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Implementation and validation of ATLAS Rivet analyses

Introduction

This page gives a brief overview of the status of Rivet routines for ATLAS analyses. See RivetForAtlas for instructions on using Rivet within Athena jobs.

We want your analysis to be included into Rivet in order to be later used for different MC generators validation/tuning. For that, we need the Rivet routine (.cc code) mimicking your analysis and the data histograms from your plots (.aida file). Once we have that, anyone is able to run different MC generators (with different tunings) to compare to your data results which then allow one to better tune them.


How to write Rivet routine for your analysis

The Rivet routine of your physics analysis is just one .cc file where the analysis flow of your analysis is done. It is then used as plugin to Rivet. You don't need to change anything in Rivet itself. There is tool ('rivet-buildplugin') which makes shared object library from this routine and it can be consequently used within rivet

To start writing the Rivet routine for your analysis you can do this in a couple ways:

- copy one of the existing analysis (.cc file) which is closest to yours and start rewriting it in your favorite editor according to your analysis flow. The list of the analyses can be obtained, e.g. if you are looking for ATLAS dijet analysis by "rivet --list-analyses|grep ATLAS|grep -i dijet". The actual files can then be found in e.g.
`/afs/cern.ch/sw/lcg/external/MCGenerators_hepmc2.06.05/rivet/1.8.1/share/sources/src/Analyses/`
- you can start from scratch by running: 'rivet-mkanalysis MY_ANALYSIS_NAME' which will create a basic template for your code.

Some general information about how to write an analysis can be found here:

<http://rivet.hepforge.org/trac/wiki/WritingAnAnalysis> 

Rules for implementation assistance

We would like to ask those seeking help with the implementation of their analysis in Rivet to consider the following "rules" that will make life much easier. Please

- provide the final corrected histograms (for experimental data only, not MC) in a suitable format, e.g. AIDA-xml (preferable), ROOT or text (each line corresponds to one bin with the following info: xLow xHigh y yErrLow yErrHigh where the errors are total uncertainties)
 - ◆ ideally, update your histograms to HepDATA [\[3\]](http://hepdata.cedar.ac.uk/view/red4992) (see e.g. <http://hepdata.cedar.ac.uk/view/red4992> [\[3\]](#))
- provide link to latest documentation of your analysis (e.g. paper draft, internal note, etc.)
- provide a table linking those histograms with the figures in your paper or draft
- provide the EVGEN dataset names of those samples that appear on the final plots (see last column of the following table)

Analyses wishlist

Analysis	Glance	Contact	Status	V
ATLAS_Unassigned DESCRIPTION	STDM-201	Unknown	Not implemented	
ATLAS_2011_I930220 Measurement of the inclusive and dijet cross-sections of b-jets	STDM-2010-15 ↗	Stephen Paul Bieniek	implemented by Stephen, preparing for validation	Expand list Collapse mc10_7TeV.113893.BBbar_PowHeg mc10_7TeV.105009.J0_pythia_jetjet. mc10_7TeV.105010.J1_pythia_jetjet. mc10_7TeV.105011.J2_pythia_jetjet. mc10_7TeV.105012.J3_pythia_jetjet. mc10_7TeV.105013.J4_pythia_jetjet. mc10_7TeV.105014.J5_pythia_jetjet.
ATLAS_2012_I921594 Measurement of the inclusive isolated prompt photon cross-section	STDM-2011-04 ↗	Unknown	Not implemented	
ATLAS_2012_I916832 Measurement of isolated diphoton cross-section	STDM-2011-05 ↗	Unknown	Not implemented	
ATLAS_2011-I928289 Measurement of the inclusive W+- and Z/gamma cross sections	STDM-2011-06 ↗	Uta Klein, Liza Mijovic	Not implemented.	
ATLAS_2012_I1083318 Study of jets produced in association with a W boson	STDM-2011-08 ↗	Alexander Paramonov	Data ready (HS), implementation done by Frank Siegert, in Rivet as unvalidated analysis since r3540	Expand list Collapse mc11_7TeV.129121.SherpaW5jetsto mc10_7TeV.107680.AlpgeJimmyW mc10_7TeV.107681.AlpgeJimmyW mc10_7TeV.107682.AlpgeJimmyW mc10_7TeV.107683.AlpgeJimmyW mc10_7TeV.107684.AlpgeJimmyW mc10_7TeV.107685.AlpgeJimmyW mc11_7TeV.129122.SherpaW5jetsto mc10_7TeV.107690.AlpgeJimmyW mc10_7TeV.107691.AlpgeJimmyW mc10_7TeV.107692.AlpgeJimmyW mc10_7TeV.107693.AlpgeJimmyW mc10_7TeV.107694.AlpgeJimmyW mc10_7TeV.107695.AlpgeJimmyW
ATLAS_2012_I1094061 Measurement of inclusive two-particle angular correlations	STDM-2011-11 ↗	James Monk		
ATLAS_2012_I924848 A measurement of the ratio of the W and Z cross sections with exactly one associated jet	STDM-2011-13 ↗	Unknown	Not implemented	
ATLAS_2012_I925932 Measurement of the transverse momentum distribution of W bosons	STDM-2011-15 ↗	Unknown	Not implemented	
ATLAS_2011_I922601 Measurement of the Z to tau	STDM-2011-18 ↗	Elias Coniavitis		

