

$W \rightarrow \tau \nu$ Note
&
Tau candidates in first data

Lidia e Attilio

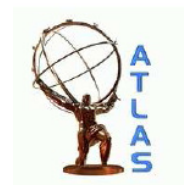
$W \rightarrow \tau \nu$ Note

Draft version 0.8

✓ Prospects for Studying $W \rightarrow \tau_{had} \nu$ Decays with ATLAS Data corresponding to an Integrated Luminosity of 100 pb^{-1}

✓ it should be submitted as COM today

✓ will ask for INT approval at the beginning of January



ATLAS NOTE

ATL-PHYS-COM-2009-000

December 18, 2009



**Prospects for Studying $W \rightarrow \tau_{had} \nu$ Decays with ATLAS Data
Corresponding to an Integrated Luminosity of 100 pb^{-1}**

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✓ I studied the QCD di-jet background.

✓ The full simulated QCD background samples available are not enough to evaluate the contribution to the analysis from this background.

✓ On the other side, the fast simulated samples have two problems:

✓ no trigger information is available

✓ the missing Et spectrum in fast and full simulation is different.

✓ I studied how to:

✓ correct the fast samples for the trigger efficiency

✓ correct the missing Et spectrum

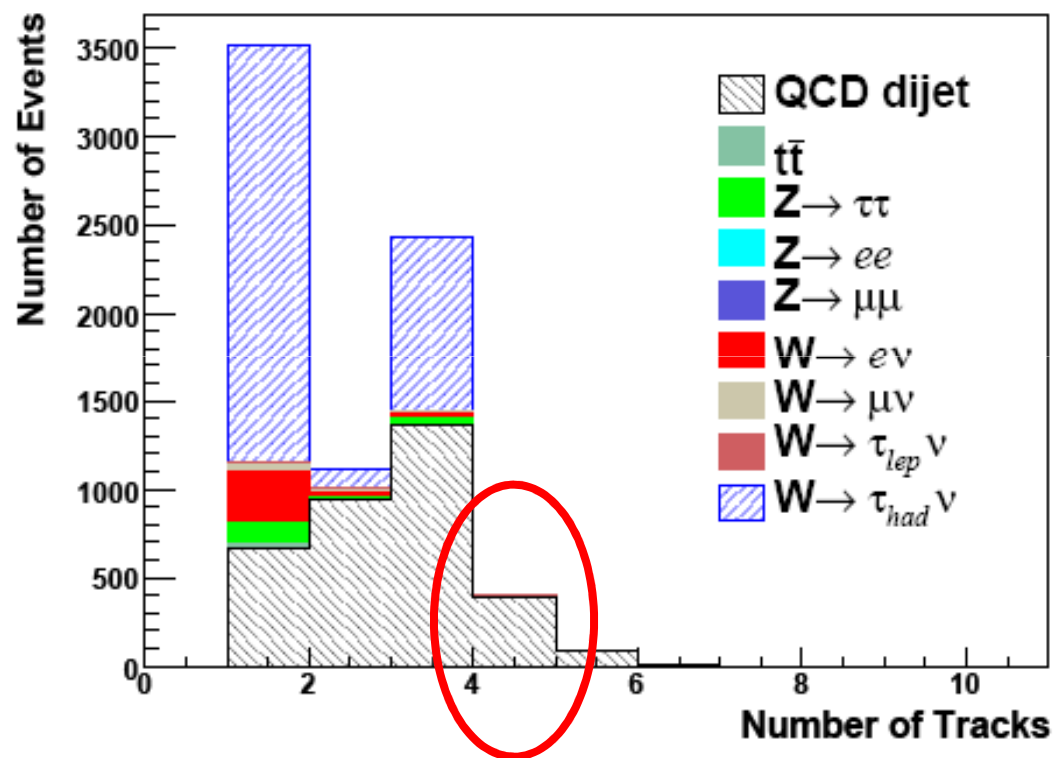
W→ $\tau\nu$ Note – Event Selection

Cut	$W \rightarrow \tau_{had}\nu$	$W \rightarrow \tau_{lep}\nu$	$W \rightarrow e\nu$	$W \rightarrow \mu\nu$	$t\bar{t}$
Total Events	769000	364008	1035285	1035285	37360
Trigger	85304 (313)	22576 (122)	463936 (235)	18687 (63)	10943 (13)
$E_T^{miss} > 40\text{ GeV}$	25861 (179)	6618 (68)	147299 (165)	10334 (47)	7477 (11)
τ_{had} Selection	5617 (85)	1735 (35)	74444 (122)	1223 (16)	1657 (6)
τ Lepton Flag	5341 (82)	166 (11)	2845 (25)	1049 (15)	450 (3)
Lepton Veto	3914 (71)	35 (5)	384 (9)	75 (4)	98 (2)
Veto Jet in Crack Region	3451 (66)	29 (5)	345 (9)	67 (4)	51 (1)
$\Delta\phi_{(\tau_{had}, E_T^{miss})} > 2.5$	2273 (54)	22 (4)	281 (8)	52 (3)	6.0 (4)

