$$\mathrm{H} \,/\, \mathbb{T}^3$$

$$\mathrm{H} \begin{cases} \mathbb{10} \\ \mathbb{2} \\ \mathbb{0} \end{cases} \boxplus \not{X}^a \in \begin{cases} E_8 \times E_8 \\ O_{32} \end{cases}$$

$${}^{xy}\mathbb{10} = \left.\begin{array}{|c}{}^{x}\not{1}^{3} K_3(y) \dfrac{\partial}{\partial y} \\ \hline \\ \end{array}\right.$$

$$\mathrm{Met}_{\,\mathrm{flat}}\ \mathbb{T}^3 = \mathbb{R}^6 \ni {}^{y}_{6}\gamma_{ij}$$

$${}^{xy}g_{ij} = {}^{x}\mathbb{0}^{6}\ {}^{y}_{6}\gamma_{ij} \Longrightarrow {}^{x}\mathbb{0}^{6} \text{ scalar super-partners}$$

$${}^{xy}\not{2} = {}^{x}\not{0}^{3}\ {}^{y}_{3}\not{2} + {}^{x}\not{X}^{3}\ {}^{y}_{3}\not{X}$$

$$H^2_{\mathbb{R}} \ni {}^{y}_{3}\not{2} \text{ basic harmonic 2-forms}$$

$$H^1_{\mathbb{R}} \ni {}^{y}_{3}\not{X} \text{ basic harmonic 1-forms}$$

$${}^{x}\not{0}^{3} \text{ massless scalars}$$

$$\text{total } \mathbb{R}^{3:6}$$

$$d\,{}^{y}\not{X} = 0 \text{ flat connex}$$

$$\pi_1\left(\mathbb{T}^3\right) = \mathbb{Z}^3$$

$$\mathrm{Conn}_{\,\mathrm{flat}}\ \mathbb{T}^3 = \mathrm{Hom}\left(\pi_1\left(\mathbb{T}^3\right) : G\right) = \mathrm{Hom}\left(\mathbb{Z}^3 : G\right) \text{ commuting triples } 3 * U_1^{16} = \mathbb{R}^{3\times 16} \text{ basic flat connexions}$$

$$H_1^{\mathbb{Z}}\left(\mathbb{T}^3\right) = \mathbb{Z}^3 \text{ basis } C_{123}$$

$$\text{Wilson loop parametrization Conn}_{\,\mathrm{flat}} \ni \not{X} \curvearrowright \int_{dy}^{C_i} {}^{y}\not{X} : \quad i \in 3$$

$$\text{vector multiplets} = \text{bundle over scalars}$$

$$\text{flat connex } {}^{y}\not{X}^{G}$$

$$\frac{g \in G}{\text{commutes with flat connex } {}^{y}\not{X}^{G}} \underset{\text{gen}}{=} U_1^{16}$$

$$\begin{cases} {}^{x}\not{X}^{16} \\ {}^{x}\not{1}^{3} \\ {}^{x}\not{X}^{3} \end{cases} = \mathbb{R}^{3:19}$$