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Central charge and topological invariant of Calabi-Yau manifolds

Tetiana Obikhod

Supersymmetry plays a fundamental role in modern high-energy physics within the framework of the superstring theory and the D-brane theory. Continuing the work of Gauss, Riemann, Poincaré, mathematicians created abstract theorems and consequences that acquired physical meaning with the advent of spaces of extra dimensions in physics. One of the most interesting problems of modern high-energy physics is the calculation of topological invariants - analogs of high-energy observables in physics. In this aspect, symmetries and the use of the apparatus of algebraic geometry play an indispensable role. We considered orbifold as simplest non-flat constructions. For D3-branes on such internal space C^n/Γ the representations are characterized by gauge groups $G = \oplus_i U(N_i)$. In this case the superpotential is of N=4 $U(N)$ super Yang-Mills,

$$W_{N=4} = \mathrm{tr} X^1[X^2, X^3],$$

where X^i are chiral matter fields in production of fundamental representation $V^i \cong C^{N_i}$ of the group $U(N_i)$. Blow up modes of orbifold singularities can be considered as coordinates of complexified Kahler moduli space. Quiver diagrams are used for discribing D-branes near orbifold point. In this case it is possible to calculate Euler character defined as

$$\chi(A,B) = \sum_i (-1)^i \mathrm{dim}\mathrm{Ext}^i(A,B),$$

where $\mathrm{Ext}^0(A,B) \equiv \mathrm{Hom}(A,B)$ and A, B are coherent sheaves over projective space, P^N (general case), which are representations of orbifold space after blowing up procedure. These fractional sheaves are characterized by D0, D2 and D4 Ramon-Ramon charges, which have special type, calculated for C^3/Z_3 case. It is necessary to stress that BPS central charge could be defined through Ramon-Ramon charges and has the following expression for B-type D-branes

$$Z = \sum_p \frac{1}{(d-p)!} ch_p (B + iJ)^{d-p},$$

where the chern character ch_p is the 2p-form.

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On the lattice of quasi-filters of left congruence on simple inverse semigroups

Roman Oliynyk

Throughout this paper S is always a multiplicative semigroup with 0 and 1. The terminologies and definitions not given in this paper can be found in [1-5].

Denoted by $Con(S)$ the set of all left congruence on S.

An inverse semigroup S is a semigroup in which every element $x$in S has a unique inverse y in S in the sense that $x = xyx$ and $y = yxy$.

Definition 1. A quasi-filter (see [**5**]) of S is defined to be subset $\mathcal{E}$ of $Con(S)$ satisfying the following conditions:

1. If $\rho \in \mathcal{E}$ and $\rho \subseteq \tau \in Con(S)$, then $\tau \in \mathcal{E}$.
2. $\rho \in \mathcal{E}$ implies $(\rho : s) \in \mathcal{E}$ for every $s \in S$.
3. If $\rho \in \mathcal{E}$ and $\tau \in Con(S)$ such that $(\tau : s), (\tau : t)$ are in $\mathcal{E}$ for every $(s, t) \in \rho$, then $\tau \in \mathcal{E}$.

Denoted by $S - q - fil$ the lattice of quasi-filters of left congruence on S.

The unique minimal element in $S - q - fil$ is $\omega = S \times S$ and the unique maximal element is $\mathcal{E}_{\triangle_S}$, which contains $\triangle_S$, when $\triangle_S = \{(s, s) | s \in S\}$. Also we call a quasi-filter $\mathcal{E}$ trivial if either it contains $\triangle_S$ or only contains ω.

Theorem 1. *Let S is simple inverse semigroup. Then the lattice of $S - q - fil$ has no trivial quasi-filter if S has normal subgroups form a infinite chain under the set inclusion.*

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