MP 9: Anomalies in Quantum Field Theory

Time: Wednesday 14:00–14:50 Location: H7

MP 9.1 Wed 14:00 H7

Deformations of Supergravity and Supersymmetry Anomalies — •Markus B. Fröb[1], Camillo Imbimbo[2], and Nicolò Risso[3] — [1]Universität Leipzig, Leipzig, Germany — [2]Università di Genova, Genoa, Italy — [3]Università di Padova, Padua, Italy

We present a BRST analysis of supersymmetry anomalies of $\mathcal{N} = 1$ supersymmetric quantum field theories with anomalous R symmetry. To this end, we consider the coupling of the matter theory to classical $\mathcal{N} = 1$ new minimal supergravity. We point out that a supersymmetry anomaly cocycle associated to the $\mathrm{U(1)_R}$ field does exist for this theory. It is non-trivial in the space of supergravity fields (and ghosts), but it becomes BRST-exact in the functional space that includes antifields. Equivalently, the $\mathrm{U(1)_R}$ supersymmetry anomaly cocycle vanishes "on shell". It is therefore removable. However, to remove it — precisely because it is not trivial in the smaller space of fields — one needs to deform the supergravity BRST operator. This deformation is triggered, at first order in the anomaly coefficient, by a local operator S_1 of ghost number 1. We give a cohomological characterization of S_1 and compute it in full detail. At higher orders in the anomaly coefficient, we expect a priori that further deformations of the BRST rules are necessary.

MP 9.2 Wed 14:25 H7

Exploring anomalies by many-body correlations — •Klaus Morawetz — Münster University of Applied Sciences, Stegerwaldstrasse 39, 48565 Steinfurt, Germany — International Institute of Physics - UFRN, Campus Universitário Lagoa nova, 59078-970 Natal, Brazil

The quantum anomaly can be written alternatively into a form violating conservation laws or as non-gauge invariant currents seen explicitly on the example of chiral anomaly. By reinterpreting the many-body averaging, the connection to Pauli-Villars regularization is established which gives the anomalous term a new interpretation as arising from quantum fluctuations by many-body correlations at short distances. This is exemplified by using an effective many-body quantum potential which realizes quantum Slater sums by classical calculations. It is shown that these quantum potentials avoid the quantum anomaly but approaches the same anomalous result by many-body correlations. A measure for the quality of quantum potentials is suggested to describe these quantum fluctuations in the mean energy. Consequently quantum anomalies might be a short-cut way of single-particle field theory to account for many-body effects. This conjecture is also supported since the chiral anomaly can be derived by a completely conserving quantum kinetic theory. [Eur. Phys. J. B 92 (2019) 176, Phys. Lett. A 383 (2019) 1362, arXiv:2004.01507]