tau cross section				
ATLAS_2012_I1094564 Jet mass and substructure of inclusive jets	STDM-2011-19 ↗	Adam Davison	Implemented, preparing for validation	N.N.
ATLAS_2012_I1091481 Measurement of the azimuthal ordering of charged hadrons	STDM-2011-20 ↗	Sharka Todorova	Done. In rivet since r3771 (marked unvalidated)	
ATLAS_2012_I1114319 Measurement of W gamma and Z gamma production cross sections	STDM-2011-26 ↗	Unknown	Not implemented	
ATLAS_2011_I945498 Measurement of the production cross section for Z/gamma in association with jets	STDM-2011-27 ↗	Evelin Meoni	In Rivet, branch 2012-06-aidarivet since r3812 (marked unvalidated).	Expand list Collapse mc10_7TeV.119126.SherpaZ5jetstoe mc10_7TeV.119127.SherpaZ5jetstoe
ATLAS_2012_I1125575 Underlying event characteristics and their dependence on jet size of charged-particle jet events	STDM-2011-30 ↗	Unknown	Not implemented	
ATLAS_Unassigned Z forward-backward asymmetry	STDM-2011-34 ↗	Unknown	Not implemented	
ATLAS_2012_I1093734 Forward-backward correlations and charged-particle azimuthal distributions	STDM-2011-35 ↗	Craig Buttar	implemented, validating	
ATLAS_2012_I1093486 Measurement of the polarisation of W bosons produced at large momentum transfer	STDM-2011-37 ↗	Unknown	Not implemented	
ATLAS_2012_I1119557 Measurements of the properties of jets for boosted particle searches	STDM-2011-38 ↗	Lily Asquith	implemented, validating	Expand list Collapse mc11_7TeV.113639.Pythia8JetsJ4.ev mc11_7TeV.113640.Pythia8JetsJ5.ev mc11_7TeV.113641.Pythia8JetsJ6.ev mc11_7TeV.113642.Pythia8JetsJ7.ev mc11_7TeV.105013.J4_pythia_jetjet. mc11_7TeV.105014.J5_pythia_jetjet. mc11_7TeV.105015.J6_pythia_jetjet. mc11_7TeV.105016.J7_pythia_jetjet.
ATLAS_2012_IXXXXXXX Measurement of the flavour composition of dijet events	STDM-2011-40 ↗	Cecile Lapoire	implemented, validating	Expand list Collapse mc10_7TeV.105009.J0_pythia_jetjet. mc10_7TeV.105010.J1_pythia_jetjet. mc10_7TeV.105011.J2_pythia_jetjet. mc10_7TeV.105012.J3_pythia_jetjet. mc10_7TeV.105013.J4_pythia_jetjet. mc10_7TeV.105014.J5_pythia_jetjet. mc10_7TeV.105015.J6_pythia_jetjet. mc10_7TeV.105016.J7_pythia_jetjet.

