

The electroweak sector of the SM and Run-3 operations WG-2

Status Report :
Recap + new information for Report #4

FAPESP Thematic 2020/04867-2

May 27 2026

Marco Leite - IFUSP



1. Physics analysis

1. Precision measurements in SM - finished
2. $HH \rightarrow bb\tau\tau$: main focus now, as it is a high profile analysis ...

2. Operations

1. Run-3 data taking (ending soon)

3. Phase-II upgrade

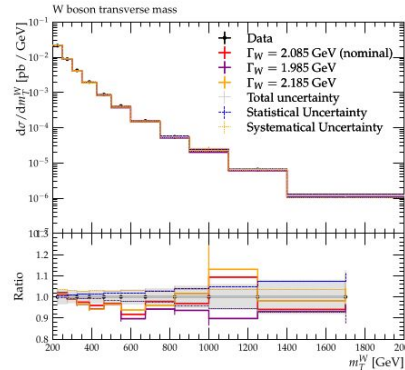
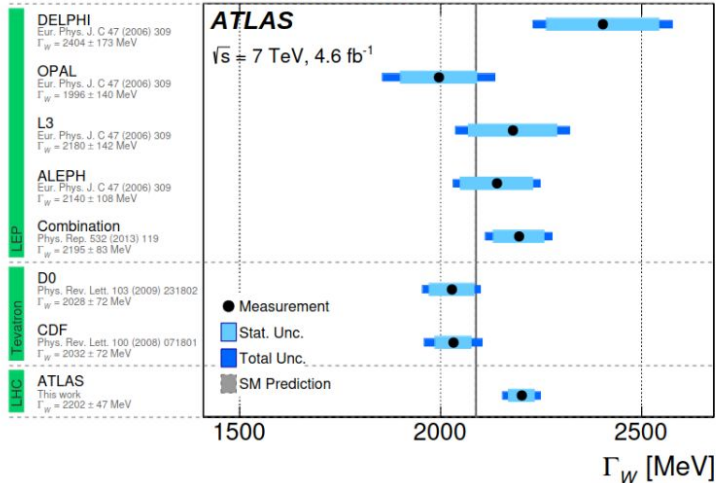
1. Report will go on WG-5.2

WG-2: Physics analysis report 4: ΓW sensitivity

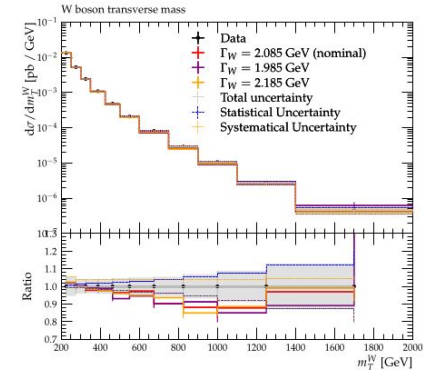
Details on
[kick-off meeting](#)

- Study if we are sensitive in high m_{TW} region to a ΓW measurement
- Use the final result (particle level kinematics and uncertainties) from our previous analysis (published 2025)
- Scan ΓW using Sherpa new version (3.0.0) - truth level only
- Pedro Mascarenhas MsC. - Jun. 2026

Overview of Γ_W measurements



(a) Distribuições de massas transversas do bóson W, para o processo $W^+ \rightarrow e^+ + \nu_e$, obtidas usando o Sherpa 3.0.0p1, para diferentes Γ^W .



(b) Distribuições de massas transversas do bóson W, para o processo $W^- \rightarrow e^- + \bar{\nu}_e$, obtidas usando o Sherpa 3.0.0p1, para diferentes Γ^W .

WG-2: Physics analysis report 4: Run 2 HH → bbττ



ATLAS Note
ANA-HIGP-2024-37-INT1
May 26, 2026



Draft version 0.7

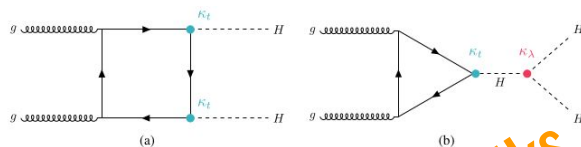


Figure 2.1: Production of Higgs boson pairs through gluon-fusion with triangle (left) and box (right) contributions. The cross-section is sensitive to modifications of the top Yukawa coupling (κ_t) and the bilinear Higgs boson self-coupling (κ_{11}).

