

Ginsparg

$$\text{background} \begin{cases} k \\ 2 \\ \chi^\alpha \end{cases}$$

$$\text{Het world-sheet} \begin{cases} \theta^\mu & 1 \leq \mu \leq 8 \\ \varphi^\mu & 1 \leq \mu \leq 8 \\ \mathbb{Q}^\alpha & \alpha \in 16 \end{cases}$$

$$\begin{aligned} \boxed{\theta^\mu \varphi^\mu \mathbb{Q}^\alpha} &= \theta^\mu_{\mu} k_{\nu} k_{\nu} \theta^\nu + \theta^\mu_{\mu} \varphi^\nu_{\mu\nu} 2 + \varphi^\mu_{\mu} k_{\nu} k_{\nu} \varphi^\nu + \mathbb{Q}^{\alpha} \mathbb{Q}^{\alpha} + \mathbb{Q}^{\alpha} \theta^\mu_{\mu} \chi^\alpha \mathbb{Q}^{\alpha} \\ &= \underbrace{\tau_{21} \theta^\mu_{\mu} \varphi^\nu_{\nu} + \frac{1}{\tau_2} \overbrace{\theta^\mu_{\mu} - \tau_{11} \theta^\mu_{\mu}} \overbrace{\varphi^\nu_{\nu} - \tau_{11} \varphi^\nu_{\nu}}}_{\text{space-time lattice}} k_{\nu} k_{\nu} + \varphi^\mu_{\mu} \varphi^\nu_{\nu} 2 + \mathbb{Q}^{\alpha} \mathbb{Q}^{\alpha} + \mathbb{Q}^{\alpha} \theta^\mu_{\mu} \chi^\alpha \mathbb{Q}^{\alpha} \end{aligned}$$

$$\text{space-time lattice } \mathbb{R}^8 \supset \Lambda = \mathbb{Z}^k \frac{\begin{matrix} 1 \\ \vdots \\ 1 \end{matrix}}{k} \ni n^i \begin{matrix} 1 \\ \vdots \\ 1 \end{matrix}$$

$$\tau \cdot \sigma + 2\pi n^i \begin{matrix} 1 \\ \vdots \\ 1 \end{matrix} \theta^\mu = \tau \cdot \sigma \theta^\mu + 2\pi i n^i \begin{matrix} 1 \\ \vdots \\ 1 \end{matrix} \theta^\mu$$

$$z = \sigma_1 + \tau \sigma_2$$

$$\frac{d\bar{z} dz}{2i} = \frac{(d\sigma_1 + \bar{\tau} d\sigma_2) \wedge (d\sigma_1 + \tau d\sigma_2)}{2i} = \frac{\bar{\tau} d\sigma_2 \wedge d\sigma_1 + \tau d\sigma_1 \wedge d\sigma_2}{2i} = \frac{\tau - \bar{\tau}}{2i} d\sigma_1 \wedge d\sigma_2 = \mathcal{I}(\tau) d\sigma_1 \wedge d\sigma_2$$