ATLAS_Unassigned Underlying Event in Z Events	STDM-2011-42 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Lambda polarization measurements in minimum bias and jet events	STDM-2011-45 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_2012_I1112906 Measurement of tau polarization in $W \rightarrow \tau \nu$ decays	STDM-2011-46 ↗	Unknown	Not implemented
ATLAS_Unassigned The differential production cross section of the $\phi(1020)$ meson	STDM-2011-47 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurement of $W+W$ -production	STDM-2012-01 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurement of ZZ production in pp collisions	STDM-2012-02 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurement of the dijet cross section at high dijet mass	STDM-2012-03 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurement of jets produced in association with Z	STDM-2012-04 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurement of the isolated di-photon cross section	STDM-2012-05 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurement of the ϕ -star distribution of Drell-Yan lepton pairs to probe Z/gamma boson transverse momentum	STDM-2012-06 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurement of $W/Z+\gamma$ differential cross sections	STDM-2012-07 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Inclusive jet cross section at $\sqrt{s} = 2.76$ TeV. Comparison to $\sqrt{s} = 7$ TeV	STDM-2012-08 ↗	Unknown	Not implemented. Analysis ongoing.
ATLAS_Unassigned Measurements of top quark pair relative differential cross-sections (Unfolded to <i>parton-level</i> $t\bar{t}$)	TOPQ-2011-07 ↗	Francesco Spano	Not implemented
ATLAS_Unassigned Measurement of the $t\bar{t}+\text{jets}$ cross-section	TOPQ-2012-03 ↗	William Bell	Not implemented. Analysis ongoing.

Completed Analyses

Analysis	Glance	Contact	Status	Validation DS
ATLAS_2010_S8591806 Charged particles at 900 GeV in ATLAS	glace_ID	Frank Siegert	In Rivet.	
ATLAS_2010_S8817804 Inclusive jet cross section and di-jet mass and chi spectra at 7 TeV in ATLAS	glace_ID	James Monk	In Rivet.	
ATLAS_2010_S8894728 Track-based underlying event at 900 GeV and 7 TeV in ATLAS	glace_ID	Andy Buckley Holger Schulz	In Rivet.	
ATLAS_2010_S8914702 Inclusive isolated prompt photon analysis	glace_ID	Mike Hance	In Rivet.	
ATLAS_2010_S8918562 Track-based minimum bias at 900 GeV and 2.36 and 7 TeV in ATLAS	glace_ID	Thomas Burgess Andy Buckley	In Rivet.	
ATLAS_2010_S8919674 W+jets jet multiplicities and pT	glace_ID	Frank Siegert	In Rivet.	
ATLAS_2011_I919017 Measurement of ATLAS track jet properties at 7 TeV	glace_ID	Seth Zenz Andy Buckley	In Rivet.	
ATLAS_2011_I925932 Measurement of the W pT with electrons and muons at 7 TeV	glace_ID	Elena Yatsenko Judith Katzy	In Rivet.	
ATLAS_2011_I926145 Measurement of electron and muon differential cross-section from heavy-flavour decays	glace_ID	Paul Bell Holger Schulz	In Rivet.	
ATLAS_2011_I944826 KS0 and Lambda production at 0.9 and 7 TeV with ATLAS	glace_ID	Holger Schulz	In Rivet.	
ATLAS_2011_S8924791 Jet shapes at 7 TeV in ATLAS	glace_ID	Andy Buckley Francesc Vives Judith Katzy	In Rivet.	
ATLAS_2011_S8971293 Dijet azimuthal decorrelations	glace_ID	Frank Siegert	In Rivet.	
ATLAS_2011_S8983313 0-lepton squark and gluino search	glace_ID	David Grellscheid	In Rivet.	
ATLAS_2011_S8994773 Calo-based underlying event at 900 GeV and 7 TeV in ATLAS	glace_ID	Jinlong Zhang Andy Buckley	In Rivet.	
ATLAS_2011_S9002537 Muon charge asymmetry in W events at 7 TeV in ATLAS	glace_ID	Frank Krauss Hendrik Hoeth	In Rivet.	
ATLAS_2011_S9019561 Two lepton supersymmetry search	glace_ID	Angela Chen	In Rivet.	
ATLAS_2011_S9041966 1-lepton and 2-lepton search for first or second generation leptoquarks	glace_ID	Angela Chen	In Rivet.	
ATLAS_2011_S9108483 Long-lived heavy charged particle search	glace_ID	Peter Richardson	In Rivet.	
ATLAS_2011_S9120807 Inclusive isolated diphoton analysis	glace_ID	Giovanni Marchiori	In Rivet.	
ATLAS_2011_S9126244 Measurement of dijet production with a veto on additional	glace_ID	Graham Jones	In Rivet.	

