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Solutions from boundary condition changing operators in open string field theory [1]

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The general form of analytic solution for regular marginal deformations is introduced by using the boundary condition changing (bcc) operators. The bcc operators σ_L and σ_R satisfy

$$\sigma_L(a)\sigma_R(b) = \exp\left[\lambda \int_a^b \mathrm{d}t\, V(t)\right], \tag{1}$$

where $V(t)$ is the primary operator with weight 1, causing the marginal deformation. The bcc operators are assumed to be primary operators with weight 0. The solution shown in this paper is given as follows:

$$\Psi = -\frac{1}{\sqrt{1-K}}(Q_{\mathrm{B}}\sigma_L)\left[\sigma_R + \frac{B}{1-K}Q_{\mathrm{B}}\sigma_R\right]\frac{1}{\sqrt{1-K}}. \tag{2}$$

It can be confirmed that this is a pure-gauge solution.

The BPZ inner product between the Ψ in (2) and a generic state $\phi = -c\partial c\phi_m$ with ϕ_m being a matter primary operator of weight 0, $\langle \phi, \Psi\rangle$ is important especially for the rolling tachyon. Because of the introduction of the bcc operator, this can be calculated by the factorization into the three-point correlation function $\langle f \circ \phi_m(0)\sigma_L(a)\sigma_R(b)\rangle$ and the ghost part with ghost number 3. Both can be calculated because the three-point correlator of primary fields is fixed in the 2-dim CFT, and the latter is usual calculations seen in the KBc subalgebra. The result has the form

$$\langle \phi, \Psi\rangle = g(h)\, \langle \phi_m(0)\sigma_L(1)\sigma_R(\infty)\rangle_{\mathrm{matter,\,UHP}} \tag{3}$$

with h being the weight of ϕ, where $g(h)$ does not depend on V. This is applied for the rolling tachyon in section 4.

References

[1] M. Kiermaier, Y. Okawa and P. Soler, *Solutions from boundary condition changing operators in open string field theory*, *JHEP* **03** (2011) 122 [1009.6185].

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