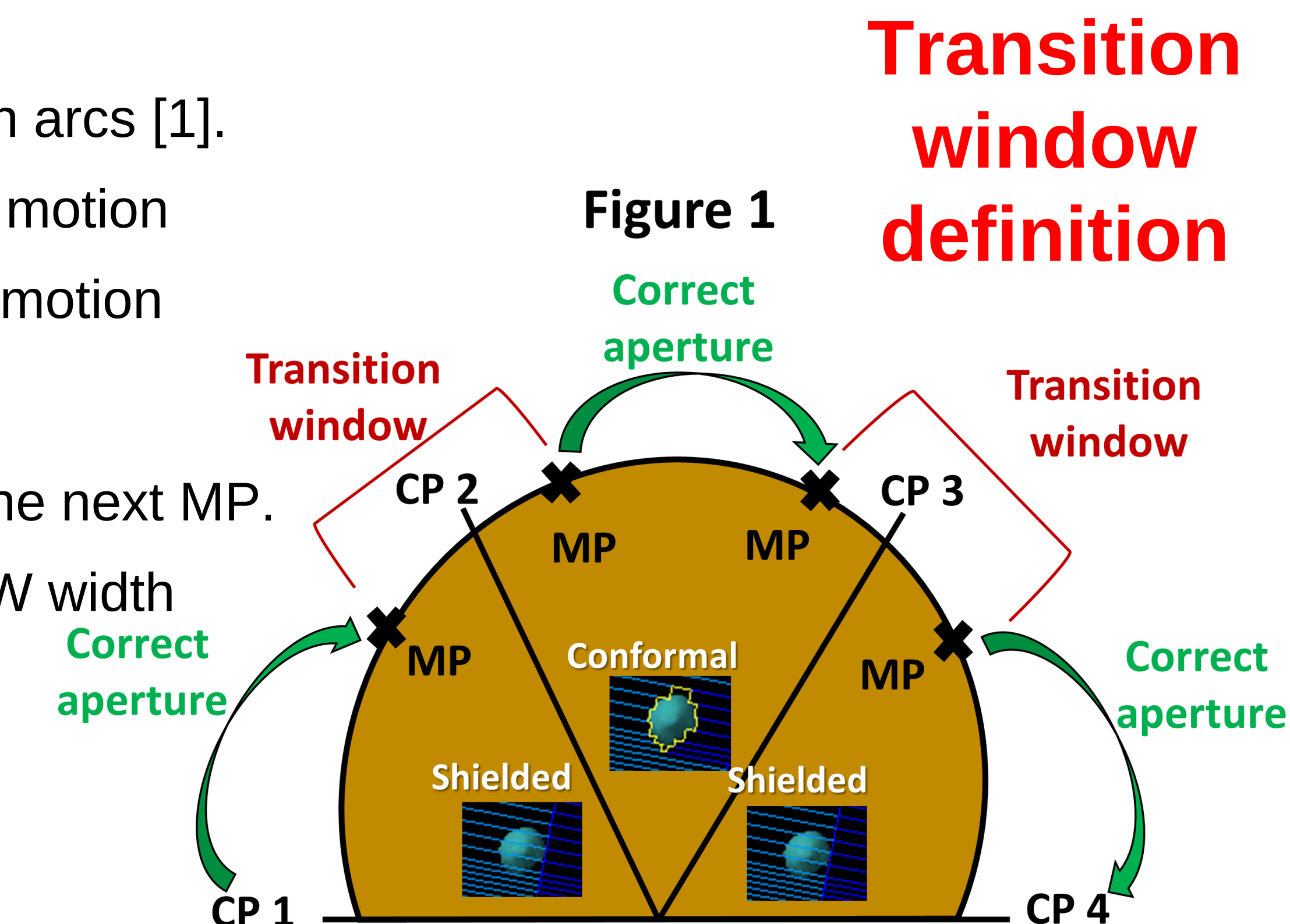
INTRODUCTION

This collimation creates a temporary closings/openings (referred to as blinking) of treatment aperture pattern for each target within an arc.

- **Planning system:** idealized blinking of each target – a smooth and instant blinking transition between control points (CPs).
- **Reality:** the MLC leaves actually move at a finite speed – which requires a blinking transition window form one CP to the next.

