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A comparison of RMS moments and statistical divergences as ways to quantify the difference between beam phase space distributions

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Accurately assessing the difference between two beam distributions in high-dimensional phase space is crucial for interpreting experimental or simulation results. In this paper, we compare the common method of RMS moments and mismatch factors, and the method of statistical divergences that give the total contribution of differences at all points. We first show that, in the case of commonly used initial distributions, there is a one-to-one correspondence between mismatch factors and statistical divergences. This enables us to show how the values of several popular divergences vary with the mismatch factors, independent of the orientation of the phase space ellipsoid. We utilize these results to propose evaluation standards for these popular divergences, which will help interpret their values in the context of beam phase space distributions.

Footnotes

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Primary author: DU, Yu (Institute of Modern Physics, Chinese Academy of Sciences)

Co-authors: WANG, Zhijun (Institute of Modern Physics, Chinese Academy of Sciences); WONG, Chun Yan Jonathan (Institute of Modern Physics, Chinese Academy of Sciences); LIU, Liwen (Institute of Modern Physics, Chinese Academy of Sciences); SU, Chunguang (Institute of Modern Physics, Chinese Academy of Sciences); YI, Man (Institute of Modern Physics, Chinese Academy of Sciences); GONG, Lingyun (European Spallation Source ERIC); ZHANG, Tao (Institute of Modern Physics, Chinese Academy of Sciences); ZHOU, Haoyu (Institute of Modern physics, Chinese Academy of Science); MA, Binghui (Institute of Modern Physics, Chinese Academy of Sciences); CHU, Yimeng (Institute of Modern Physics, Chinese Academy of Sciences); LI, Tingyue (Institute of Modern Physics, Chinese Academy of Sciences); WANG, Tielong (Institute of Modern physics, Chinese Academy of Science)

Presenter: WANG, Zhijun (Institute of Modern Physics, Chinese Academy of Sciences)

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