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Unstable Nambu-Goldstone modes

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Nambu-Goldstone (NG) modes for 0-form and higher-form symmetries can become unstable in the presence of background fields. The examples include the instability of a photon with a time-dependent axion background or with a chirality imbalance, known as the chiral plasma instability, and the instability of a dynamical axion with a background electric field. We show that all these phenomena can be universally described by a symmetry algebra for 0-form and higher-form symmetries. We prove a counting rule for the number of unstable NG modes in terms of correlation functions of broken symmetry generators. Based on our unified description, we further give a simple new example where one of the NG modes associated with the spontaneous 0-form symmetry breaking $U(1) \times U(1) \to 1$ becomes unstable.

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