METHOD

- **Seven plans were studied:** each consisting of a full gantry arc and two 180° couch arcs [1].
 - Gantry arc: continuous unidirectional couch motion, optional bidirectional gantry motion
 - Couch arc: continuous unidirectional couch motion, optional bidirectional gantry motion
- **Plan delivered using motion points (MPs) (Figure 1):**
 - Transition window (TW): MLC transition starts at the first MP and completes at the next MP.
 - 7 delivery techniques: 6 fixed TW width (ranging from 0 to 100%) + 1 variable TW width
- **Measurements:**
 - Dose delivery accuracy: gamma analysis (5% / 2mm, 95% gamma pass)
 - Delivery time: manually recorded.



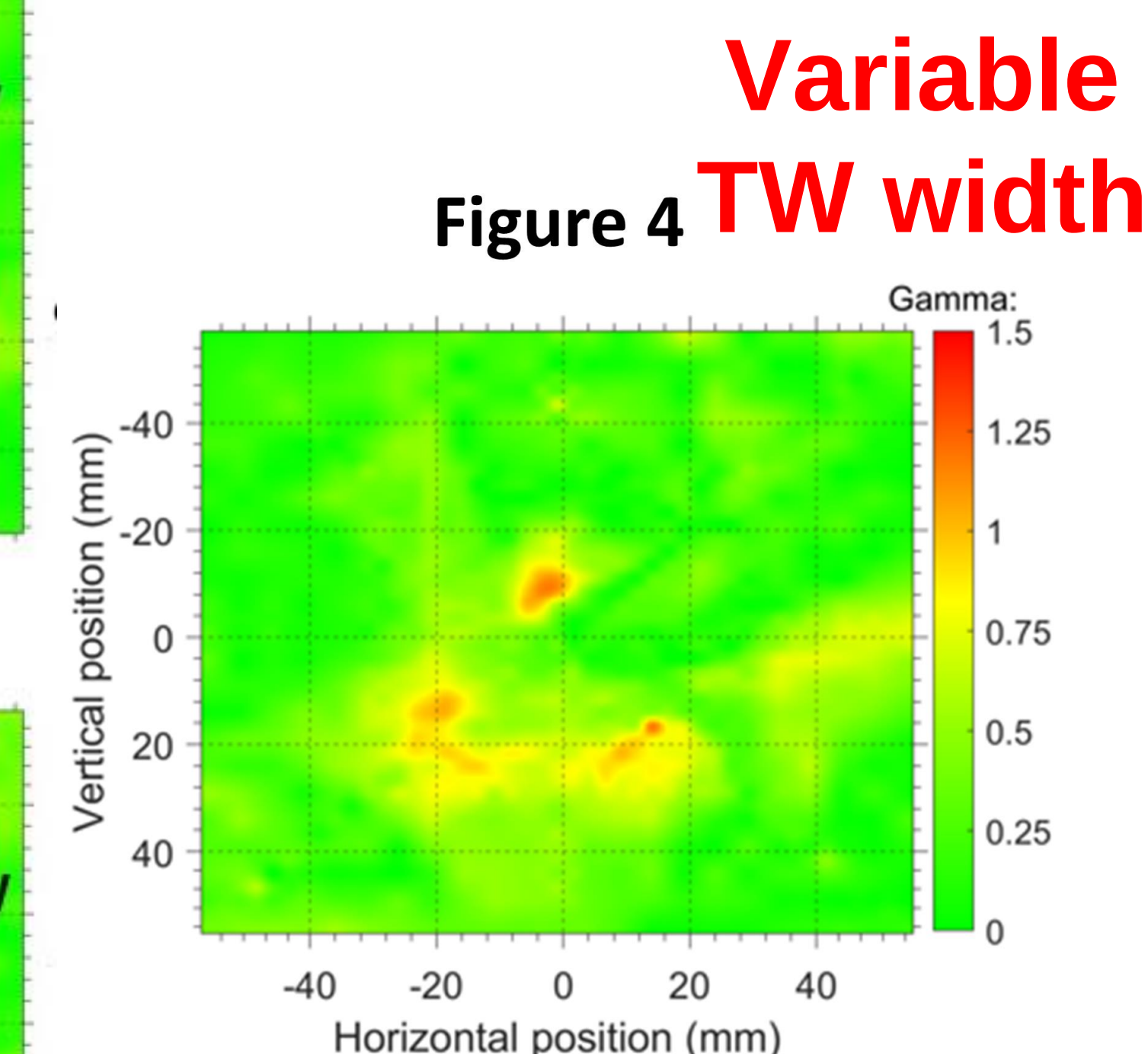
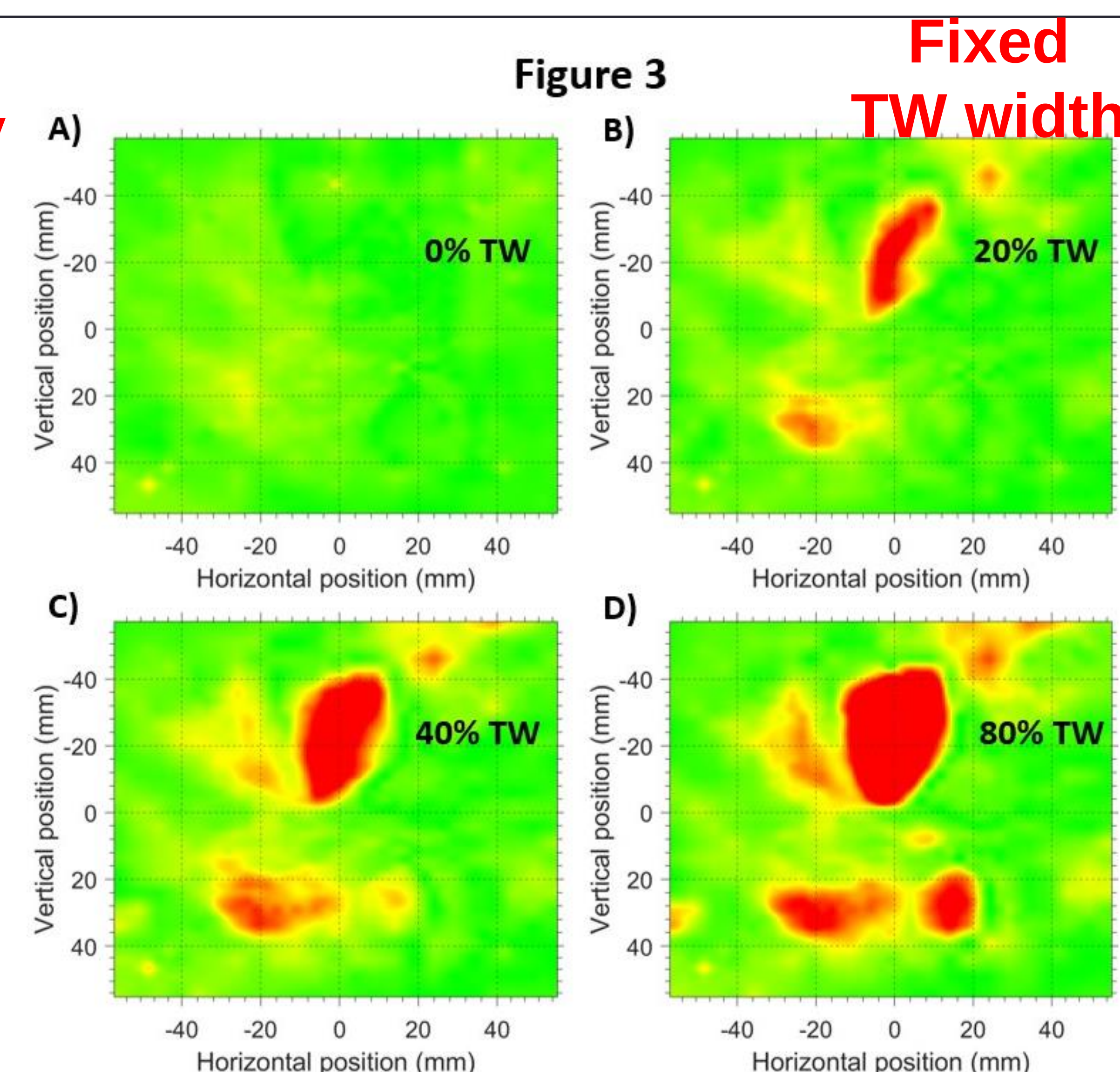
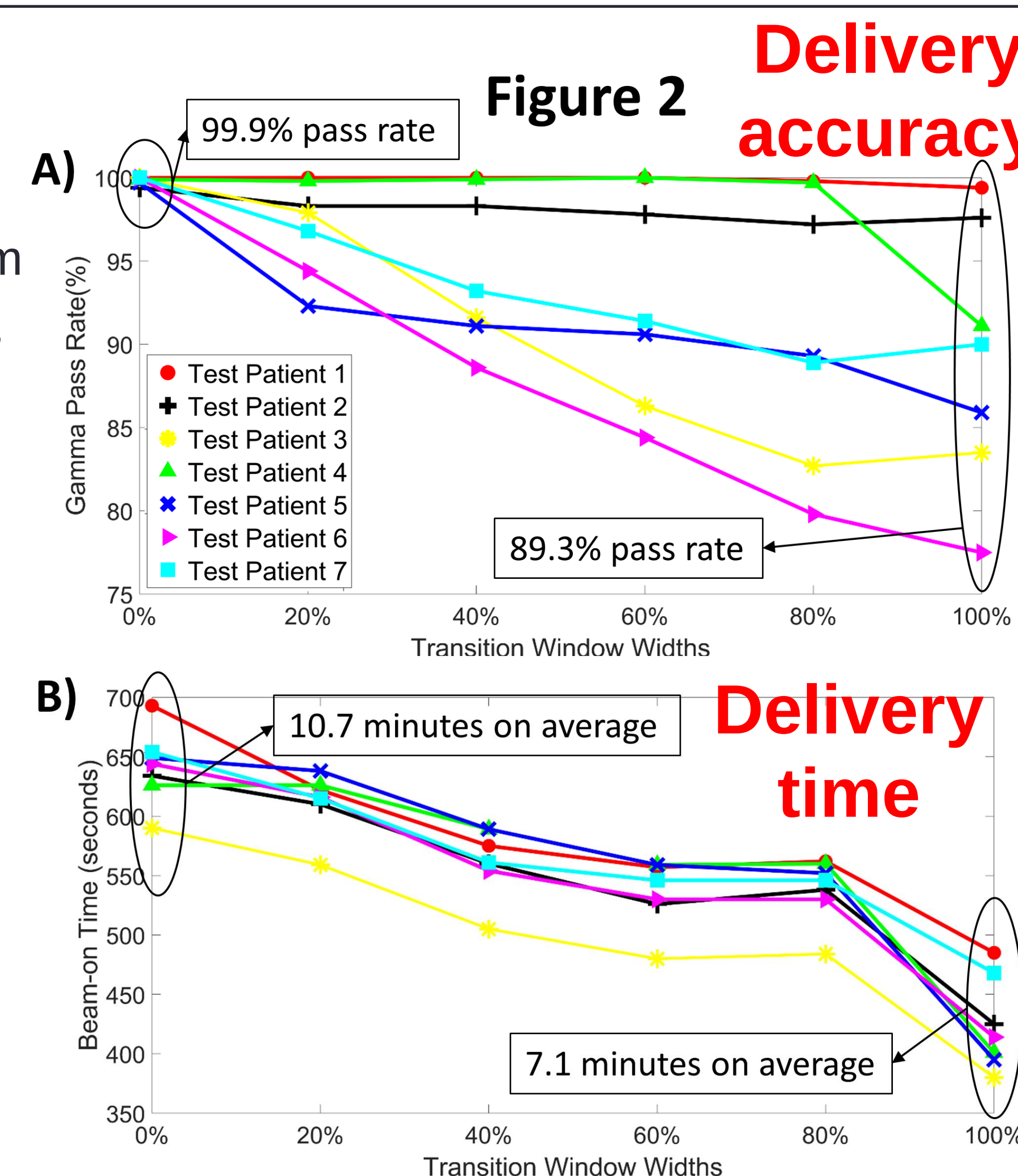
RESULTS

Fixed TW width result:

- **Figure 2:** As the TW widens from 0 to 100%, the treatment delivery is faster but with a cost in dose accuracy compared to what we see in the planning system.
- **Figure 3:** gamma map comparison (worse case)

Variable TW width result:

- **Figure 4:** Improvement in gamma distribution (worse case)
- **On average, 98% gamma pass rate & 9 mins delivery time**



CONCLUSIONS

- The **variable width** was found to be the **most accurate and efficient approach** for delivering dynamic plans.
- Future work aims to improve the design of the variable width method.

REFERENCES

- [1] Lee, E., MacDonald, R. L., Thomas, C. G., & Syme, A. (2022). Intra-arc binary collimation with dynamic axes trajectory optimization for the SRS treatment of multiple metastases with multiple prescriptions. *Medical physics*, 49(7), 4305–4321. <https://doi.org/10.1002/mp.15689>

