

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

Status Report

FAPESP Thematic 2020/04867-2

December 14th 2022

Marco Leite - IFUSP



1. Physics analysis

- 1.1. Precision measurements in SM
- 1.2. $HH \rightarrow bb\tau\tau$

2. Operations

- 2.1. Run-3 data taking
- 2.2. Phase-I commissioning

3. Phase-II upgrade

- 3.1. Report will go on WG-5.2

Perspectives for the next months highlighted in blue

WG-2: Physics analysis report 1: Run 2 High mTW



ATLAS Note
ANA-STDM-2018-41-INT1
21st May 2022



1
2 **Double-differential charged-current Drell-Yan cross**
3 **sections at high transverse masses in pp collisions at**
4 **$\sqrt{s} = 13$ TeV**

Details on
[*kick-off meeting*](#)

- On-going analysis, EB interaction
- ~~Wrap-up still this year (?)~~ (Still needs to understand discrepancy between e and mu channels →2023)
- Unfolding tests and model systematics (Sherpa, PowhegPythia)
- **M. Leite**
 - Rivet routine for particle level kinematics
- Aiming to publication in 2023 - no more people will be involved
- **Spin-off : ΓW (starting with some prospect studies in 2023). Includes Run-3**

WG-2: Physics analysis report 2: Run 2 $Z \rightarrow \tau\tau$



ATLAS Note
ANA-STDM-2021-10-INT1
8th August 2022



Draft version 0.1

1

2 **Measurements of high-mass production of τ -lepton**
3 **pairs at $\sqrt{s} = 13$ TeV with the ATLAS detector**

Details on
[*kick-off meeting*](#)

- Ongoing Run-2 analysis,
- EB request approved on Exotics (Lepton+X) Dec. 12th.
- Target is Moriond 2023
- **C. Daumann** (MS) : mass reconstruction studies,
- **R. Macedo** (MS) : τ Fake factors and fake rates
- ~~New student~~ (MS) ~~may start next year~~ (TBD)
- **Long range analysis (beyond Run-3)**, will also involve charged current, new interpretations etc.

WG-2: Physics analysis report 4: Run 2 $HH \rightarrow b\bar{b}\tau^+\tau^-$



ATLAS Note
ANA-HDBS-2019-27-INT1
3rd December 2022



Draft version 0.1

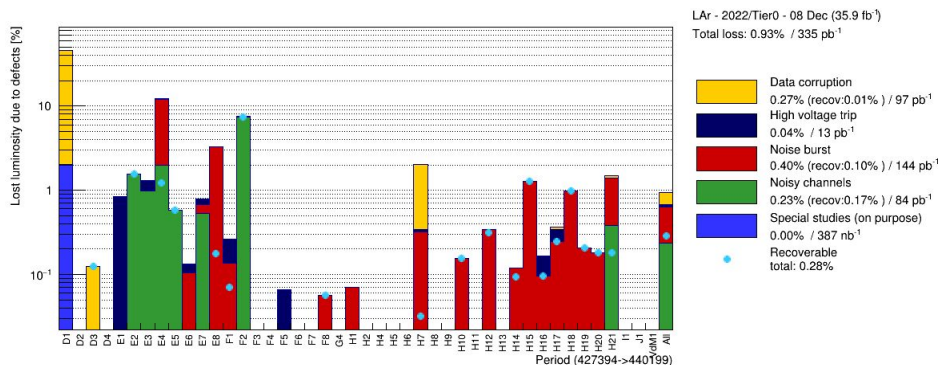
- 1
- 2 **Search for the non-resonant $HH \rightarrow b\bar{b}\tau^+\tau^-$ process**
- 3 **via gluon-fusion and vector-boson fusion production**
- 4 **modes using proton-proton collisions at $\sqrt{s} = 13$ TeV**
- 5 **with the ATLAS detector**

Details on
[*kick-off meeting*](#)

- Full Run-2 dataset analysis with focus on κ_λ and κ_{2V} optimisation
- **M. Donadelli :**
 - contact editor, MVA analysis strategy, VBF/ggF categorisation
 - contributions in : $\tau_{\text{had}}\tau_{\text{had}}$ and $\tau_{\text{lep}}\tau_{\text{had}}$ channels
- EB meeting in January: publication target for LHCP (May 2023)
- Ramping up with Run-3 commitments (*see next slides*)

