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1/2-BPS line defects in 4d N=2 SQFTs via Cohomological Hall algebras

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Supersymmetric quantum field theories (SQFTs), particularly those with N=2 supersymmetry in four dimensions, often exhibit intricate behaviors. Yet, their rich structures can be more tractable than those of their non-supersymmetric counterparts. Notably, their BPS sectors are governed by algebraic frameworks reminiscent of those in simpler holomorphic-topological models.

In this talk, I will focus on the 1/2-BPS line defects in such theories, which are expected to form monoidal categories endowed with additional structures, such as rigidity and a system of renormalized r-matrices. These structures encapsulate the fusion, duality and "meromorphic" brading properties of lines.

Building upon this, we propose a construction that associates to each theory a category of bimodules over the Cohomological Hall Algebra (CoHA) derived from its BPS quiver. This category is designed to mirror the anticipated properties of the category of line defects, providing a bridge between the physical intuition and mathematical formalism.

Based on joint work with Davide Gaiotto and Wei Li.

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