

Quantum spectral curve of melting crystal model and its 4D limit

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The melting crystal model is a statistical model of 3D Young diagrams. Its partition function can be identified with the instanton partition function of 5D $\mathcal{N} = 1$ supersymmetric $U(1)$ Yang-Mills theory on $\mathbb{R}^4 \times S^1$. Its deformation by a set of external potentials is known to be a tau function of the KP hierarchy. We can derive an associated quantum spectral curve by the method of q -difference Kac-Schwarz operators (arxiv:1609.00882). In the 4D limit where the radius of S^1 tends to 0, this quantum curve turns into the quantum spectral curve of Gromov-Witten theory on $\mathbb{C}P^1$ derived by Dunin-Barkowski, Mulase, Norbury, Popolitov and Shadrin (arxiv:1312.5336). The partition function itself, too, has a natural limit to a generating function of the Gromov-Witten invariants. We can thus reproduce the results of Dunin-Barkowski et al. from a different approach.