WG-2: Run 3 Operations

- Intense period of commitment for **9 weeks (24 hour-shift) (M. Donadelli)**
- DQ assessment to declare good runs for physics and calibration analysis for both main readout and digital trigger (Phase I Upgrade)
- Improvement of DQ infrastructure with reprocessing campaigns and training for newcomers
- LAr performing well, $\sim 1\%$ of data loss during all 2022 GRL (35.9 fb⁻¹)
- Annual effort during Run 3 (end of 2025)



Express sign-off

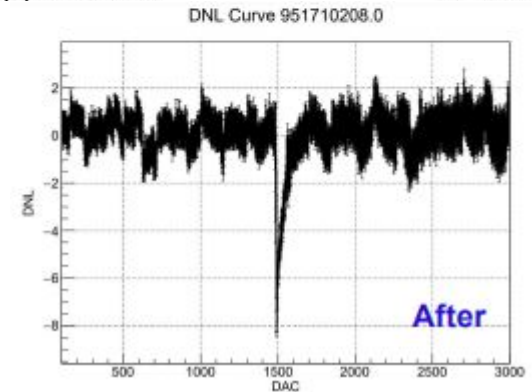
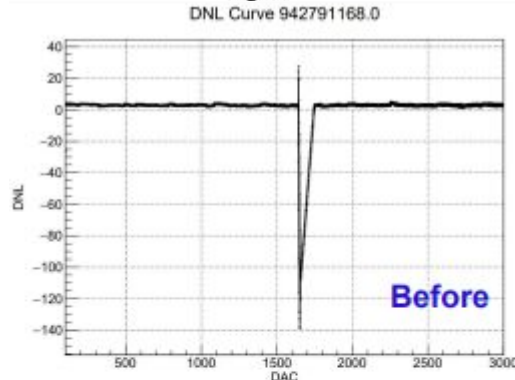
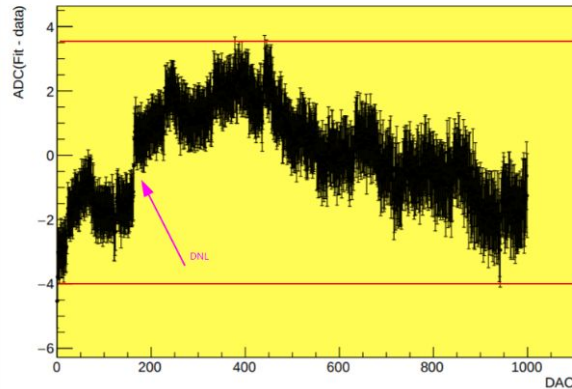
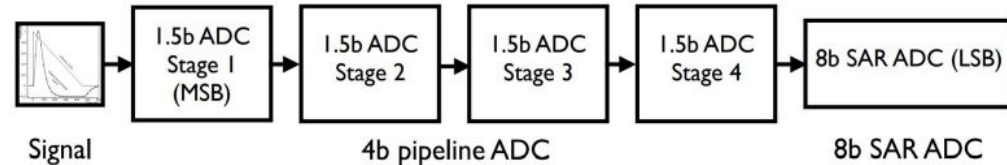
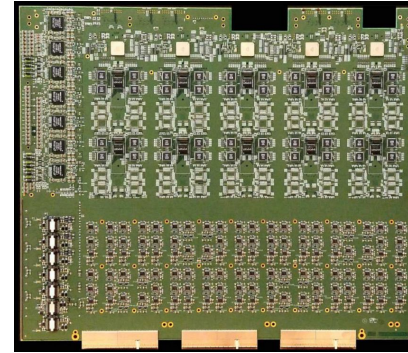
- RUNS with STABLE BEAMS : 435229 ([jira](#)), 435333 ([jira](#)), 435678 ([jira](#)), 435816 ([jira](#)), 435831 ([jira](#)), 435854 ([jira](#)), 435931 ([jira](#))

Reprocessing 427596 - 431493 (f1265_h393) to correct for LAr pileup noise (DATREP-237)

