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N=4 Amplitudes/Wilson loops at strong coupling from integrability

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N=4 Super Yang-Mills is a supersymmetric and conformal gauge theory with remarkable properties. Among them, its duality with a IIB string theory in the AdS₅×S⁵ background and the correspondence between null polygonal Wilson loops and gluon scattering amplitudes. Even more surprisingly, some integrable features pop up when computing a certain class of observables in the theory. For instance, the anomalous dimension of the gauge invariant operators admits a spin chain description where the application of many techniques belonging to integrable systems is possible. As for the null polygonal Wilson loops, a non-perturbative approach employing the integrability of the theory has been proposed and tested in the last few years. In this respect, we have found some results in the strong coupling regime, on the one side reproducing the minimal area computation for the classical string and on the other side analytically proving a previously proposed quantum correction of the same order. A parallel between the fermionic contribution to the Wilson loop and the Nekrasov instanton partition function is proposed. Furthermore, we partially unravelled the matrix structure of the pentagon transition, giving a description in terms of Young tableaux.

Presenter: BONINI, Alfredo (BO)