Aspects of minimal $\mathcal{N} = 4$ Chern-Simons theories

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I and my collaborator, T.Nosaka, revisited minimal $\mathcal{N} = 4$ Chern-Simons theories from its exact $\mathbf{S}^3$ partition function and its superconformal index, both of which are reduced to finite-dimensional matrix models by supersymmetric localization. We found some new aspects of this interesting model and some main results are listed below.

[1] The integration in a matrix model of $\mathbf{S}^3$ partition function may be performed completely by using the technique called the Fermi-gas analysis.

[2] The resulting partition function completely factorized into that of pure CS theory for two gauge groups and an analogous contribution for the bifundamental hypermultiplet. We call this *complete factorization*.

[3] We presented the all order 't Hooft expansion of the free energy and discussed the connection to the higher-spin theory in the dual gravity side.

[4] The level/rank (or Seiberg-like) duality, which is expected from the Hanany-Witten transition in the type IIB brane realization, was confirmed from the factorized partition function up to an overall factor, which may be a signal of existence of some *decoupled* sector.

[5] We have analyzed such decoupled sector more precisely by using a superconformal index, which is now still on-going.

In this poster, I will report on this progress.