

# Asymmetry and Stability of a Robotic Radiosurgery Motorized Collimator

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## Abstract

**Objectives:** During the commissioning process of an Iris 2 collimator on a robotic radiosurgery unit, it was noted that the collimator demonstrated different side lengths along its dodecahedron shaped field, significantly deviating from its expected equilateral shape. PDDs, profiles, and output factors of the unequally-sided field sizes were obtained and compared to the multi-institute data provided by the manufacturer.

**Methods:** Profiles were taken using chromodynamic film in solid water, as well as with a diode detector in a water tank. Output factors were obtained using a diode detector. PDDs were obtained in water with a diode detector. Weekly quality assurance films were reanalyzed with commercial film analysis software to characterize the long and short profiles on a periodic basis.

**Results:** Films demonstrated significant deviations from an ideal symmetry, with some edges of the Iris being longer than the other. Short and long profiles are not always 15° apart, and they do not always overlap about the same point. Additionally, the long and short profiles tend to drift over time, with the long profile tending to enlarge faster than the short profile. iQA tests were consistent with these results. Recalibrations of the collimator reduced the difference between the long and short collimator to its original value measured at commissioning. The differences were most visible with the 40 mm and greater field sizes, whereas with smaller collimators differences were indiscernible to the naked eye. Output factors, TMRs were unremarkably similar to expected values.

**Conclusions:** Despite its differences, the asymmetric Iris 2 collimator did not demonstrate significant dosimetric differences as compared to a symmetric one. Variations in field size visible in the short and long profiles can be measured and can be a barometer for a collimator recalibration need.

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### Abstract

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