HiggsTools

the 

Node

Presented by *Giampiero Passarino* at the

HiggsTools Kick-Off Meeting 2−4 April 2014 London

Torino
Milano
Pavia

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Mario Pelliccioni
Sandro Uccirati

Stefano Forte
Federico Carminati
Alessandro Vicini
Giancarlo Ferrera

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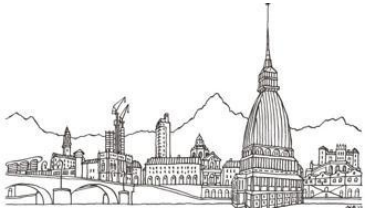


Talent wins games, but teamwork wins championships

① *G. Passarino* (TH) Deputy Coordinator, Node Coordinator thesis advisor

② *C. Mariotti* (CMS) WP1 leader, thesis advisor

③ *D. Rebuzzi* (ATLAS) recruitment committee

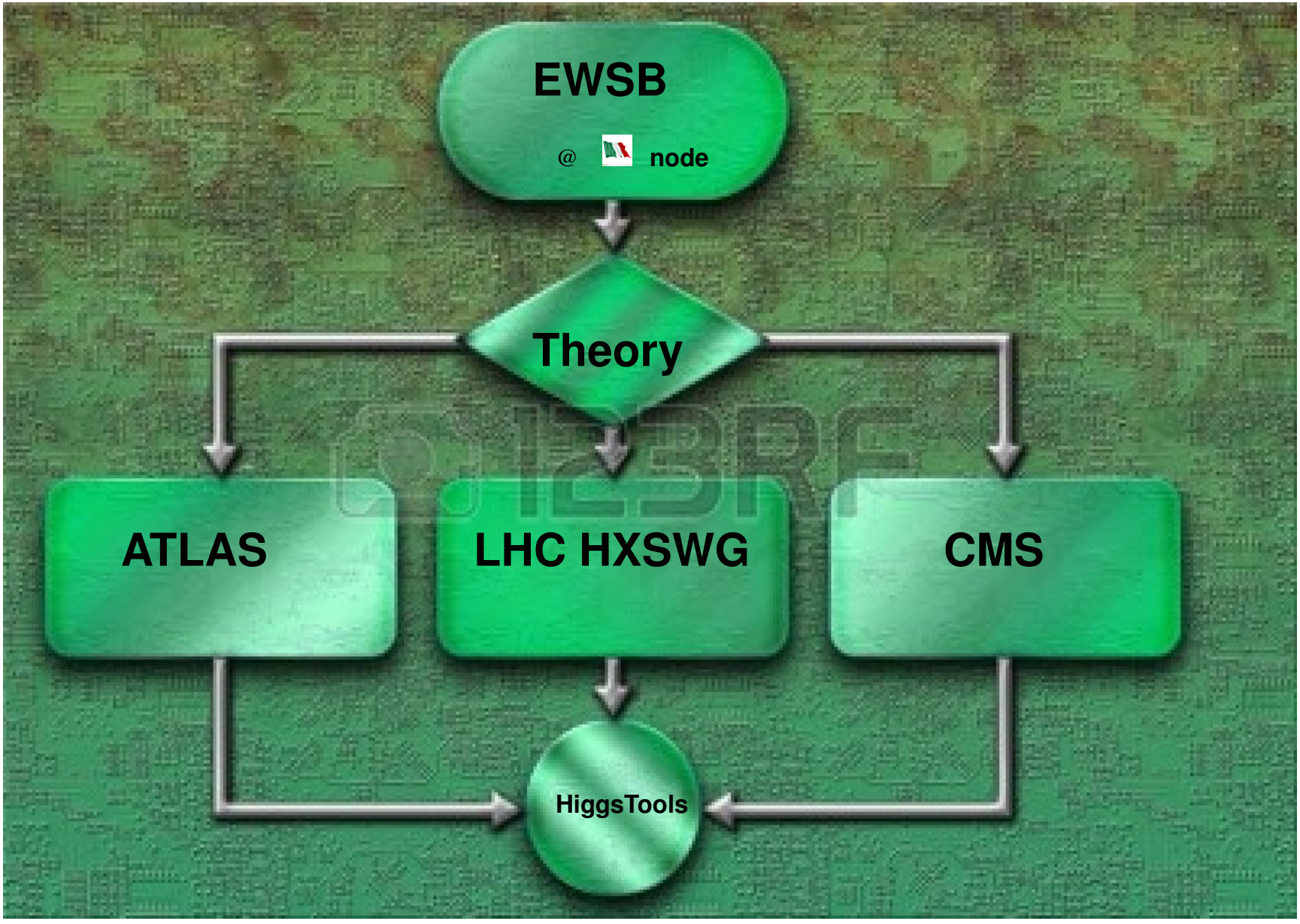
④ *S. Forte* (TH) thesis advisor

⑤ *F. Carminati* (ATLAS) thesis advisor

⑥ *N. Amapane* WP1/WP2 *M. Pelliccioni* WP1/WP2 (CMS) *R. Bellan* WP1/WP2 (CMS)

⑦ *L. Magnea* WP1 *E. Maina* WP3 *S. Uccirati* WP1/WP2 (TH)

