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# Astigmatism Compensation in the Cosmic Explorer Corner Layout

## Abstract

The design of the 40 km arm length Cosmic Explorer requires a substantial increase in beam size compared to LIGO, necessitating a comprehensive redesign of the recycling cavities. This redesign must carefully balance the need for precise beam focusing with critical parameters such as beam size at the Beam Splitter and overall cavity length. In this study, several corner interferometer configurations to address these challenges have been studied. The presentation will discuss the theoretical framework for astigmatism induced by optical components and propose strategies for its mitigation. In particular, we demonstrate how to achieve a nearly non-astigmatic Power Recycling Cavity and a completely non-astigmatic Signal Extraction Cavity within the Long Crab1 layout. Our approach, which involves optimizing factors like the Radius of Curvature of mirrors and the Angle of Incidence on spherical optical elements, is adaptable to various interferometer designs. Overall, our findings not only offer a viable solution for the future gravitational wave detectors but also provide a framework that can be generalized to enhance the performance of a complex optical cavity.