

BSM Ensembles for ILDG

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on behalf of the TELOS Collaboration

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$SU(2)$ with adjoint matter

- Aim
 - Study conformal/near-conformal strong dynamics
 - Potential applications to walking technicolor
- Common characteristics:
 - Wilson gauge action
 - Wilson fermion action
 - Storage format: quaternions, 4 real numbers per site
 - Typical ensemble size: 4000 trajectories
- $N_{\text{adj}} = 1$ Dirac
 - Seven values for $\beta \in [2.05, 2.4]$
 - Volumes up to 96×48^3
 - Minimum $am_{2_s^+}$: 0.2772(14)
 - Ergodic topology ($\beta = 2.4$ marginal)
- $N_{\text{adj}} = 2$ Dirac
 - Single $\beta = 2.35$
 - Volumes up to 128×64^3
 - Minimum $am_{2_s^+}$: 0.47442(51)
 - Significant topological freezing

$Sp(2N)$ with fundamental/antisymmetric matter

- Aim:
 - Composite Higgs models in symplectic groups
 - Theories that could explain dark matter via the SIMP mechanism
- Common characteristics
 - Wilson gauge action
 - Wilson fermion action
 - Storage format: $Sp(2N)$ half-matrices (first N rows)

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| <ul style="list-style-type: none">• $N_f = 2$ fundamental Dirac<ul style="list-style-type: none">• 5 values for $\beta \in [6.9, 7.5]$• Volumes up to 48×42^3• Minimum m_{PS}/m_V: 0.407(16)• Ergodic topology | <ul style="list-style-type: none">• $N_{as} = 3$ antisymmetric Dirac<ul style="list-style-type: none">• 6 values for $\beta \in [6.6, 6.9]$• Volumes up to 54×36^3• Minimum m_{ps}/m_v: 0.7954(44)• Ergodic topology at small β, marginal from $\beta = 6.8$, getting worse as $m_{as} \rightarrow 0$ | <ul style="list-style-type: none">• $N_f = 2, N_{as} = 3$ mixed reps<ul style="list-style-type: none">• 3 values for $\beta \in [6.45, 6.5]$• Volumes up to 56×36^3• Minimum m_{PS}/m_V: 0.8768(30); m_{ps}/m_v: 0.9022(27)• Significant topological freezing at small m_{as} |
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In preparation

- $SU(2), N_{\text{adj}} = 1, 2$ Wilson fermions with Pauli–Villars fields
- $SU(2), N_{\text{adj}} = 1, 2$ Möbius Domain Wall Fermions
- $Sp(4), N_f = 2$ Möbius Domain Wall Fermions

Summary

Group	Fermion Action	N_f	N_{as}	N_{adj}	N_{PV}	V_{max}	β	Status	Storage
SU(2)	Wilson			1		96×48^3	[2.05, 2.4]	Ready	36TiB
SU(2)	Wilson			2		128×64^3	2.35	Ready	16TiB
SU(2)	Wilson			1, 2	5, 10, 15	40^4	[2.35, 2.7]	In preparation	O(15TiB)
SU(2)	Möbius			1, 2	tbc	tbc	tbc	In preparation	
Sp(4)	Wilson	2				48×42^3	[6.9, 7.5]	Ready	24TiB
Sp(4)	Wilson		3			54×36^3	[6.6, 6.9]	Ready	16TiB
Sp(4)	Wilson	2	3			56×36^3	[6.45, 6.5]	Ready	28TiB
Sp(4)	Möbius	2				tbc	tbc	In preparation	