



# Exploring Minimal Scenarios to Produce Transversely Bright Electron Beams Using the Eigen-Emittance Concept

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Next generation hard X-ray free electron lasers require electron beams with low transverse emittance. One proposal to achieve these low emittances is to exploit the eigen-emittance values of the beam. The eigen-emittances are invariant under linear beam transport and equivalent to the emittances in an uncorrelated beam. If a correlated beam with two small eigen-emittances can be produced, removal of the correlations via appropriate optics will lead to two small emittance values, provided non-linear effects are not too large. We study how such a beam may be produced using minimal linear correlations. We find it is theoretically possible to produce such a beam, however it may be more difficult to realize in practice. We identify linear correlations that may lead to physically realizable emittance schemes and discuss promising future avenues.

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