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Towards a beyond the Standard Model model with elementary particle non-perturbative mass generation

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We show that a recently discovered non-perturbative field-theoretical mechanism giving mass to elementary fermions, is also capable of generating a mass for the electro-weak bosons and can thus be used as a viable alternative to the Higgs scenario. A detailed analysis of this remarkable feature shows that the non-perturbatively generated fermion and W masses have the parametric form $m_f \sim C_f(\alpha)\Lambda_{RGI}$ and $M_W \sim g_w c_w(\alpha)\Lambda_{RGI}$, respectively, where the coefficients $C_f(\alpha)$ and $c_w(\alpha)$ are functions of the gauge couplings, g_w is the weak coupling and Λ_{RGI} is the RGI scale of the theory. In view of these expressions, we see that to match the experimental value of the top quark and W masses, we need to conjecture the existence of a yet unobserved sector of massive fermions subjected, besides ordinary Standard Model interactions, to some kind of super-strong gauge interaction, so as to have the RGI scale of the whole theory in the TeV region. Though limited in its scope (in this talk we ignore hypercharge and leptons and discuss only the case of one family, neglecting weak isospin splitting), this approach opens the way to a solution of the mass naturalness problem and an understanding of the fermion mass hierarchy.

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