

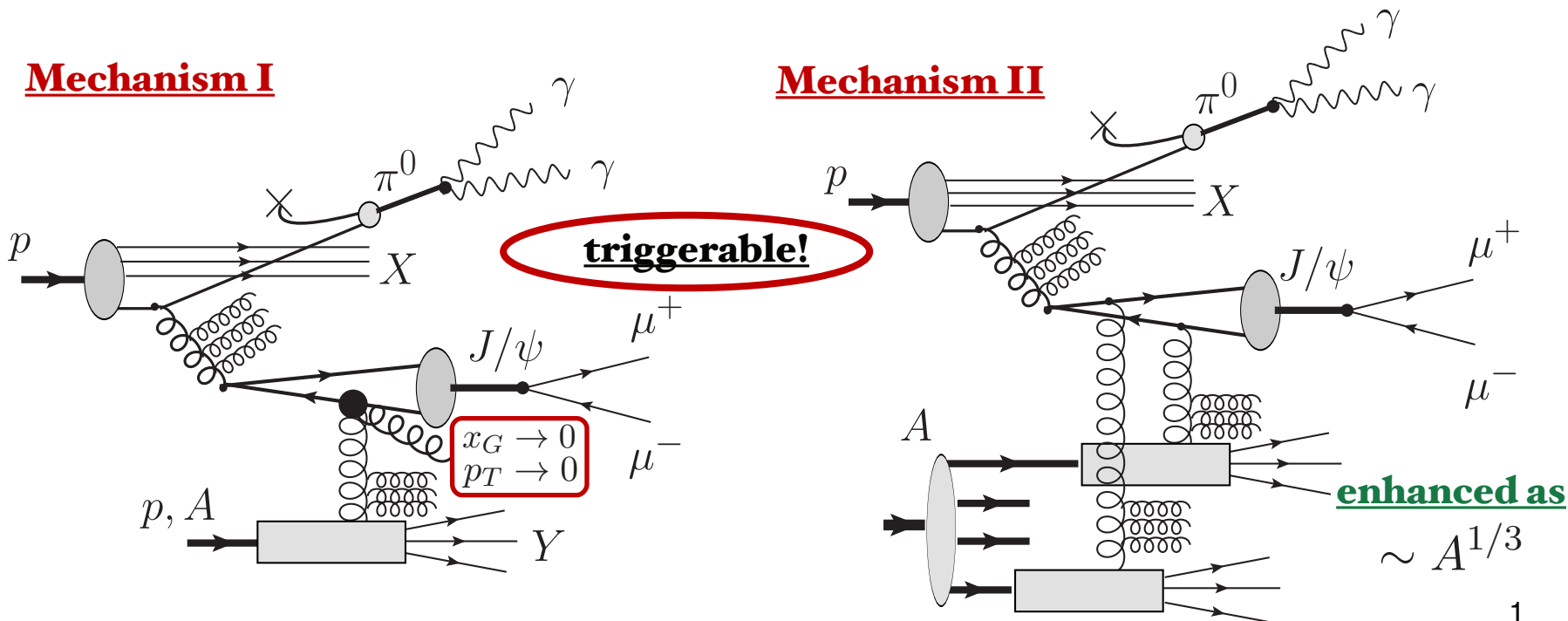
Forward-central pion-quarkonia correlations at RHIC

- ✓ **Quarkonia production in pp/pA**, as well as high pT forward particle production in pA, traditionally are very important probes for **QCD dynamics in hard and soft regimes**.

e.g. QCD factorisation, gluon resummations, higher order PT and non-PT effects, CGC etc

- ✓ **J/psi puzzle**: highly uncertain production and evolution in hot environment
What is the dominating QCD mechanism and role of the medium? why R_{pA} is close to one?

- ✓ In order to address these issues, we propose **a new measurement**:
central J/psi or Upsilon production in association with forward leading pion



