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Probing Nuclear Structure through Ultra-Peripheral Heavy-Ion Collisions

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Ultra-peripheral heavy-ion collisions provide a unique laboratory for studying the structure of both nuclear and nucleon targets. In photonuclear interactions, the high-energy photons provided by the ultra-Lorentz boosted ions serve as a "femtoscope"for probing sub-femtoscale nuclear properties of the target, revealing details of the gluon distributions within nuclear matter. Substantial increases in the statistics collected by experiments at RHIC and the LHC in the last decade have allowed multi-differential analyses revealing the role of spin interference in ultra-peripheral A+A collisions. In this talk, I will review recent experimental measurements of coherent diffractive vector meson production from RHIC and the LHC that have advanced our understanding of dense gluonic environments and the role of shadowing, saturation, and quantum phenomenon. I will discuss the role of spin interference in vector meson photoproduction and how it may provide novel approaches for investigating the tensor pomeron and elliptic gluon distribution within dense nuclear systems, including compelling theoretical predictions relevant to the upcoming Electron-Ion Collider. Finally, I will provide an outlook on the impact of similar measurements in a host of collisions species, such as O+O and asymmetric A+A collisions, outlining their potential to further refine our understanding of nuclear structure and gluonic matter.

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Session Classification: New directions in UPCs, connection to heavy-ion physics, and synergies with EIC and other facilities