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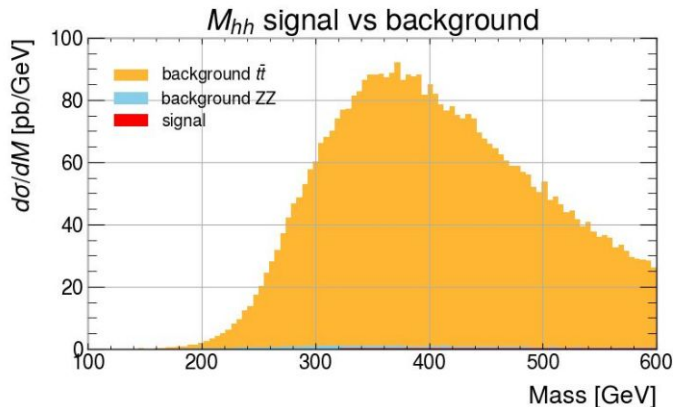


A search for non-resonant Higgs boson pair production in the $bb\tau^+\tau^-$ final state using Run 2 + partial Run 3 data recorded by the ATLAS detector

Ali, Shahzad^a, Almeida De Assis, Victor^b, Amini, Baktash^c, Baer, Tamas Marton^d, Behr, Janna Katharina^e, Bernardi, Gregorio^f, Betti, Alessandra^g, Bhattacharai, Prajita^h, Bijl, Pim^c, Bokan, Petarⁱ, Bortoletto, Daniela^j, Breden Madden, William Dmitri^k, Cadamuro, Luca^l, Cairo, Michael Andrew^m, Carquin Lopez, Edsonⁿ, Castiglioni, Whitmaur Robert^o, Che, Yimin^p, Coadou, Yann^q, Cortes-Gonzalez, Arely^r, D'Anniballe, Gabriele^s, Dahbi, Salah-Eddine^t, Dao, Valerio^u, De Almeida Dias, Flavia^v, De Maria, Antonio^w, Degens, Jordy^x, Deiana, Allison Mccarn^y, Dingfelder, Jochen Christian^z, Dixit, Bhupesh^{aa}, Donadelli, Marisilvia^{ab}, Du Pree, Tristan Arnoldus^{ac}, Duperrin, Arnaud^{ad}, Farman, Kiran^{ae}, Feligioni, Lorenzo^{af}, Ferrari, Arnaud^{ag}, Ferrari, Pamela^{ah}, Fiacco, Davide^{ai}, Francavilla, Paolo^{aj}, Fuenzalida Garrido, Sebastian Julio^{ak}, Fujimoto, Minoru^{al}, Giagu, Stefano^{am}, Grimm, Tschann Grimm Kath^{an}, Gwilliam, Carl^{ao}, Haslbeck, Florian^{ap}, Haussler, Katharina Eva^{aq}, Hofer, Dustyn Dean^{ar}, Imam, Hajar^{as}, Jakobs, Karl^{at}, Jang, Wonho^{au}, Jankovych, Samuel^{av}, Juste Rozas, Aurelio^{aw}, Karkout, Osama^{ax}, Kiefer, Aurora Van Buren^{ay}, Kim, Young-Kee^{az}, Koenke, Karsten^{ba}, Lai, Stan^{bb}, Leney, Katharine^{bc}, Lenz, Tatjana^{bd}, Li, Liang^{be}, Li, Tong^{bf}, Lin, Storm^{bg}, Lisboa Leite, Marco^{bh}, Liu, Yanlin^{bi}, Lu, Miaoran^{bj}, Maloizel, Alexis^{bk}, Marchiori, Giovanni^{bl}, Masubuchi, Tatsuya^{bm}, Mavungu Tsava, Christian^{bn}, Melo, Andres Hugo^{bo}, Mo, Cen^{bp}, Moser, Brian^{bq}, Myers, Greg^{br}, Nagy, Elemer^{bs}, Narayanan, Easwar Anand^{bt}, Nelson, Kevin Michael^{bu}, Okawa, Hideki^{bv}, Oliveira Correa, Gabriel^{bw}, Ordek, Serhat^{bx}, Padovano, Giovanni^{by}, Pampel, Jonathan^{bz}, Pandini,

	bb	WW	ττ	ZZ	γγ
bb	34%				
WW	25%	4.6%			
ττ	7.3%	2.7%	0.39%		
ZZ	3.1%	1.1%	0.33%	0.069%	
γγ	0.26%	0.10%	0.028%	0.012%	0.0005%

