Guest Editorial

The Aftermath of Europhysics 2011

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Abstract

In this Guest Editorial, some alternative visions about the physics after Europhysics 2011 are discussed.

The general feeling at the Eve of Europhysics 2011 conference was that this meeting might become one of the key events in the history of physics. This might turn out to be the case. CDF and D0 were the groups representing the data from p-pbar collisions at Tevatron whereas ATLAS and CMS represented the data about p-p collisions at LHC. The blog participation transformed the conference from a closed meeting of specialists to a media event inspiring intense blog discussions and viXra log became the most interesting discussion forum thanks to the excellent postings of Phil Gibbs giving focused summaries of various reports about SUSY and Higgs.

The hope was that two basic questions would receive a unique answer. Does Higgs exist and if so what is its mass? Is the standard view about SUSY correct: in other words do the super-partners exist with masses below TeV scale? It was clear that negative answer to even the Higgs issue would force a thorough reconsideration of the status of not only MSSM but also that of super string theory and M-theory because of the general role of Higgs mechanism in the description massivation and symmetry breaking for the QFT limits of these theories. The implications are far reaching also for the inflationary cosmology where scalar fields and Higgs mechanism are taken as granted. Actually the non-existence of Higgs forces to reconsider the entire quantum field theoretic description of particle massivation.

Already before the conference several anomalies had emerged and the question was whether LHC data gives a support for these anomalies.

- A 145 GeV bump with 4 sigma significance in the mass distribution of jet pairs jj in Wjj final states was reported by CDF but not confirmed by D0. The interpretation as Higgs was excluded and some of the proposed identifications of 145 GeV bump was as decay products of leptophobic Z' boson or of technicolor pion. There were also indications for 300 GeV bump in the mass distribution of Wjj states themselves suggesting cascade like decay.

- Both CDF and D0 had reported two bumps at almost same mass about 325 GeV having no obvious interpretation in standard model framework. Technicolor approach and also TGD suggests an interpretation as pionlike state.

- CDF and D0 had also reported anomalous forward-backward asymmetry in top-pair production in p-pbar collisions suggesting the existence of new kind of flavor changing colored neutral currents. TGD based explanation of family replication phenomenon combined with bosonic emergence predicts that gauge bosons should appear as flavor singlets and octets. Octets would indeed induce flavor changing currents and asymmetry. Also many other indications for new physics such as anomalously large CP breaking in BBbar system had been reported and one should not forget long list of forgotten anomalies from previous years, say the two and half year old CDF anomaly which D0 failed to observe. Recall also that proton has shown no signs of decaying.

What did we learn during these days? Already before the conference it was clear that standard SUSY had transformed from the healer of the standard model to a patient. The parameter space for MSSM (minimal supersymmetric extension of standard model predicting two Higgs multiplets) had been narrowed down by strong lower limits on squark and sgluon masses to the extent that the original basic motivation for MSSM (stability of Higgs mass against radiative corrections) had been lost as well as the explanation for the anomaly of g-2 of muon. During the conference the bounds on SUSY parameters were tightened further and the rough conclusion is that squark and gluinos masses must be above 1 TeV. Even

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Lubos Motl was forced to conclude that the probability that LCH discovers standard SUSY is 50 per cent instead of 90 per cent or more of 2008 blog posting. In TGD framework simple p-adic scaling arguments lead to the proposal that the only sfermions with mass below 1 TeV are selectron and sneutrinos with selectron having mass equal to 250 GeV. Low sneutrino masses allow in principle to understand g-2 of muon and it could fix the muonic sneutrino mass. Selectron could decay to electron plus neutralino for which mass must be larger than 46 GeV neutralino would eventually decay to photon or virtual Z plus neutrino.

The Higgs issue became the central theme of the conference and the three days from Thursday to Sunday were loaded with excitement. After many twists, the final conclusion was that there is 2.5 sigma evidence from ATLAS for a state in the mass range 140-150 GeV, which might be Higgs or something else. The press release of Fermi lab at Friday announced that they have confined Higgs to the interval 120-137 GeV. After the announcement of ATLAS both D0 and CDF discovered suddenly evidence for Higgs in 140-150 GeV mass range. The evidence for this mass range emerged from the decays of a might-be Higgs to WW pairs decaying in turn to lepton pairs. The proponent of technicolor would of course see this as evidence for an off mass shell state of a neutral pion like state explaining also the jj bump in Wjj system and at 145 GeV mass and not allowing an interpretation as Higgs. In TGD framework the experience with earlier anomalies such as two year old CDF anomaly encouraged the interpretation in terms p-adic mass octaves of the pion of p-adically scaled up variant of hadron physics with mass scale 512 times higher than that of the ordinary hadron physics. Somewhat frustratingly, the final conclusion about the Higgs issue was promised to emerge only towards the end of the next year but it is clear that already now standard model might well be inconsistent with all data irrespective of the mass of Higgs. MSSM would allow additional flexibility but is also in difficulties.

The surprise of the first conference day was additional evidence for the bump at 327 GeV reported already earlier by CDF. This state is a complete mystery in standard model framework and therefore extremely interesting. The proponents of technicolor would probably suggest interpretation as exotic ρ or ω meson. in TGD framework both 145 GeV pion and 325 GeV ρ and ω appear as mesons of M_{89} hadron physics if one assumes that the u and d quarks of M_{89} physics have masses corresponding to the p-adic length scale $k = 93$ (mass is 102 GeV and should be visible as a preferred quark jet mass).

Also super string inspired predictions of various exotics such as microscopic black holes, strong gravity, large extra dimensions, Randall-Sundrum gravitons, split supersymmetry, and whatever were tested. No evidence was found. Neither there was evidence for lepto-quarks, heavier partners of intermediate gauge bosons, and various other exotics.

To my view, the results of the conference force to re-consider the basic assumptions of the approach followed during last more than three decades. Is it possible be find a more realistic physical interpretation of mathematically extremely attractive supersymmetry? Unitarity requires new physics in TeV scale: is this new physics technicolor or its TGD analog or something else? To me however the mother of all questions concerns the microscopic description of massivation: the description in terms of Higgs is after all a phenomenological description borrowed from condensed matter physics. What actually happens in the massivation: could it be that all components of Higgs, of its super partners, and of its higher spin generalizations are eaten in a process in which massless multiplets with various spins combine to form only massive multiplets. Here twistor approach might provide the guideline since its applicability requires that massive particles should allow interpretation as bound states of massless ones. Perhaps the simple observation that spin one bound states of massless fermion and anti-fermion are automatically massive might help to get to the deeper waters.