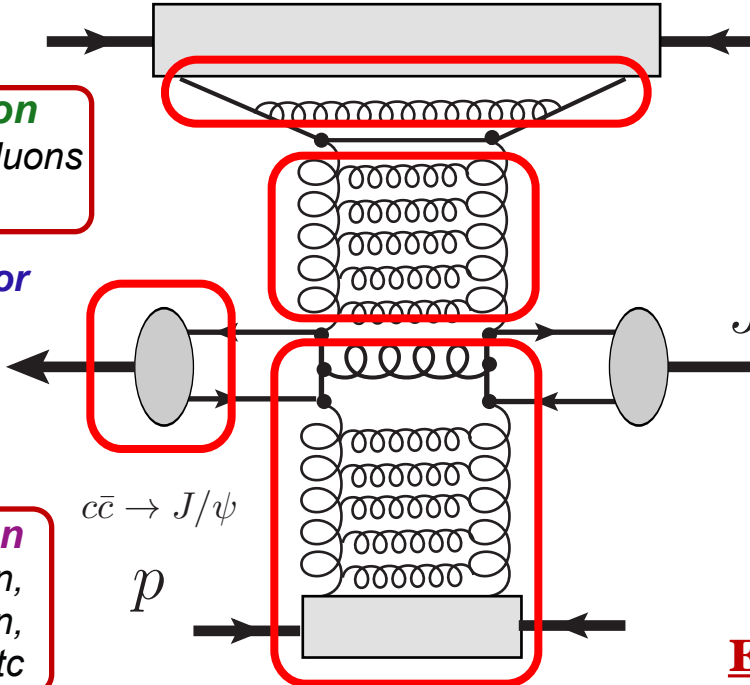
Strategy and expectations

Mueller graph:

BFKL Pomeron
resummed low- x gluons
 $\sim \alpha_s(\mu) \ln x$

Pomeron becomes **important** for a large rapidity difference between pion and quarkonium, but **less important** for harder scale and lower energy

J/ψ wave function accounts for suppression, energy loss, polarisation, non-PT effects, etc

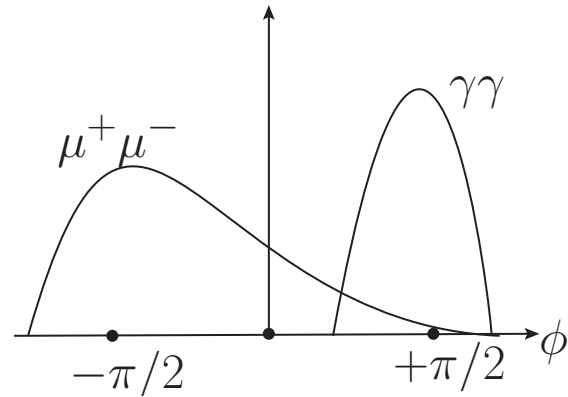
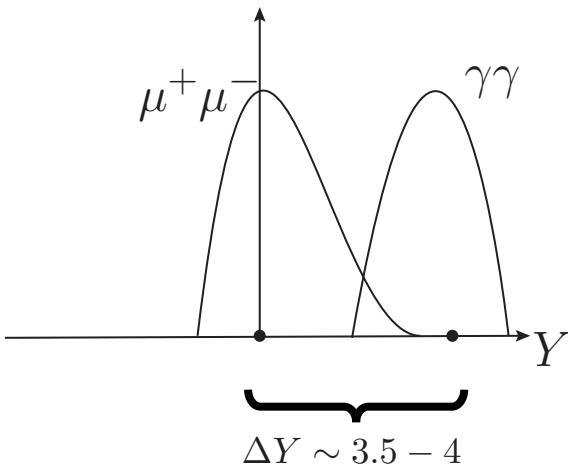


valence quark PDF dominates the Reggeon at large $x \sim 1$

In the dipole approach: a superposition of universal elastic dipole amplitudes times $q \rightarrow qG$, $G \rightarrow c\bar{c}$ and $c \rightarrow cG$ wave functions

Expectations:

- ✓ nearly back-to-back azimuthal correlation broadened by soft gluon emissions etc
- ✓ background due to Drell-Yan is strongly reduced due to a harder pion p_T spectrum
- ✓ uncertainties are cancelled in R_{pA}
- ✓ improved test of quarkonia production mechanisms



Future prospects and needs

- **Future prospects:**

Both PHENIX and STAR experiments are (or will be in near future) well equipped to measure forward-central correlations both in pp and pA.

- **Needs:**

Strong “Theory-Experiment” co-operation is needed to test the importance of such pQCD aspects as BFKL evolution, QCD factorisation, proton structure at low x , quarkonia production mechanisms, polarisation effects, CNM effects (such as J/psi suppression, rescattering, melting, energy loss etc).

- **Physics goals:**

The proposed measurement provides a good way to reduce backgrounds and uncertainties in studies of quarkonia production in pp/pA and thus allows to test higher order effects in pQCD at RHIC and disentangle them from e.g. CGC and other multi-particle effects.

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