Contribution ID: **27**   Type: **Poster Presentation**

Real-time simulation of pure Yang-Mills SU(3) glueballs scattering processes with MPS

We introduce a model-independent method to construct Matrix Product Operator (MPO) representations of quasiparticle creation operators acting on the interacting vacuum of (quasi-)one-dimensional quantum many-body systems. This method exploits maximally localized Wannier functions constructed from single-particle states at intermediate system sizes, which provides the building blocks for a generic single-quasiparticle MPO wave-packet creation operator. This enables the preparation of arbitrary input states for real-time scattering simulations. We test this approach on a relevant scenario for Lattice Gauge Theory: the glueball-glueball scattering on a pure Yang-Mills SU(3) ladder, opening a path to real-time simulations of non-abelian scattering processes, a still largely unexplored frontier.

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Session Classification: C - Poster Session