

# Integrability and Exact Results in $N = 2$ gauge theories

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Any  $N=2$  gauge theory in four dimensions contains a set of local operators made only out of fields in the  $N=2$  vector multiplet that is closed under renormalization to all loops, with  $SU(2,1|2)$  symmetry. We present a diagrammatic argument that for any planar  $N=2$  theory the  $SU(2,1|2)$  Hamiltonian acting on infinite spin chains is identical to all loops to that of  $N=4$  SYM, up to a redefinition of the coupling constant  $g^2 \rightarrow f(g^2)$ . Thus, this sector is integrable and anomalous dimensions can be read off from the  $N=4$  ones up to this redefinition.

The functions  $f(g^2)$  dubbed as effective couplings encode the relative, finite renormalization between the  $N=2$  and the  $N=4$  gluon propagator and thus can be computed in perturbation theory using Feynman diagrams. For each  $N=2$  theory exact effective couplings can be obtained by computing different exact results for localizable observables such as Wilson loops and the Bremsstrahlung function and by comparing them with their  $N = 4$  counterparts.

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