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## Closed-orbit distortion study of XiPAF upgrading project synchrotron

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Xi'an 200 MeV proton application facility (XiPAF) upgrading project is now in the design phase. For the synchrotron of the project, the influence of the dipole and quadrupole errors on the closed-orbit distortion(COD) is a matter we must pay attention to. However, Before the synchrotron assembly is complete, we do not know the actual errors of magnets. So we set certain distribution for different types of magnet errors according to the previous engineering experience and then investigate the COD caused by it, and finally we use the principle of statistics to find the relationship between them.

This work was carried out with MADX program. Results show that for almost all types of magnet error, the rms value of COD is in direct proportion to the rms value of magnet error, except the rotation error around the y-axis for dipoles, in which case the COD is in direct proportion to the square of the rms value of the error. In addition, the proportionality coefficient between COD and different types of magnet error varies a lot. This can guide us to restraint the error type with high coefficient strictly for better synchrotron performance and relax the requirements slightly of the error type with low coefficient for a more economic cost.

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### Footnotes

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