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Dual energy electron beams from two independent injection events

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LWFA electron beams have evolved from their rather random performance of the early days to a well-controlled, tunable electron source able to serve real-world applications. The key ingredient for this evolution was the realization of various controlled injection schemes. Here we show that by combination of shock-front and colliding pulse injection it is possible to generate two independently energy-tuneable electron beams from a single LWFA. Such dual beams may be used to drive a Thomson source in order to produce a two-color X-ray pulse. By the nature of the injection process, the temporal separation of both pulses in the current scheme is of the order of only few femtoseconds. We will discuss how this separation can be enhanced or even controlled to produce a two-color source for X-ray pump / X-ray probe studies. Such dual beams may also be used as driver-witness pairs for hybrid wakefield acceleration. We will present a scheme based solely on shock-front injection for generating such double bunches with large temporal saturation. Finally, we will show first electron acceleration results from the new ATLAS-3000 laser at CALA.

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