A string field theoretical description of (p,q) minimal superstrings[1]

Kyoto university   Hirotaka Irie

E-mail: `irie@gauge.scphys.kyoto-u.ac.jp`

Noncritical string theory is a useful toy model of critical counterparts. There are low degree of freedom and the worldsheet description, Liouville theory, is well developed. Also noncritical strings are interpreted as an ensamble of random surfaces, so formulated as dynamical trianglation, and the nonperturbative definition like matrix models are well established. One of the most important properties of noncritical strings is the integrablility of matrix models. In the two-matrix-model case, there are critical points corresponding to (p,q) minimal strings which are equipped with KP hierarchy. With the language of this integrable system, a string field theory of minimal strings can be constructed and various aspects of the string theory are clarified in this formulation.

One of the motivation of this work is to establish this kind of string field theory of noncritical superstrings and to clarify nonperturbative property of superstrings and relations between superstrings and matrix models. Recently the relationship between type 0 noncritical superstrings and 2-cut critical points of matrix models is proposed. So in this work we extend these proposal to the two-matrix-model cases and construct the corresponding string field theories.

Main results are the following:

- The integrable structure of 2-cut two matrix models is 2-component KP hierarchy with the canonical pair of (P, Q) order $(\hat{p}, \hat{q})$. If $\hat{p} + \hat{q} \in 2Z + 1$, the theory is identified with that of $(p,q) = (2\hat{p}, 2\hat{q})$ minimal superstrings, and $\hat{p} + \hat{q} \in 2Z$ with $(p,q) = (\hat{p}, \hat{q})$.

- Corresponding SFT includes two pairs of $Z_{\hat{p}}$ chiral twisted fermions $(c_a^{(\pm)}(\zeta), \bar{c}_a^{(\pm)}(\zeta))$, which are identified with $\eta = -1$ FZZT branes with Ramond-Ramond charge $\pm$. Their algebraic curves are obtained from the $W_{1+\infty}$ constraint and (p,q) even/odd models are unifiedly described.

- There are also D-instanton operators of ZZ branes given by bilinear operators of fermions.

For more discussion, see the paper [1]. In this paper, other amplitudes like annulus amplitudes are also completely matched with Liouville theory and many other points are clarified.

[1] M.Fukuma and H.Irie, "A string field theoretical description of (p,q) minimal superstrings", in preparation;

---

[1]This talk is based on the work [1] colaborated with Masafumi Fukuma in Kyoto university.