Cut	$Z \rightarrow \tau\tau$	$Z \rightarrow ee$	$Z \rightarrow \mu\mu$	QCD di-jet	
Total Events	112837	98381	98381	1.26×10^{12}	
Trigger	9211 (31)	3262 (8)	1546 (6)	–	–
$E_T^{miss} > 40\text{ GeV}$	2231 (16)	21 (1)	280 (2)	$13.2(5) \times 10^6$	$9.5(5) \times 10^6$
τ_{had} Selection	534 (8)	3.4 (3)	35 (1)	$49(5) \times 10^3$	$24(5) \times 10^3$
τ Lepton Flag	378 (7)	0.32 (8)	28 (1)	$43 (4) \times 10^3$	$20 (4) \times 10^3$
Lepton Veto	183 (5)	0.04 (3)	1.9 (2)	$20 (3) \times 10^3$	$10 (3) \times 10^3$
Veto Jet in Crack Region	152 (4)	0.04 (3)	1.6 (2)	$96 (10) \times 10^2$	$34 (5) \times 10^2$
$\Delta\phi_{(\tau_{had}, E_T^{miss})} > 2.5$	82 (3)	0.04 (3)	1.1 (2)	$15 (4) \times 10^2$	$7 (3) \times 10^2$

✓ it is important to estimate QCD background from data.

Extracting QCD from data



Samples

- MonteCarlo:
 - mc09_900GeV.105001.pythia_minbias.merge.AOD.e466_s604_s582_r871_r879 (day1 conditions)
 - mc09_900GeV.105001.pythia_minbias.merge.AOD.e466_s604_s582_r873_r879 (day100 conditions)
- Data(*): only some LumiBlocks from
 - data09_900GeV.00142383.physics_MinBias.merge.DESD_COLLICAND.f190_m311
 - data09_900GeV.00142195.physics_MinBias.merge.DESD_COLLICAND.f189_m305
 - data09_900GeV.00142193.physics_MinBias.merge.DESD_COLLICAND.f195_m326
 - data09_900GeV.00142191.physics_MinBias.merge.DESD_COLLICAND.f189_m305
 - data09_900GeV.00142189.physics_MinBias.merge.DESD_COLLICAND.f189_m305
 - data09_900GeV.00142174.physics_MinBias.merge.DESD_COLLICAND.f189_m305
 - data09_900GeV.00142171.physics_MinBias.merge.DESD_COLLICAND.f189_m305
 - data09_900GeV.00142166.physics_MinBias.merge.DESD_COLLICAND.f189_m305
 - data09_900GeV.00142165.physics_MinBias.merge.DESD_COLLICAND.f189_m305
 - data09_900GeV.00142154.physics_MinBias.merge.DESD_COLLICAND.f188_m305
 - data09_900GeV.00142149.physics_MinBias.merge.DESD_COLLICAND.f188_m305
 - data09_900GeV.00141811.physics_MinBias.merge.DESD_COLLICAND.f187_m305
 - data09_900GeV.00141749.physics_MinBias.merge.DESD_COLLICAND.f187_m305

(*) good data has been selected using the AtlasRunQuery
- Release 15.6.1 + some packages for D3PD production (see backup)

GoodRunList

- ✓ decide a list of good runs (→atlas-runquery →GoodRunList)
 - ✓ Pixel and SCT ON
 - ✓ Solenoid ON
 - ✓ data at 900 GeV

Run Search – Insert Your Query:

`f t 20.11.2009+ and dq pix g and dq sct g and mag s and ptag data09_900GeV /sh dq pix and dq sct`

[Default query condition] [Type 'f ... / show all' to see full info (except for DQ and trigger)]

