	Spin chain	gauge theory	string theory
SU(N)	non existent	gauge symmetry (manifest)	gauge symmetry (manifest)
SU(2)	global, manifest (rotates spins)	present @ infinite coupling (in 2D), non manifest	present @ infinite coupling global (in 2D) manifest

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3D

W=2 theory with $\mathcal{N}$ non-R global symmetries g^I,

choose real parameters m_I,

deform theory with a central term.

$$\{Q_\alpha, \bar{Q}_\beta\} = 2\Gamma^\mu_{\alpha\beta} P_\mu + 2Z\delta_{\alpha\beta}$$

$$Z = m_I g^I$$

States carrying g_I get masses $m^2 = |m_I g^I| + m^2_{F+D}$

If 3D lifts to 4D, we can dimensionally oxidize deformation to Wilson lines with monodromy $m_I g^I R_{\tilde{8}}$

D2 on 012 lifts to D3 on 012$\tilde{8}$ $\underbrace{345}_{w_1}\underbrace{(7}_{w_2}\underbrace{9}_{w_3}$

$$g_1 = \begin{pmatrix} 1 & & \\ & -1 & \\ & & 0 \end{pmatrix} \qquad g_2 = \begin{pmatrix} 1 & & \\ & 0 & \\ & & -1 \end{pmatrix}$$

Most supersymmetric case: $m_2 = 0$

$$\mathcal{Z} = m g, \quad g_1 = g.$$

Susy NS flux brane (aka $\mathcal{Q}$-deformation with $\epsilon_1 = -\epsilon_2$)

$$ds^2 = dx_\mu dx^\mu + d\rho_1^2 + d\rho_2^2 + \rho_1^2 d\phi_1^2 + \rho_2^2 d\phi_2^2$$

$$+ \underbrace{\frac{-m^2(\rho_1^2 d\phi_1 - \rho_2^2 d\phi_2)^2 + dx_9^2}{1 + m^2(\rho_1^2 + \rho_2^2)}}_{0123\,9}$$

where

$$\rho_{1,2} = |w_{1,2}|$$

$$B = m \frac{(\rho_1^2 d\phi_1 - \rho_2^2 d\phi_2) \wedge dx_9}{1 + m^2(\rho_1^2 + \rho_2^2)} \; ; \; e^{(-\bar{g})} = \frac{\sqrt{1 + m^2(\rho_1^2 + \rho_2^2)}}{g_s^2 \sqrt{\alpha'}}$$

1. SUSY is preserved
2. (16 of 32)
3. D2's are BPS (8 of 16)
4. Rotating D2's are BPS (4 of 8)
5. Adding NS5 preserves SUSY (8 killing spinors)
6. D2's in presence of NS5's + deformation are BPS
7. BPS when rotating