NIELSEN IDENTITIES IN THE STANDARD MODEL

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It is not always clear whether definitions of physical quantities is really physical, for example, it may be that the definition is gauge-dependent. One of investigating gauge-dependence is the use of Nielsen Identities [1] — a generalised form of Slavnov-Taylor Identities [2], which come from BRST symmetry [3, 4]. These Identities enable us to express dependence on the gauge parameter in terms correlation functions containing BRST sources related to the gauge parameters.

This study focuses on understanding Nielsen Identities in the Standard Model, in which we investigate the gauge dependence of quark self-energies. We explore dependencies of quark self-energies on the gauge parameter in two distinct ways: 1) by calculating the Nielsen identities via a BRST Lagrangian; 2) by calculating quark self-energies and taking the derivative with respect to the gauge parameter. The goal is to check the consistency between the results obtained through both approaches.

In this presentation, we will introduce all the needed concepts as well as our progress.

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