UK Node

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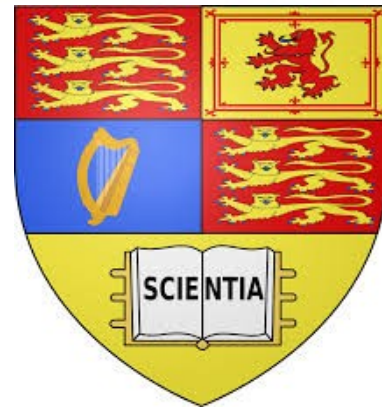**HiggsTools**

Kick-Off Meeting

UCL April 2014

University College – ATLAS

- The UCL ATLAS group is involved in SM measurements, especially jets and vector boson fusion & scattering, as well as Higgs searches/measurements especially H->bb

- In addition, Sinead Farrington from Warwick is a member of the network, and very involved in WBF signatures

Imperial College – CMS

- The Imperial CMS group is very active in the studies of the found Higgs boson, in particular the $\gamma\gamma$, the $\tau\tau$ and the invisible modes.

- We expect to continue in these and try to make more and more precise measurements of the properties.

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IPPP Durham

- The group in Durham is active in all aspects of particle physics phenomenology, including precision calculations, construction of event generators, and phenomenology studies.

- In addition Richard Ball from Edinburgh provides expertise in PDFs

Projects:

ESR 1 (TH)

- Heavy particle initial statres for NLO MC simulations, in particular in bb → H and H-b associated production

ESR 2 (ATLAS)

- Boosted SM and BSM Higgs boson channels and establishment of novel reconstruction techniques

ESR 3 (TH)

- H + jet production at NNLO, construction of a parton – level MC for this process, related phenomenology studies

ESR 4 (CMS)

- Measurement of Higgs couplings in various decay channels, in particular in WBF and for H → invisible

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Expertise in the overall node

Experimental:

- $H \to \gamma\gamma$

- WBF, $H \to \tau\tau$, $H \to$ invisible.

- Boosted bosons and jet substructure

- Jets and jet vetoes

- B-tagging, $H \to bb$

- Trigger

- Statistical combination

- MC, validation & tuning

Theoretical:

- Multi-loop calculations

  - NNLO (Glover)

  - N^3LO (Duehr) $gg \to H$

- Tools for boosted objects and shower deconstruction of events (Spannowsky)

- Precision MC (Krauss)

- PDFs (Ball)

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Expertise in the overall node

Organisation matters:

- Organisation of workshops and schools:

    – YETI   (UK school for PhD students)

    – Other network schools

- Involvement in similar other networks:

    – LHCphenonet, MCnet, TeraUniverse (London Unis)

- Outreach activities:

    – Organisation of HEP master classes, school visits etc.

    – Jon's blog on the Guardian

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Inner-node links & activities:

- UK deeply involved in relevant tools:
  PDFs, MCs, advanced analysis and statistical tools, Rivet, Professor, HepData

- Joint appointments of ESRs 2 & 4

- Intensified Exp – Th interactions, joint visits & workshops

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Inner-network links:

- Co-supervision of PhD students:

    – ESRs 1, 3, 8, 13

- Additional secondments

    – DUR ↔ ALU-FR, DUR ↔ ETH, DUR ↔ DFTTO,

- Joint projects

    – NNLO & NNNLO (DUR ↔ ETH)

    – Sherpa + Gosam (DUR ↔ MPI), Sherpa + OpenLoops (DUR ↔ UZ)

    – Explore ATLAS-CMS links and synergy (DUR-IC ↔ ALU-FR)

    – NNPDF (DUR-Edi ↔ DFTTO-Milan)

    – Pheno studies with new scalars (DUR ↔ CNRS)

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Outside links:
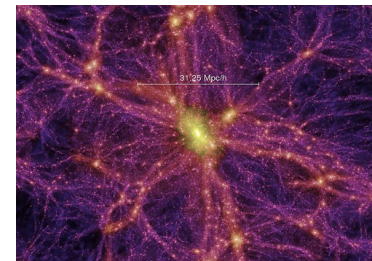
- Very visible role of exp. members in collaborations: ex-spokesperson, working group convenerships etc.

- Active role in LHC HXSWG

- Further networks: LHCphenonet, MCnet

- MC collaborations, HepTopTagger etc.