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Spectral Control of THz Super-Radiant Spontaneous Undulator Radiation Driven by Ultrashort Electron Beam with Energy Spread

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Intense coherent THz radiation has been generated from an 18-period, hybrid-type U100 planar undulator as it is driven by short relativistic electron pulses produced from the NSRRC photoinjector. However, it is observed that the number of output optical pulse cycles is much less than the number of undulator periods and therefore the radiation spectral bandwidth has been broadened. It is found that the dispersion of undulator with excessive energy spread is responsible for this undesired broadening of THz radiation spectrum. In this study, instead of using rectilinear rf bunch compression (i.e. velocity bunching) in photoinjector linac, we investigate the feasibility of using nonlinear magnetic bunch compression for spectral bandwidth control of coherent THz undulator radiation.

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