

# Spectral form function with applications in beam physics

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To describe longitudinal fine structure within a particle beam like microbunching, a classical approach is to define a bunching factor or form factor which is the Fourier transform of the particle density distribution in longitudinal dimension. Such a 1D definition of form factor can be generalized to 6D spectral form function (SFF) to describe more complicated structure in phase space. The complex SFF is another complete description of beam in spectral domain and can offer complementary and valuable insight in beam dynamics study which usually invokes the real particle density distribution. The basic property and Fokker-Planck equation of the SFF is presented, along with its solution in a general coupled linear lattice. The example applications of SFF in electron storage ring physics and laser-induced microbunching are presented.

## Footnotes

## Funding Agency

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Yes

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