

Strong dynamics beyond the Standard Model at LHC and Future Colliders

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collaboration:

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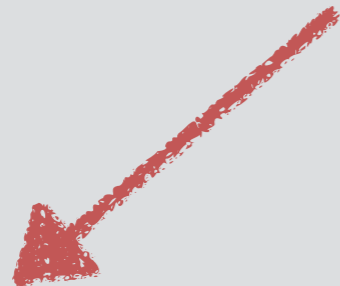
Activity and plans

- Activity 2019
 - D.Harada visited IP2I Lyon in September 2019; A.Deandrea visited KEK in October 2019. G.Cacciapaglia co-organized the workshop Composite 2019 in Guangzhou; A.Deandrea and G.Cacciapaglia co-organized the workshop in Lyon in July 2019.
 - Conference talks:
 - M. Hashimoto, "Fundamental Composite Higgs and Phase Structure", talk at Composite 2019: The 2019 International Workshop on Composite Higgs, Dark Matter, Neutrinos and Related Topics, 21-24 Nov. 2019, Guangzhou, China
 - M. Hashimoto, "Fundamental Composite Higgs and Phase Structure", talk at KEK Theory Meeting on Particle Physics Phenomenology (KEK-PH2020), 18-21 Feb. 2020, KEK, Tsukuba, Japan
 - D. Harada, "Higgs boson pair production in the Composite Higgs Model" talk at KEK Theory Meeting on Particle Physics Phenomenology (KEK-PH2020), 18-21 Feb. 2020, KEK, Tsukuba, Japan
- Activity 2020
 - M.Hashimoto planned visit to IP2I Lyon of March-April 2020 postponed due to corona-virus
 - Small workshop organisation in Lyon in September 2020 with Labex-LIO funding on the subject of the collaboration.

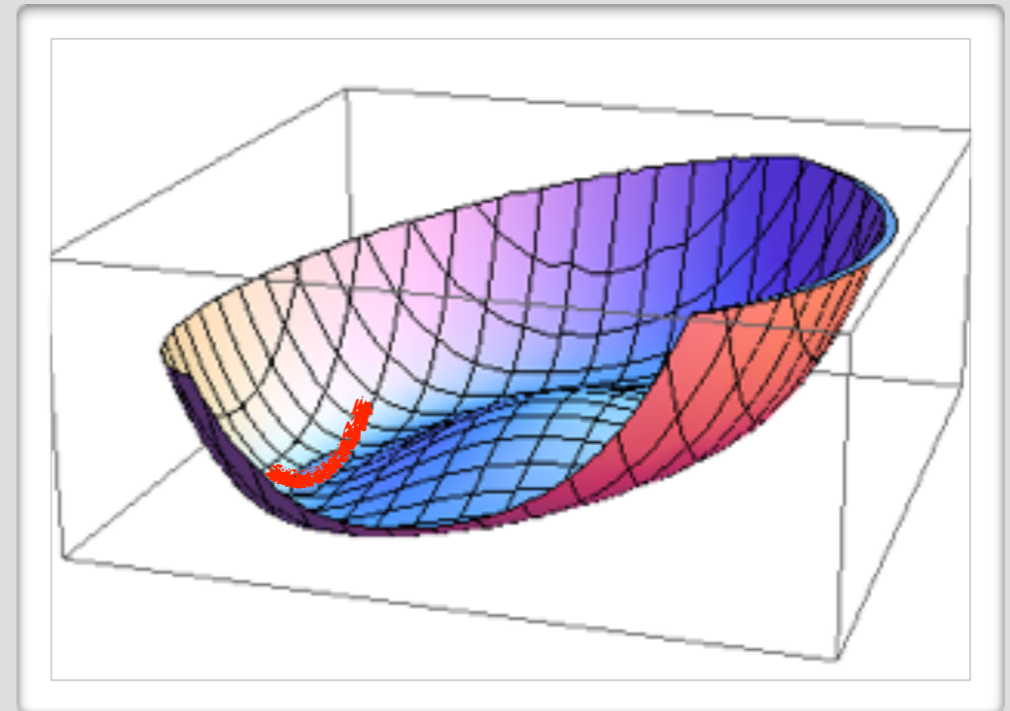
Strong dynamics in the EW sector

Global symmetry containing the gauged part:

$$G \longrightarrow H$$



$$SU(2)_X U(1) \longrightarrow U(1)_{em}$$



In the models of “Strong Dynamics” the Higgs boson is naturally light as it is a pseudo Nambu-Goldstone boson of the broken symmetry of the strong sector, parameterised with an effective chiral Lagrangian, which can be computed in terms of new fundamental fermionic states of which the bound states we study are made of.

Which models, which resonances?

- Strong dynamics for the EW sector:

- spin 1 (popular guess but S parameter needs extra contribution (axial-vector, ...), via Drell-Yan mainly, **typically heavy**)

- spin 0 (new composite scalars, PNgB) already the minimal model contains more than the Higgs!

- spin 1/2 (new vector-like fermions)

- Extended SM scalar sector, DM candidate

- **We focus on the spin 0 (and spin 1/2 (vector-like) bound states in these models**

Perspectives

- Current limits with the LHC data span up to 1 TeV in mass for vector-like quarks (actual limits depend on the specific decay patterns and we study possible extra decay modes).
- Scalars/Pseudoscalars may be much lighter and difficult to detect. We study specific signatures which are of special interest for future colliders and HL/HE LHC.
- We study new final states for top-partner searches.
- We investigate realistic set-ups and signatures in composite models at the LHC and future colliders.