Overlaps and domain walls: what's the price of chirality?

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Statement 1:

The 5D domain wall construction in the limit $N \to \infty$ is completely equivalent to a 4D lattice formulation of Ginsparg-Wilson fermions.

5D operator

$$D_5 = \frac{1}{2}\{\gamma_5(\partial_s^* + \partial_s) - a_s\partial_s^*\partial_s\} + M$$

$$M = D_w - m_0$$

correspondts to a 4D operator

$$aD_4 = 1 - A(A^\dagger A)^{-1/2}$$

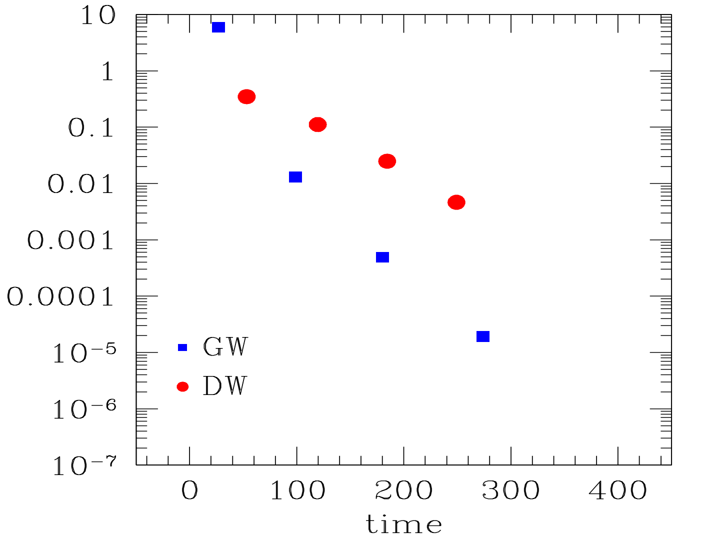
$$A = -a_s M(2 + a_s M)^{-1}$$

that satisfies the Ginsparg-Wilson relation

Statement 2

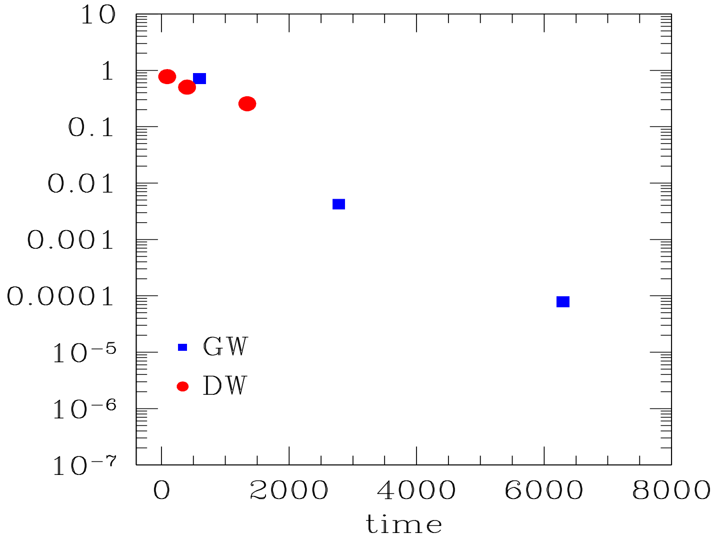
Domain wall fermions do not perform better than overlap fermions

$$\left|(\Gamma_\pi^{\text{exact}}(T/3) - \Gamma_\pi^{\text{N}}(T/3))/\Gamma_\pi^{\text{exact}}(T/3)\right|$$



$8^3 24$

$\beta = 5.85$



$12^3 24$

$\beta = 5.85$

Statement 3

Keeping N finite: the residual mass is not all

Locality of chirality breaking effects is only guranteed at distances

$$|x-y| \gg Na$$

Consequences?

strong need for clarification

Statement 4

Whatever time estimate we find for Wilson fermions: multiply the effort by a factor $\mathrm{O}(100)$.

GW: degree of polynomial $\mathrm{O}(100)$, no preconditioning

DW: large number of solver iterations

Hope: prove at the conference that statement 4 is wrong