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# Study on the Accuracy of Varian Eclipse MLC Modelling When MLCs are Open Beyond the Jaw in Breast Cancer Patient Planning Using AAA and Acuros XB with Both Dual-Isocentric Technique and Mono-Isocentric Technique.

## Introduction

Attaining a homogenous dose distribution through the chest wall-supraclavicular junction can be a challenge due to several factors such as beam divergence, setup variability, and patient anatomy. But is essential due to the nodal regions being treated through that junction.

MLCs can be used to decrease this issue by opening one MLC beyond the jaw on the superior and inferior sides of the junction, allowing a portion of leakage and scatter radiation to bolster the coverage through this area.

This study is a prospective experimental phantom-based study that aims to verify the dosimetric accuracy of Varian Eclipse treatment planning system modeling at chest wall and supraclavicular field junctions when MLCs are deliberately left open beyond the jaw.

## Methods

A total of 24 three-dimensional conformal radiation therapy (3D-CRT) treatment plan variations were created on a scanned water phantom cube and delivered on a Varian TrueBeam linear accelerator.

The plans were created to mimic a standard three-field chest wall and SCV node radiation technique with two opposing tangential fields and one SCV field. Plans were generated with three different photon beam energies (6MV, 10MV, and 15MV), mono-isocentric, dual-isocentric, then calculated each in AAA and AcurosXB. Identical beam angles were used for all plans, and couch kicks were used to match beam divergence in the dual-Isocentric plans.

Phantom measurements were then converted to cGy for comparison.

### Plan Evaluation Criteria

The primary metric used for the evaluations was the point dose difference at the junction between the Eclipse-calculated dose and the actual received and measured dose. The dose accuracy was assessed using the absolute dose difference in centi-gray (cGy) and the percent dose difference (%).

## Results

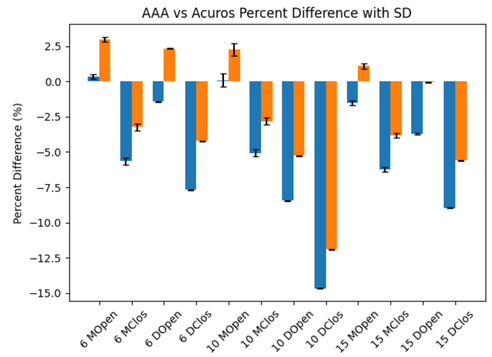


**Figure 1.** Percent difference between measured and calculated dose for AAA (blue) and Acuros XB (orange) across all beam configurations. Error bars represent one standard deviation derived from 12 repeated measurements per configuration.

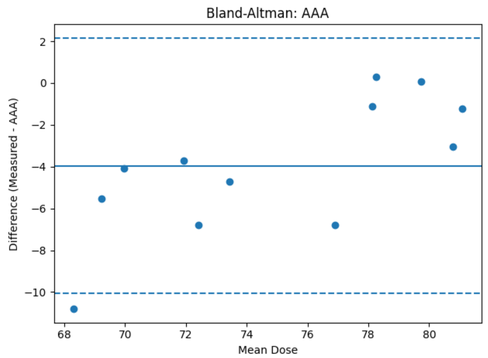


**Figure 2.** Bland–Altman plot comparing measured dose and AAA-calculated dose across all beam configurations. The mean difference (bias) indicates systematic overestimation of dose by AAA. The dashed lines represent the 95% limits of agreement (±1.96 SD).

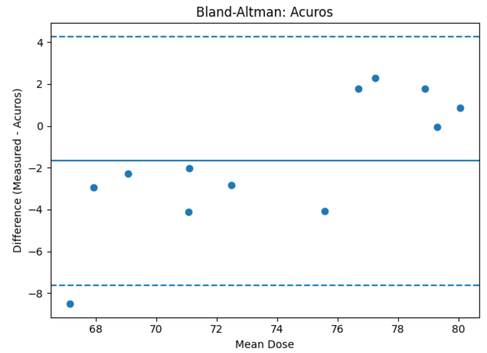


**Figure 3.** Bland–Altman plot comparing measured dose and Acuros XB-calculated dose across all beam configurations. The mean difference (bias) demonstrates improved agreement relative to AAA.

## Conclusion

Measured dose was compared with calculated dose from both AAA and Acuros across 12 treatment configurations. The mean measured dose demonstrated closer agreement with Acuros than with AAA overall. Across all configurations, AAA overestimated measured dose by a mean of 3.96 cGy (95% CI, 1.89 to 6.03 cGy; p = 0.0015), corresponding to a mean percent difference of -5.24%. Acuros overestimated measured dose by a mean of 1.67 cGy (95% CI, -0.34 to 3.69 cGy; p = 0.094), corresponding to a mean percent difference of -2.35%. The largest discrepancies were observed in Dual Iso/Closed MLC configurations, particularly at 10 MV, where both algorithms underestimated measured dose, though Acuros remained closer to measurement than AAA.

### Limitations

This study was limited to one specific type of beam arrangement used with breast cancer patients, a three-field arrangement. These plans were also identical as far as gantry angles from plan to plan which may limit the extent that these results can be applied. In addition, the plans were measured using a Farmer Ionization Chamber which is less ideal for this type of measurement but was used due to the lack of access to film processing which would have given superior detail in the measurement.

### References

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