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Matrix Models Dualities in the Collective-Field Formulation

by

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in collaboration with

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MM FERMIONS

BIPZ REDUCTION TO EIGENVALUES

INDEPENDENT $M_{ij} = N + \lambda N(N-1)$

INVARIANT INTEGRATION

$$\boxed{\int dM\, f(M)} \qquad f({}^{U}M) = f(M)$$

$${}^{U}M = U M U^{\dagger}$$

FP:

$$1 = \Delta_{FP} \int dU \prod_{i<j} \delta(\mathrm{Re}\, UMU^{\dagger}_{ij})\, \delta(\mathrm{Im}\, UMU^{\dagger}_{ij})$$

$$\int dM\, f(M) = \int d\Omega \prod_i \int d\lambda_i\, f(\lambda_k)\, \Delta_{FP}$$

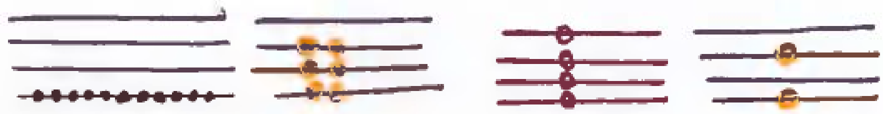
$$\Delta_{FP} = \prod_{i<j} (\lambda_i - \lambda_j)^{2\lambda}$$

G	λ
O(N)	1/2
U(N)	$\lambda = 1$
Sp(N)	$\lambda = 2$

FRACTIONAL-EXCHANGE STATISTICS

$$\psi(x_1 \cdots x_N) \sim \prod_{i<j} (\lambda_i - \lambda_j)^{\lambda}\, \phi(x_1 \cdots x_N)$$

D branes



HALL

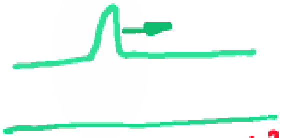
$\lambda = 0$	$\lambda = 1/2$	$\lambda = 1$	$\lambda = 2$	$\lambda = 3$
BOSE	FRACT.	FERM		

SOLITON DUALS : GIANT GRAVITONS

TWO EXTREME CASES:

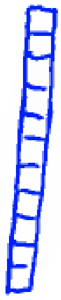
① $\epsilon_{\ell 00\cdots} = \ell(N-1) + \ell^2 = \left(\ell + \frac{N-1}{2}\right)^2 - \left(\frac{N-1}{2}\right)^2$ $\qquad \frac{N-1}{2} = k_F$

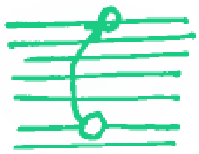
$\chi_3 = (\mathrm{Tr}\,U)^3 + 2\,\mathrm{Tr}\,U^3 + 3\,\mathrm{Tr}\,U\,\mathrm{Tr}\,U^2$

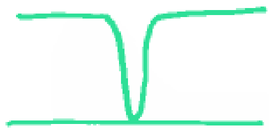


$\omega(k) = k_F|k| + \frac{k^2}{2}$

② $\epsilon_{111\cdots} = \frac{N+1}{2} - \left(\frac{N+1}{2} - \ell\right)^2$







$\tilde{\omega}(k) = k_F|k| - \frac{k^2}{2}$

$\chi_{111} = \frac{1}{6}(\mathrm{Tr}\,U)^3 + 2\,\mathrm{Tr}\,U^3 - 3\,\mathrm{Tr}\,U\,\mathrm{Tr}\,U^2$

MM:

$E = k_F|k| - \frac{\lambda-1}{2} k^2$

BUBBLING AdS SPACE

$$\begin{array}{ccc} \text{AdS} & \longleftrightarrow & \text{CFT} \\ \downarrow & & \downarrow \\ \text{GR} & \longleftrightarrow & \text{FERMIONS} \end{array}$$

$$\int dx \, p(x, E) = 2\pi \hbar \, m$$

$$E_p = 2N_F \, p + p^2 \qquad E_h = 2N_F \, p - p^2$$

$$E_{tot} = \int_x dx \int dp \; E(p, x) = \iint_D dp\,dx \; E(p, x)$$

particle exc. hole exc. D BRANE

$$g^{AdS \cdot S}_{\mu\nu} \sim \int_{\partial D} dl \; m_i' \frac{x_i - x_j}{(\vec{x} - \vec{x}')^2 + y^2} + \sigma_{\text{Boundry}}$$

MM GENERATORS $\qquad$ AdS generators

$$T_+ \; T_- \; T_0 \quad \xleftarrow[z=0]{} \quad l_{-1} \; l_0 \; l_1$$

$$[T_0 \, T_\pm] = \pm T_\pm$$

$$[T_+ \, T_-] = -2T_0$$

AT THE BOUNDRY OF AdS_2
WE HAVE 1 D CFT