central jet activity			
ATLAS_2011_S9128077 Measurement of multi-jet cross sections	glace_ID	Frank Siegert	In Rivet.
ATLAS_2011_S9131140 Measurement of the Z pT with electrons and muons at 7 TeV	glace_ID	Elena Yatsenko Judith Katzy	In Rivet.
ATLAS_2011_S9212183 0-lepton squark and gluino search	glace_ID	Chris Wymant David Grellscheid	In Rivet.
ATLAS_2011_S9225137 High jet multiplicity squark and gluino search	glace_ID	Peter Richardson	In Rivet.
ATLAS_2012_I1082009 D^{\pm} production in jets	glace_ID	Peter Richardson	In Rivet.
ATLAS_2012_I1083318 W+jets production at 7 TeV	glace_ID	Frank Siegert	In Rivet.
ATLAS_2012_I1091481 Azimuthal ordering of charged hadrons	glace_ID	Sharka Todorova Holger Schulz	In Rivet.
ATLAS_2012_I1093738 Isolated prompt photon + jet xsection	glace_ID	Giovanni Marchiori	In Rivet.
ATLAS_2012_I1094568 Measurement of ttbar production with a veto on additional central jet activity	glace_ID	Kiran Joshi	In Rivet.
ATLAS_2012_I1095236 b-jets search for supersymmetry with 0- and 1-leptons	glace_ID	Peter Richardson	In Rivet.
ATLAS_2012_I1112263 3 lepton plus missing transverse energy SUSY search	glace_ID	Peter Richardson	In Rivet.
ATLAS_2012_I943401 Search for supersymmetry with 2 leptons and missing transverse energy	glace_ID	Peter Richardson	In Rivet.
ATLAS_2012_I946427 Search for supersymmetry with diphotons and missing Transverse Momentum	glace_ID	Peter Richardson	In Rivet.

Color definition:

Not implemented	Implementation in progress	Implementation complete. Unvalidated.	Validation in progress	Validated
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ATLAS analysis wishlist

Here we list ATLAS analyses for which Rivet analyses are wanted:

Analysis	Physics group	Contact	Reference	Comments
Jet shapes and masses	SM	Lily Asquith	STDm-2010- ↗	
Event shapes in high momentum transfer events	SM	David Miller	STDm-2010- ↗	
ZZ->2l2v	SM		STDm-2010- ↗	
WW->lvlv	SM		STDm-2010- ↗	
Z->bb substructure	SM	Ben Cooper		Analysis incomplete
R_jets	SM	Gerhardt Brandt		Analysis incomplete
b-jet masses etc.	SM	Javier Merino		Analysis incomplete
UE in jet events	SM	Andy Buckley		AB will supply
WZ cross-section	SM	Lynn Marx	http://inspirehep.net/record/1126131/↗	

Further projects

Project	Description	Status
**	Tune job GRID submission framework	Tesing phase (RL)
**	Automated validation	Unknown (RL)
RivAid	Website dedicated for ROOT file conversion to Rivet format (AIDA, YODA)	Basically working, no server yet (HS)

Running custom analyses on EVNT datasets

Further explanations can be found at RivetForAtlas.

```
cd empty
asetup 17.0.4,here
source $SITEROOT/sw/lcg/external/MCGenerators/rivet/1.6.0/i686-slc5-gcc43-opt/rivetenv.sh
rivet-buildplugin RivetATLAS_2011_S9185208.so ATLAS_2011_S9185208.cc -m32

pathena IncLeptonsMB.py --inDS mc09_7TeV.105805.filtered_minbias6.evgen.EVNT.e530/ --outDS user.h
```

Here's how to run the merging on the Grid:

```
prun --noBuild --exec "bash ./AIDAMergeWrapper.sh %IN" --athenaTag=17.0.4,AtlasProduction --outD
```

Extracting cross-section information from AMI

You can use the attached script after sourcing athena. You need to enter your AMI username and password. The usage is e.g.

```
./getXSfromAMI.py mc10_7TeV.126053.WZMcAtNloJimmy12870_1_1.evgen.EVNT.e787 mc10_7TeV.126054.WZMcAtNloJimmy12880_1_1.evgen.EVNT.e787
```

This will give you the following output:

```
mc10_7TeV.126053.WZMcAtNloJimmy12870_1_1.evgen.EVNT.e787
  2.359700e-06 [nano barn]
mc10_7TeV.126054.WZMcAtNloJimmy12880_1_1.evgen.EVNT.e787
  1.266800e-06 [nano barn]
```

Please do keep in mind that Rivet requires cross-section information to be given in [pb].

-- HolgerSchulz - 29-Nov-2011 -- AndyBuckley - 01-Mar-2012 -- RomanLysak - 25-Apr-2012

%RESPONSIBLE% KiranJoshi
%REVIEW% **Never reviewed**

This topic: Sandbox > KiranJoshiSandbox
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