Scattering Amplitudes: LHC

Feynman Diagrams

Theories: strong interactions

gluons, quarks

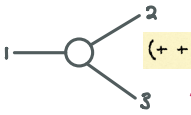
gluons: N=4 SYM

Qu: Other theories, particles?

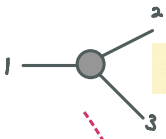
Parke-Taylor formula

On-shell diagrams (planar graphs)

Constructed from fundamental 3pt amplitudes



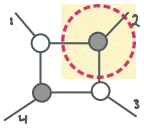
(+ + −)



(+ − −)

Simple amps.

$$\frac{[ab]^4}{[12][23][31]}$$



combine

Parke-Taylor formula: Single on-shell diag.

Parameterization: n = #external lines
k = helicity count

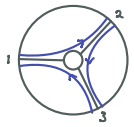
n=3,k=3: 3 on-shell diags.

Qu: Nonplanar on-shell diags?

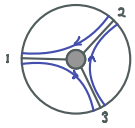
Amplituhedron
Gr(n,k)

Cluster algebras

Permutations/Plabic graphs



(1,2,3)->(2,3,1)



(1,2,3)->(3,1,2)

Perm=>diag
Reduced diag=>perm

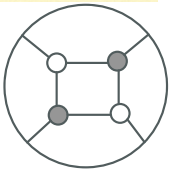
Info for tree-level amps.

(YB moves conseq. of Id moves.)

Positive Grassmannians

Gr+(k,n)

faces, edges



$$C = \begin{pmatrix} 1 & 0 & * & * \\ 0 & 1 & * & * \end{pmatrix}$$

$$c_{ab} = -\sum \prod (-f_j) = -\sum \prod \alpha_i$$

Qu: positive Grassmannian? Real? Role of Schubert cells, patches? Schubert calc., Young diags and symm. polys? Extensions?