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Spinon Deconfinement at the Quantum Critical Point of $2+1$ D Antiferromagnets ZAIRA NAZARIO, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, DAVID I. SANTIAGO, Instituut-Lorentz, Leiden University, Leiden, The Netherlands — The natural spin 1 excitations of $2+1$ D antiferromagnets are made of constituent confined quarks of spin $1/2$, spinons. The quantum paramagnetic phase possesses quantum tunneling events or instantons, which confine the spinons. There have been recent suggestions of new critical points where spinons are deconfined. Instanton events which cause the spinon confinement disappear at the deconfined critical point because the massless spinons screen them effectively and because instanton tunneling becomes infinitely costly. We point out that this happens irrespective of the intrinsic spin of the antiferromagnet. Hence spinons are deconfined irrespective of microscopic spin. Berry phase terms relevant to the paramagnetic phase make the confinement length scale diverge more strongly for half-integer spins, next strongest for odd integer spins, and weakest for even integer spins. There is an emergent photon at the deconfined critical point, but the "semimetallic" nature of critical spinons screens such photon making it irrelevant to long distance physics and the deconfined spinons behave as strictly free particles. A unique prediction critical free spinons at the quantum critical point is an anomalous exponent η for the susceptibility exactly equal to one.

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