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Seminar on

THEORETICAL PARTICLE PHYSICS

on Wednesday, 21 October 2015, at 2.00 p.m. c.t.
Theresienstraße 37 / III, Seminar Room A318

Speaker: Rafael Delgado
Theoretical Physics Department I
Universidad Complutense de Madrid, Spain

Title: "Uses of the non-linear Electroweak Chiral Lagrangians at the TeV Scale"

Abstract
The Standard Model (SM) is a weakly interacting theory, which keeps unitarity even a tree level. In the particular case of longitudinal gauge boson scattering, the Higgs couplings are precisely those that cancel the terms which make the elastic cross section too large at the TeV and higher scales. However, if the couplings were slightly modified, this fine cancellation would no longer work, so that new physics is necessary to recover the unitarity bound. In a similar way to the low energy regime of QCD, it can happen that the perturbative approach no longerworks.
One way of parameterizing a beyond-SM theory at low energy, without specifying a particular renormalizable theory, is using an Effective Field Theory (EFT), which means maintaining the SM but slightly changing the couplings. But, when using it at the TeV scale, the longitudinal gauge boson scattering would break unitarity, due to the fact that the theory is no longer weakly interacting. This happens even when

we go to NLO (Next to Leading Order computation), where new subleading effective couplings need to be introduced to fulfill the renormalization, as the theory is no longer renormalizable. What can be done, if the usual perturbative approach does not work? In this work, we use different Unitarization Procedures, which were successfully applied to the QCD effective Lagrangian in order to deal with its strongly coupled regime.
Now, they are applied to a NLO Electroweak Chiral Lagrangian within its strongly coupled regime. The scattering processes VV->VV, VV->hh, hh->hh and AA->VV are considered, where V=W,Z are the longitudinal components of the gauge bosons at high energy. And an extensive study of the validity range of the different unitarization procedures is also given.

Prof. Buchalla