Non Linear Gauge Fixing for FeynArts

Jurgis Pašukonis and Thomas Gajdosik

Institute of Physics and Vilnius University

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2. Non Linear Gauge Fixing in the SM

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3. Non Linear Gauge Fixing in the MSSM
4. Outlook

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- Then why the talk here?
  - There was no FeynArts model file.
  - The actual messy calculations are "left as exercises for the reader".

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- Difficulties and Problems
  - We had to change the existing Lorentz files.
    - `Lorentz.gen` does not support the extended couplings.
    - `Lorentz.gen` has a wierd definition for the ghost propagator $\frac{i\sqrt{\xi}}{p^2-\xi m^2}$.
    - `Lorentzbgf.gen` does not support all counter terms: ghost wfr and mass.

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The gauge fixing conditions are defined for the mass bases $\{A_\mu, Z_\mu, W_\mu^\pm\}$ and $\{H_h, H^\pm, G^0, G^\pm\}$, $h = 1, 2, 3$:

$$F^A = \partial^\mu A_\mu \ , \qquad F^Z = \partial^\mu Z_\mu + \xi_Z m_Z G^0 + \tfrac{1}{2} g_Z \xi_Z \tilde{\epsilon}_h H_h G^0 \ ,$$

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with the additional 9 parameters $\tilde{\alpha}, \tilde{\beta}, \tilde{\delta}_h, \tilde{\epsilon}_h, \tilde{\kappa}$ (only 7 for CP conserving).

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- Gauge invariance of the MSSM is easy in the interaction basis,
- but non trivial in mass eigenstates.
- Parameters can be used to check gauge invariance numerically.
- It is hopefully useful for checks in the Complex Mass Scheme (CMS).
  A. Denner, S. Dittmaier,
  Nucl. Phys. Proc. Suppl. **160** (2006) 22 [arXiv:hep-ph/0605312].

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- Difficulties and Problems
  - There was little time for checks and no numeric check **yet** .

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- Calculate processes for the LHC
  - to get students in Lithuania interested in particle physics.

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- the Conference organizers
  - for starting with the preSUSY school
  - and for providing a welcoming atmosphere.