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Impact of the inner triplet polarity on the optics commissioning of the LHC in 2024 and 2025

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To mitigate the risk of radiation damage induced failure while operating the LHC beyond its initial integrated luminosity target, changes to the triplet polarity and crossing angles have been applied in the two main experimental interaction regions of the LHC. This allows for a more distributed radiation deposition in the insertion region magnets, which should allow their survival until they are replaced as part of the High Luminosity LHC upgrade from 2026-2030. These changes in the optics during 2024 and 2025 came with important challenges regarding machine commissioning and optics correction. In this paper, we discuss our experience of linear optics correction for the various triplet polarity configurations and review the implications for nonlinear optics corrections.

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