Spin chains, defects, and quantum wires for the quantum-double edge

Non-Abelian defects that bind Majorana or parafermion zero modes are prominent in several topological quantum computation schemes. Underpinning their established understanding is the quantum Ising spin chain, which can be recast as a fermionic model or viewed as a standalone effective theory for the surface-code edge -- both of which harbor non-Abelian defects. We generalize these notions by deriving an effective Ising-like spin chain describing the edge of quantum-double topological order. Relating Majorana and parafermion modes to anyonic strings, we introduce quantum-double generalizations of non-Abelian defects. We develop a way to embed finite-group valued qunits into those valued in continuous groups. Using this embedding, we provide a continuum description of the spin chain and recast its non-interacting part as a quantum wire via addition of a Wess-Zumino-Novikov-Witten term and non-Abelian bosonization.