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The mixed 0-form/1-form anomaly in Hilbert space: pouring new wine into old bottles

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We study four-dimensional gauge theories with arbitrary simple gauge group with 1-form global center symmetry and 0-form parity or discrete chiral symmetry. We canonically quantize on a three-torus in a fixed background field gauging the 1-form symmetry. We show that the mixed 't Hooft anomaly results in a central extension of the global-symmetry operator algebra. We determine this algebra in each case and show that the anomaly implies degeneracies in the spectrum of the Hamiltonian at any finite-size torus. We discuss the consistency of these constraints with both older and recent semiclassical calculations in SU(N) theories, with or without adjoint fermions, as well as with their conjectured infrared phases.

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