⑧ *G. Ferrera* WP1/WP2 *A. Vicini* WP1/WP2 (TH)

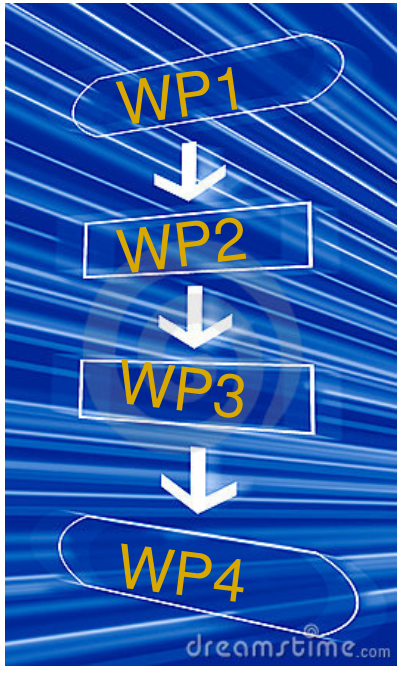

EWSB
@ node
Theory
ATLAS
LHC HXSWG
CMS
HiggsTools

Excellence is not a skill. It is an attitude. **Ralph Marstone**

No precision for precision's sake!

Precision for a discovery search!

HEFT *Higgs Couplings* *Loops* *Automated Algorithms* PDF *resummation*
TH uncertainty *EW* EVENT GENERATORS *Higgs Production* *Infrared*
Singularities *nest-to-eikonal* NNPDF *UV Completion* VECTOR
BOSON *scattering* PSEUDO *observables* *mixed EW-QCD*



https://twiki.cern.ch/twiki/bin/view/LHCPhysics/CrossSections

Higgs width
Higgs couplings

CERN

Freiburg
Würzburg
Zurich

Edinburgh
Amsterdam
Louvain-FOM

EW, N^{n}LO

QCD, NNPDF, resummation

https://nnpdf.hepforge.org/

ToMiPv

Every sin is the result of a collaboration **Lucius Annaeus Seneca**

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ALMA UNIVERSITAS TAURINENSIS

where the HXSWG was invented

① *G. Passarino* EW, Higgs, multi-loop; HXSWG overall contact

② *L. Magnea* QCD, resummation

③ *S. Uccirati* EW, multi-legs

① *C. Mariotti* (CMS) Higgs, **ZZ**; HXSWG overall contact

② *N. Amapane* (CMS); **HZZ4l** convener

③ *R. Bellan* (CMS) **VV** -scattering

④ *M. Pelliccioni* (CMS); HXSWG BSM convener

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① *S. Forte* NNPDF, N^{3}LO PDF, resummation; HXSWG PDF convener

② *G. Ferrera* resummation; HXSWG **WH/ZH** convener

③ *A. Vicini* EW-QCD, PDF-MC

Expertise of the node:

M2.1.2 Better control of theoretical uncertainties for the SM-like Higgs boson scenario

M2.3.2 Better control of theoretical uncertainties (on backgrounds)

- Resummation and its use for the improvement of fixed-order calculations
- Mixed strong-electroweak corrections, also through their impact on PDFs

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Expertise of the node:

M3.2.2 Automated matching of NLO codes to the parton shower

M3.3.2 Methods for PDF uncertainties in shower Monte Carlos

M3.3.3 Improved PDFs using LHC data

M3.3.4 Consistent PDF fits at NNLO

- integration of the NNPDF sets into aMC@NLO
- development of dedicated PDF sets for usage within Monte Carlos,
- interplay between PDF uncertainties and Monte Carlos
- New NNPDF sets with LHC data, and with various theoretical impovements such as QED corrections, intrinsic heavy quarks
- $N^3$3LO PDFs, theoretical uncertainties on PDFs

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Links with activities outside the network:

① significant overlap with the NNPDF collaboration, of which Forte is spokesman, https://nnpdf.hepforge.org/

② collaboration with the PDF4BSM ERC starting grant (Juan Rojo, Oxford) http://www.juanrojo.com/pdf4bsm

③ collaboration with the Higgs center in Edinburgh http://higgs.ph.ed.ac.uk/, and also with the Discovery center at the Niels Bohr Institute http://discoverycenter.nbi.ku.dk/ of both of which Forte is a scientific associate, on topics related to resummation and precision QCD corrections to Higgs production and decay

④ collaboration with the European Investment Bank project (http://www.eiburs.unimi.it/) on the cost-benefit assessment for fundamental research infrastructuires (EIBURS) of which S. Forte is one of the principal investigators

University of Pavia and INFN, Sezione di Pavia: *Daniela M. Rebuzzi* (ATLAS)

- (within ATLAS) Higgs MC Manager, supervising the Higgs related MC (signal+backgrounds) productions for the ATLAS HWG with the following responsibilities: gather the requests from all Higgs subgroups and prepare a production priority list, coordinate the MC validation efforts, inform the experimental community group about the latest developments in MC and their tunings, update and maintain a Web page giving the relevant information

① Member of the ATLAS Higgs Coordination Board, member of the ATLAS Higgs management.

② HXSWG BR convener