- Status of the assessment: [spreadsheet link](#)
- Covered until Monday Sep 19th, **covered afterwards, beam spot correction runs, including the ones since Friday, Sep 30**
- 427882 [jira link](#) 428071 [jira link](#) 429452 [jira link](#) 430178 [jira link](#) [430897 jira link](#)
- 427883 [jira link](#) 428353 [jira link](#) 429469 [jira link](#) [430183 jira link](#)
- 427884 [jira link](#) 428580 [jira link](#) 429470 [jira link](#) [430488 jira link](#)
- 427885 [jira link](#) 428648 [jira link](#) 429603 [jira link](#) [430490 jira link](#)
- 427892 [jira link](#) 428700 [jira link](#) 429606 [jira link](#) [430526 jira link](#)
- 427911 [jira link](#) 428747 [jira link](#) 429612 [jira link](#) [430336 jira link](#)
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- 428759 [jira link](#) 429027 [jira link](#) 429940 [jira link](#) [430648 jira link](#)
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- 429018 [jira link](#) 429142 [jira link](#) 430036 [jira link](#) [430896 jira link](#)

WG-2: Run 3 Operations

- Liquid Argon Calorimeter Operations
- Phase-I Upgrade Liquid Argon Trigger Digital Board (LTDB) commissioning studies
- **R. Estevam (IC)**
 - ADC non-linearities and calibration across all calorimeter ($\sim 320\text{ch} \times 128$ boards)
 - Integration in DQ
 - Procedure to increase calibration efficiency
- Should (must) conclude in 2023
- Very important for 2023 ($\langle \mu \rangle = 60 \sim 70$)
- TT-2 requested to FAPESP

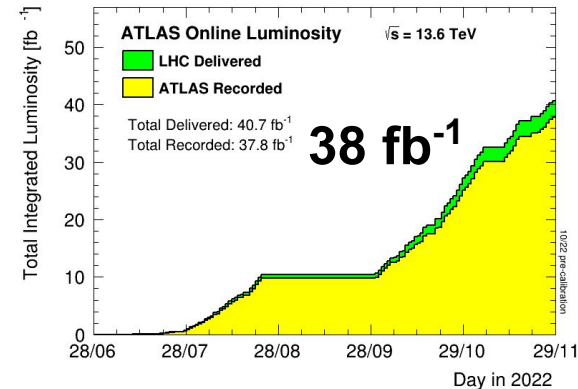


WG-2: Final remarks and action items

- All analysis : on track (benefit from ATLAS pace and organization)
 - Regular reports on ATLAS analysis groups
 - ML: Editorial board of “*Measurement of The Lund Jet Plane in $t\bar{t}b\bar{a}r$ Events*” (ANA-STDM-2020-31)
- Commitments on Run 3 operations → LAr subsystem : on track
 - Data quality and calibration @ CERN
 - Phase-I commissioning

Action items for next months

- $Z \rightarrow \tau\tau$
 - Resonant and non-resonant leptoquark signal generation (analysis)
 - τ polarization modeling impact on phase space analysis
- $HH \rightarrow bb\tau\tau$
 - EB final interactions by early 2023
 - **Ramp-up Run-3 analysis with UERJ (MB)+ UFRJ (YC)**
 - **common HH analysis software development**
 - **MC signal samples (non-resonant and resonant): consider new calculations/treatments and coordinate with LHC-HWG-HH)**
- Presence at CERN: Class-2 & 3 Shifts
- Phase-I LTDB commissioning : Request FAPESP TT-II for R. Estevam (2-3 months CERN presence for LAr)



BACKUP

WG-2: Physics analysis report 3: Run 2 $HH \rightarrow bb\tau\tau$

EUROPEAN ORGANISATION FOR NUCLEAR RESEARCH (CERN)



CERN-EP-2022-109
23rd September 2022

Search for resonant and non-resonant Higgs boson pair production in the $b\bar{b}\tau^+\tau^-$ decay channel using 13 TeV pp collision data from the ATLAS detector

Details on [kick-off meeting](#)

- Paper submitted on Sep. 22nd 2022 !
 - <https://arxiv.org/abs/2209.10910>
- Sensitivity improved by factor of four on the previous ATLAS search (Phys. Rev. Lett. 121, 191801 (2018))
- **M. Donadelli**
 - contributions in : $\tau_{\text{had}}\tau_{\text{had}}$ and $\tau_{\text{lep}}\tau_{\text{had}}$ channels
- Many implications for Run 3 over the next years