- Overwhelming top and ZZ background
- Studing the use of GNN

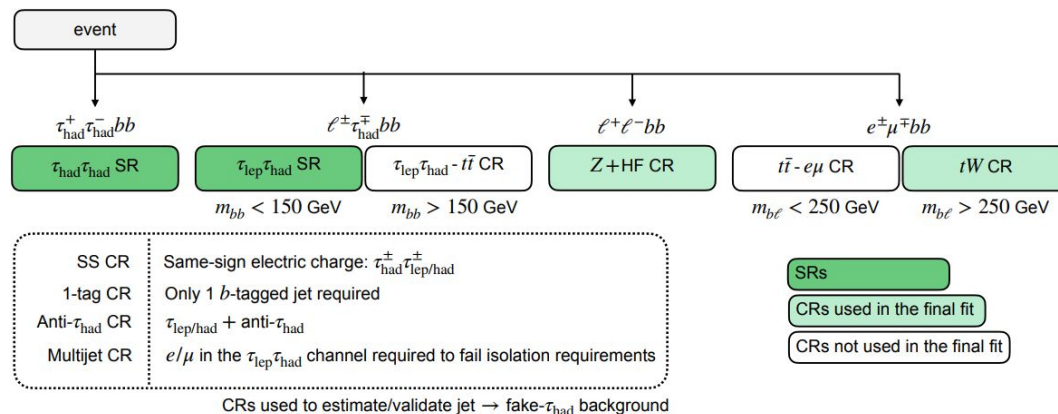


WG-2: Strategy for the next months

Focus efforts on HH \rightarrow $bb\tau\tau$

Contribution on new
HH analysis Framework

- Di-Higgs analysis is a *flagship and high profile LHC analysis*
- Very large effort in ATLAS and CMS
- Tasks for this analysis :
 - New analysis framework (*easyjet*)
 - New format for the data containers
 - Trigger validation on semi-leptonic channel
 - Performance studies (compare with Run-2)
- Contribution in Software and Performance (Tau Software & Performance)
- 2026 : Early Run-3 with HH \rightarrow $bbbb$, HH \rightarrow $bb\tau\tau$, HH \rightarrow $bb\gamma\gamma$
- 2026 : All Run-3 with all channels
- 202x : Run2+Run3



AQP : Evaluation of Tau trigger efficiency scale factors

- analyses for Tau Trigger and Tau Offline Analyses for efficiency scale factors
- measurement of tau trigger efficiency scale factors in 2025/26 data-taking (where GNTau was used).

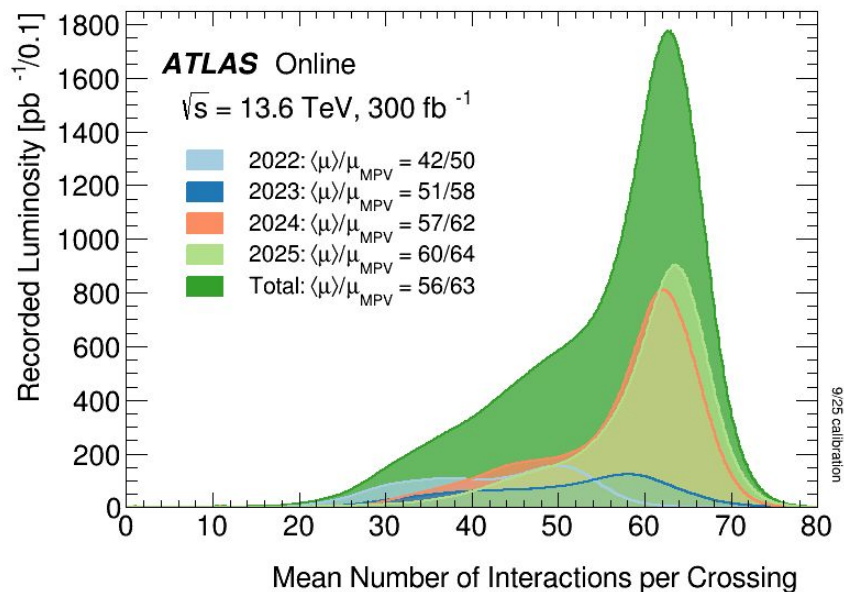
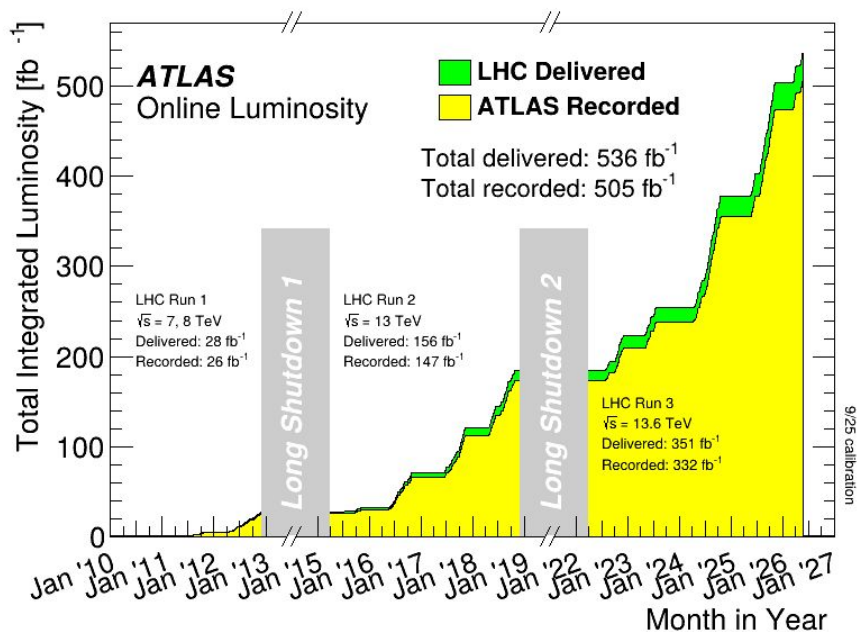
WG-2: Strategy for the next months

