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## **Weak-strong beam-beam simulation with crab cavity noises for the hadron storage ring of the Electron-Ion Collider**

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The Electron Ion Collider (EIC), to be constructed at Brookhaven National Laboratory, will collide polarized high-energy electron beams with hadron beams, achieving luminosities of up to  $1e+34 \text{ cm}^{-2} \text{ s}^{-1}$  in the center-mass energy range of 20-140 GeV. Crab cavities are employed to compensate for the geometric luminosity loss caused by a large crossing angle of 25 mrad in the interaction region. The phase noise in crab cavities will induce a significant emittance growth for the hadron beams in the Hadron Storage Ring (HSR). Various models have been utilized to study the effects of crab cavity phase noise. In this article, we present our numerical simulation results using a weak-strong beam-beam model. In addition to horizontal emittance growth, we also observed vertical emittance growth resulting from both crab cavity noises and beam-beam interaction. The tolerance for crab cavity phase noise was determined and compared with analytical predictions.

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