ID contributo: **203** Tipo: **Invited talk**

3D structure of microbunched plasma-wakefield-accelerated electron beams inferred by coherent optical transition radiation

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Plasma-wakefield accelerators produce relativistic, micron-scale electron bunches. The sub-micrometer internal distribution of these bunches, which critically influences gain in free-electron lasers or particle yield in colliders, has proven elusive to characterize. Through analysis of multi-spectral images of coherent optical transition radiation (COTR) that laser-wakefield-accelerated e-bunchs generated when transiting a metal foil, we elucidate the micro- and macro-structure of these bunches. Key features of COTR images and spectra correlate uniquely with how plasma electrons inject into the wake. We measured COTR from bunches injected by three different regimes: by a plasma-density discontinuity, by ionizing high-Z gas-target dopants, or by uncontrolled laser-plasma dynamics. With additional input from electron spectra, and particle-in-cell simulations, we reconstructed not only the longitudinal profile of these beams, but also their coherent 3D charge structures. The results demonstrate versatile metrology for next-generation X-ray free-electron lasers.

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