ATLAS Note
SUSY-2018-XX
February 19, 2019
Draft version 0.1

SUSY group text snippets for INT notes

ATLAS SUSY Group

This note contains text snippets and tables that should be included in supporting notes from the SUSY group.

The templates are in American English. If wanted, some adaption to British English could be made.

This document was generated using version 07-00-00 of the ATLAS LaTeX package.

2019-02-04: This file is a work in progress (WIP) and will probably be updated. Backwards incompatible changes may be made as the examples develop.

Contents

1 Executive Summary

This section, ideally less than two pages, should be placed at the beginning of the supporting note. It should give a high-level overview of the analysis including (but not limited to):

- physics target and the general characteristics of the signal;
- analysis strategy;
- general characteristics of the control, validation, and signal regions;
- a background estimation strategy overview;
- highlights of major or most important points of the analysis;
- a table or list of all critical tasks and who is responsible for each.

This section should include explicit pointers to the items required for the PAR and FAR. For reference, those items are listed below. Please feel free to modify these lists into references to document sections.

For a PAR (ed board request), the SUSY group looks for:

- A definition of the target scenarios
- A brief run-down of the signal grids, in particular pointing to any production problems or places where the production has not yet begun
- A discussion of any non-standard object definitions in the analysis, and any on-going development that might affect the object definition
- A discussion of the derivations: whether any reprocessing is needed, and whether the required samples have been requested
- Data/MC comparisons in some inclusive regions (demonstrating the technical ability to use the data from all periods in the team's framework)
- Any signal region definitions that are available, with some preliminary optimization in place and some description of the optimization procedure
- Plans for further optimization (e.g. optimization for different model space regions, or use of an MVA or multi-bin fit)
- An outline of the plans to get from here to a paper (plan of work, noting if person power is insufficient for any of the areas), as a part of this summary

If you are using SUSYTools, please include the current configuration file in the archive.

For a FAR, the SUSY group looks for:

- Definitions of SR, CR, VR, including expected yields with the targeted luminosity for all backgrounds that will be estimated with transfer factors or pure MC. Include signal contamination in CR and VR.
- Cutflow for the background and for representative signal points.
- Outline of background estimation strategies, including validation and closure tests for data-driven estimations. Statistical uncertainties for transfer-factor (TF) estimated and data-driven estimated backgrounds.

- Comparison of data and MC with the relevant dataset in CR and VR. Strategy for mitigation of mis-modelling wherever needed with proof of feasibility.
- Estimate of the detector level systematic uncertainties through propagation of CP recommendations.
- A clear statement on how all others systematic uncertainties will be evaluated: all the procedures need to be defined before unblinding.
- A clear plan for "discovery regions" as well as the statistical treatment of the signal regions.
- Background only fit with pull plot for the nuisance parameters.
- Estimated exclusion, including depth of exclusion within the normal exclusion contour, with Asimov fit.
- To-do list for achieving final result and possible bottlenecks (can the rest of the SUSY WG help with anything?)
- For analyses using machine learning methods, additional diagnostics are required, which are explained here.

The background forum recommends the following diagnostic plots:

- Standard occupancy maps and plots that can reveal detector or non-collision background issues — plot for CRs, VRs and SRs of MET phi, the leading jet and/or leading lepton eta vs. phi 2D map, and the leading jet and/or leading lepton phi distributions
- Selection efficiencies as a function of mu (VR, SR, and CR): to check how dependent the analysis is on pileup (primarily for MC)
- Run number and data period dependencies: plot lumi-normalized yields in CRs, VRs and SRs as a function of the run number and data period (data only). This is to check for potential temporary issues in the data present only for certain runs, and to reveal potential chunks of data not processed by mistake. You should normalize the per-run yield using the lumi as reported from an independent source (not the in-file metadata!), e.g. simply use this script in SUSYTools to build the luminosity-vs-run histogram from your `iLumiCalc` file.
- In particular, for Full Run 2 dataset analyses, a plot of data from 2018 vs period, specifically to compare the efficiencies for the period with two dead tile modules to the periods without.
- Check for missing data: Compare the total number of processed data events and compare to the reference numbers for the combination of GRL and derivation you're running over in this spreadsheet. If your total does not match this reference number, feel free to contact BG forum conveners and derivation contacts for help with debugging.
- Check for duplicated events: several bugs in MC and DAOD production have caused duplicated events to appear in the derivations in the past. This can potentially happen in both MC and data. Please check that there are no duplicated events in your CRs, VRs or SRs. If you notice duplicated events in your derivations, please get in touch with the Background Forum conveners immediately.
- Comparisons of data and MC in the CRs and VRs, as well as MC in the SRs, for 2015+2016, 2017, and 2018 separately, for key distributions and yields.

- Debug stream yields in SR and CR. The full name of the debug stream is `debugrec_hlt`, and derivation datasets can be found for both 2015 and 2016 data with a query like `rucio ls -short -filter type=container data*_13TeV.00*.debugrec_hlt*DAOD_SUSY1*p2709*`.
- Pileup reweighting check: plot the nvtx distribution before and after pileup reweighting (data Vs MC). Purpose: check that the pileup reweighting works as intended.

Again, if you are using SUSYTools, please include the current configuration file in the archive. Please also take care that you have looked into the items recommended by DataPrep.

Please feel free to also include a change log with major updates either before or after the executive summary.

2 Introduction

Place a short introduction here. It is useful to introduce your analysis target signals, place them in context, and describe any previous analyses that this analysis follows on (particularly if significant pieces are in common).

Please note that in an internal note there is no need for a description of the ATLAS detector, unless the search uses some unusual or less well-known features of the detector of which reviewers will need a reminder.

3 Signal Models

Place the description of your target signal models here, potentially including a description of the "signal grids" that you will ultimately use for interpretataion.

4 Data and Simulated Event Samples

Place the description of your dataset (including GRL) and Monte Carlo simulated samples here. Please place any long tables (e.g. lists of used datasets) into appendices.

5 Object definition

Please describe your object definition here.

6 Event selection

Place the description of your event selection here. This can include signal region optimization, control region selection, and pre-selection.

7 Background Estimation

Place the description of your background estimation here.

8 Systematic Uncertainties

Place the description of your systematic uncertainties here.

9 Results

Place your results here.

10 Conclusion

Place your conclusion here.

The supporting notes for the analysis should also contain a list of contributors. This information should usually be included in `mydocument-metadata.tex`. The list should be printed either here or before the Table of Contents.

List of contributions

Appendices

In an ATLAS note, use the appendices to include all the technical details of your work that are relevant for the ATLAS Collaboration only (e.g. dataset details, software release used). This information should be printed after the Bibliography.