Higgs particle in TGD

1. Higgs has been the black sheet of TGD for decades. There are several questions which one must distinguish from each other.

   (a) Does TGD predict/allow Higgs like particle or not?

   (b) If Higgs like particle exists in TGD Universe, does Higgs vacuum expectation provide a mechanism of particle massivation.

   (c) Could it be that Higgs mechabism makes sense only in quantum field theoretic description relying on point like particles? This assumption does not hold true in TGD and Higgs mechanism is indeed only parametrization in the case of fermions. The couplings of fermions to Higgs are chosen to reproduce the mass spectrum.

   The recent discovery of Higgs meant a very intense period of work in attempts to understand Higgs in TGD. TGD allows Higgs but p-adic thermodynamics suggests itself strongly as the proper description of massivation. The analog of Higgs vacuum expectation is not completely excluded as the description at QFT limit of TGD.

2. Possible answers to the questions.

   (a) TGD allows Higgs like particles and it would be very difficult to develop a convincing argument for their non-existence. The model for elementary particles as string like objects consisting CP_2 of "urfermions" with electroweak quantum numbers of electron and quark allows also scalar particles.

   (b) The notion of Higgs vacuum expectation as fundamental mechanism of particle massivation is not supported by the following argument.

      i. Higgs would naturally correspond to CP_2 vector field -most naturally in complex coordinates for CP_2 behaving like electro-weak doublet.

      ii. This field should be covariantly constant but CP_2 does not allow covariantly constant vector fields. This could conform with the view that p-adic thermodynamics describes particle massivation.

   (c) One can consider loophole to this argument. Could it happen that Higgs field is covariantly constant only with respect to the induced spinor connection?

3. Quite recent little progress in the understanding of Kähler-Dirac equation suggests that the analog of Higgs vacuum expectation might be present and could even code for masses although p-adic mass calculations certainly are the manner to understand particle masses.

   (a) The Kähler-Dirac action for the modes of induced imbedding space spinor field reduces to a vanishing contribution in the interior of space-time surface and by weak form of electric magnetic duality (WFEMD) to a boundary term given by Chern-Simons action.

   (b) For the light-like partonic orbits associated with wormhole contacts these terms must vanish by conservation of fermionic charges and one obtains just algebraic form of M^4 Dirac action at the partonic 2-surface so that massless fermionic propagators are obtained. Nothing Higgs like in propagators.

   (c) At the space-like 3-surfaces defining the ends of space-time at boundaries of CDs one obtains algebraic massless Dirac plus Chern-Simons term.

   (d) Could this term play the the role of Higgs vacuum expectation? Does this term give only a small additional contribution to the masses of particles besides that given by p-adic thermodynamics for wormhole con- tacts and for string like object in electroweak or even Compton length scale?

   (e) What happens at at the ends of string world sheets? Here the Higgs termwould correspond to the normal (time-like) component Γ^n of KD gamma matrix. Vanishing of boundary variation gives mass shell condition with Higgs massterm: $(p^k\gamma_k + \Gamma^n)\Psi = 0$.

(f) CP_2 part of ^{n} would give non-tachyonic contribution to fermion mass. This terms might provide correlate for the particle mass as given by p-adic mass calculations at some level of hierarchy of spacetime sheets.

(g) M^4 part of ^{n} would give a tachyonic contribution, which might relate to the still poorly understood question about how the tachyonic ground states of super-conformal representations with half integer con- formal weight needed in padic mass calculations emerge.