

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

Status Report

FAPESP Thematic 2020/04867-2

September 28th 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 years highlighted in blue

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



ATLAS Note

ANA-STDM-2018-41-INT1

21st May 2022



Draft version 0.1

Details on [kick-off meeting](#)

1

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

- On-going analysis, EB interaction
- Wrap-up still this year (?)
- 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*](#)

- On-going Run-2 analysis, aiming at EB @ end of the year
- Full day workshop in October to push the analysis
- **C. Daumann** (MS)
 - mass reconstruction studies,
- **R. Macedo** (MS)
 - τ Fake factors and fake rates
- **New student** (MS) may start next year
- **Long range analysis (beyond Run-3)**, will also involve charged current, new interpretations etc.

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

WG-2: Physics analysis report 4: Run 2 $HH \rightarrow bb\tau\tau$



ATLAS Note
ANA-HDBS-2019-27-INT1
18th August 2022



Draft version 0.1

1

2 **Search for non-resonant ggF and VBF $HH \rightarrow bb\tau\tau$**
3 **production using the full Run-2 dataset**

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
- **Aiming for publication in 2023.**
- **Many implications for Run 3 over the next years:**
 - **The aim is to improve sensitivity to HH searches ($bb\tau\tau$ amongst the 3 most sensitive channels), set stricter constraints on the Higgs boson self-coupling, and probe possible BSM signatures.**

WG-2: Run 3 Operations

- Liquid Argon Calorimeter Operations
- Data Quality and Calibration
- **M. Donadelli**
 - @CERN 09/09/2022 a 05/12/2022
 - DQ & calib development (digital trigger (Phase-I) and main readout) , **on-call expert**
 - CR shifts
- Annual effort during Run 3 (end of 2025)

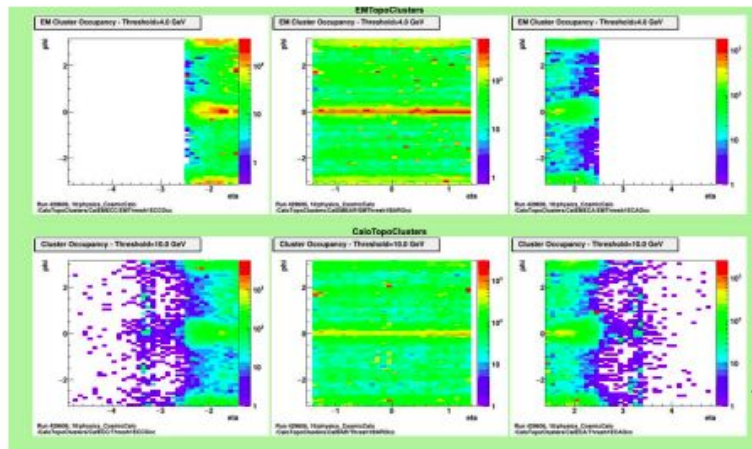
429606

min number of clusters: 400

mapping of potential hole is really important!

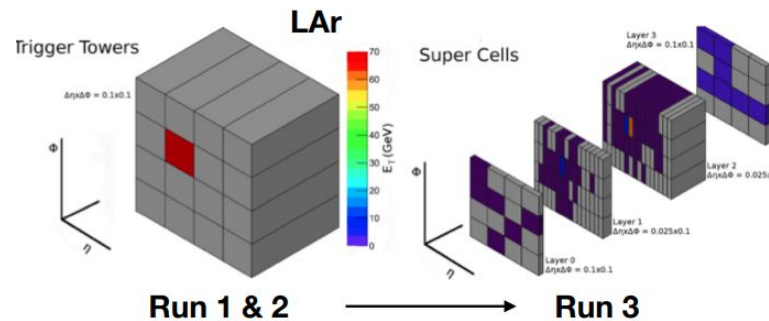
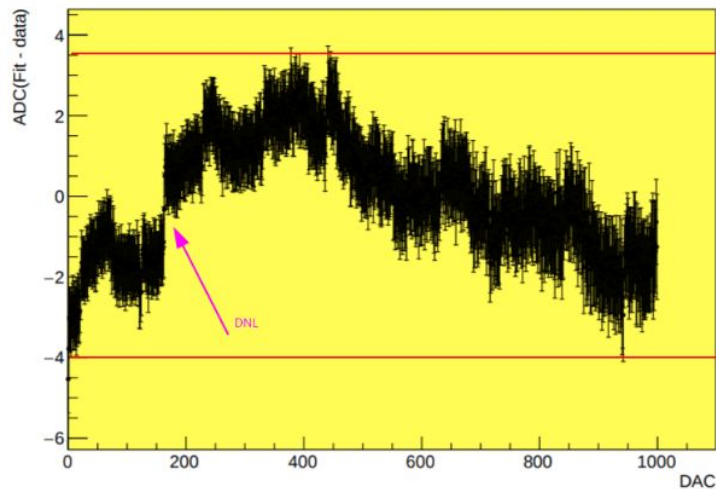
- hot spot responsible for ~10 neighbouring EMECA cells proposed for highNoiseHG, proposed to set an irrecoverable **SEVNOISYCHANNEL defect for the 4 LBs : 614, 615, 621, 622**
- 138 SBN - 187 HNHG → **24 SBN - 18 HNHG** before reprocessing
- After reprocessing + removing cells in 4LBs
 - Total number of sporadicBurstNoise: **30** (9 in presampler)
 - Total number of highNoiseHG: **11** (3 in presampler)