Focus efforts on HH \rightarrow $bb\tau\tau$

- This analysis will also lay the groundwork for the HL-LHC HH program
- Large intersection with HGTD for pile-up mitigation
 - VBF signatures
- HL-LHC will test the Higgs self-interaction with 95% CL
- Need new tracking strategies to cope with the Physics requirements (see WG 5.2 presentation)
- Marisilvia :
 - MC, Hepdata, MVA studies
 - Higgs Processes subgroup convener
- Will (PD) :
 - Tau performance contribution (Tau trigger SF)
 - JER systematics studies
- Gabriel (MS)
 - New techniques for signal/background separation (GNN)
- Fabio (DD)
 - fully hadronic di-tau decay channel
 - impact of HGTD information for HL-LHC
- Vitor (UERJ)
 - MVA Studies
- Marco :
 - Check MC samples for full Run3 Analysis

WG-2: Strategy for the next months

- All analysis : on track (benefit from ATLAS pace and organization)
 - Regular reports on ATLAS analysis groups
- Commitments on Run 3 operations → LAr subsystem
 - Already took 505 fb^{-1} → mostly now from Run 3
 - < 1 month (?) left before Long Shutdown !



WG-2: Deliverables

- ATLAS journal publications during the period (06/2025 -> today)
 - **ATLAS Collaboration** : +56
- ATLAS appointments :
 - **MD**: ATLAS Higgs Processes Subgroup Convener - joint ATLAS PMG (Physics Modelling Group) and Higgs and Di-Higgs group (HIGP) (Feb 2026-Feb 2028)
 - **MD**: ATLAS Higgs and Di-Higgs group Monte Carlo contact (Nov 2024- ongoing)
 - **MD**: ATLAS Higgs and di-boson searches (HDBS) Monte Carlo contact - (Aug. 2023 - October 2024)
 - **MD**: Higgs and di-boson searches (HDBS) HEPData Validator: (Jan 2024 -> Jan 2026)
 - **MD**: Training new people on MC sample request (PMG)
 - **ML**: ATLAS Upgrade Speakers Committee (04/2020 -> 04/2024, Chair 2023->02/2027)
 - **ML**: ATLAS Upgrade Steering Committee (Member)
 - **ML**: ATLAS HGTD Speakers Committee (Member, 11/2024 ->06/2026, Chair 06/26 > 07/26)
 - **ML**: ATLAS International Computing Board (Member)
- ATLAS presentations in ATLAS internal meetings
 - **ALL**: SM, Higgs, LAr (operations), HGTD
- ATLAS operations (last call until HL-LHC)
 - **Will** : LAr DQ
 - **MD**: LAr DQ