Mask	Task	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
37				13-Sep-2022	13-Sep-2022	14-Sep-2022	14-Sep-2022	15-Sep-2022	15-Sep-2022	16-Sep-2022	16-Sep-2022	17-Sep-2022	17-Sep-2022
37	LA: Data Inspection and Signif	0:24 24h Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													
38				19-Sep-2022	20-Sep-2022	21-Sep-2022	22-Sep-2022	23-Sep-2022	24-Sep-2022	24-Sep-2022	24-Sep-2022	26-Sep-2022	26-Sep-2022
38	LA: Data Inspection and Signif	0:24 24h Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													
39				26-Sep-2022	27-Sep-2022	28-Sep-2022	29-Sep-2022	30-Sep-2022	30-Sep-2022	1-Oct-2022	1-Oct-2022	2-Oct-2022	2-Oct-2022
39	LA: Data Inspection and Signif	0:24 24h Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													
40				3-Oct-2022	4-Oct-2022	5-Oct-2022	6-Oct-2022	7-Oct-2022	8-Oct-2022	8-Oct-2022	8-Oct-2022	9-Oct-2022	9-Oct-2022
40	LA: Data Inspection and Signif	0:24 24h Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													
42				17-Oct-2022	18-Oct-2022	19-Oct-2022	20-Oct-2022	21-Oct-2022	22-Oct-2022	22-Oct-2022	22-Oct-2022	23-Oct-2022	23-Oct-2022
42	LA: Data Inspection and Signif	0:24 24h Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													
43				24-Oct-2022	25-Oct-2022	26-Oct-2022	27-Oct-2022	28-Oct-2022	29-Oct-2022	29-Oct-2022	29-Oct-2022	30-Oct-2022	30-Oct-2022
43	LA: Data Inspection and Signif	0:24 24h Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													
45				7-Nov-2022	8-Nov-2022	9-Nov-2022	10-Nov-2022	11-Nov-2022	12-Nov-2022	12-Nov-2022	12-Nov-2022	13-Nov-2022	13-Nov-2022
45	ATLAS Calo and Shadow Shifts (ACR)	18-22 Evening Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													
47				21-Nov-2022	22-Nov-2022	23-Nov-2022	24-Nov-2022	25-Nov-2022	26-Nov-2022	26-Nov-2022	26-Nov-2022	27-Nov-2022	27-Nov-2022
47	ATLAS Calo and Shadow Shifts (ACR)	18-22 Evening Shift		100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
No group													

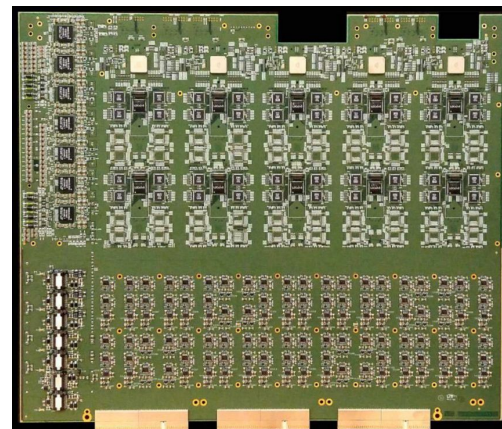


WG-2: Run 3 Operations

- 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
- Should (must) conclude in 2023



- **Phase-1:** LAr trigger electronics with higher granularity “Super Cells”, longitudinal shower information



WG-2: Final remarks and action items

- All analysis : on track (benefit from ATLAS pace and organization)
- Regular reports on ATLAS analysis groups
- 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 the EOY
 - Ramp-up Run-3 analysis with UERJ (MB)+ UFRJ (YC)
- Phase-I LTDB commissioning
 - Request FAPESP TT-II for R. Estevam