- ✓ run on DESD_COLL CAND to produce D3PD
- ✓ run the same code on MonteCarlo to produce D3PD
- ✓ D3PD produced privately
- ✓ we are in touch with D3PD developers, to add all the variables we need
- ✓ then D3PD will be produced centrally
- ✓ will produce new D3PD after Christmas reprocessing



Run	good LB
141749	19-100
141811	126-165
142149	65-87
142154	22-35
142165	134-257
142166	38-96
142171	217-229
142174	8-48
142189	140-147
142191	7-36 + 141-234
142193	33-153
142195	11-54
142383	260-283

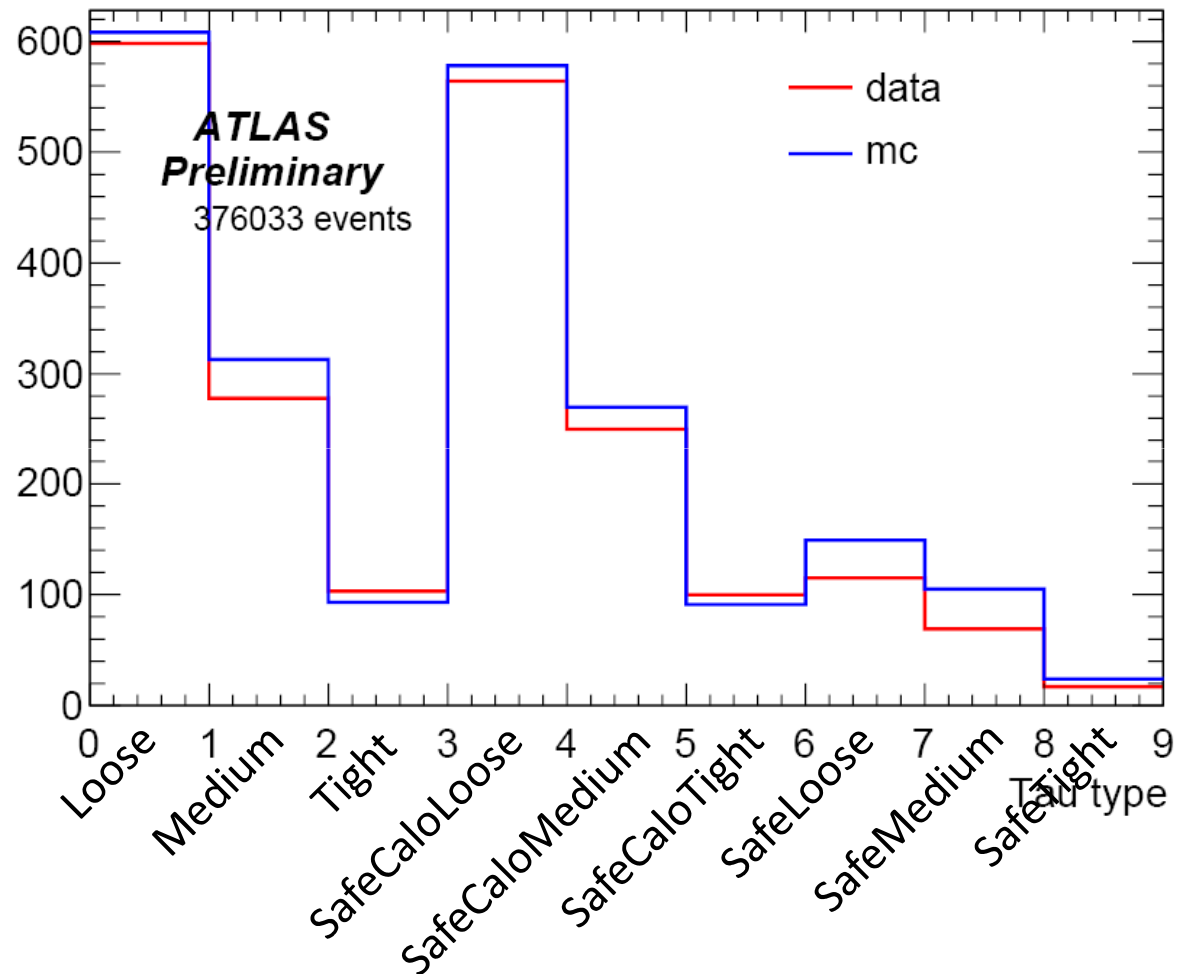
Some very preliminary plots...

✓ number of reconstructed taus for different identification levels
(→ Note ATL-PHYS-INT-2009-082)

✓ “SafeCalo” variables based on calorimetric variables

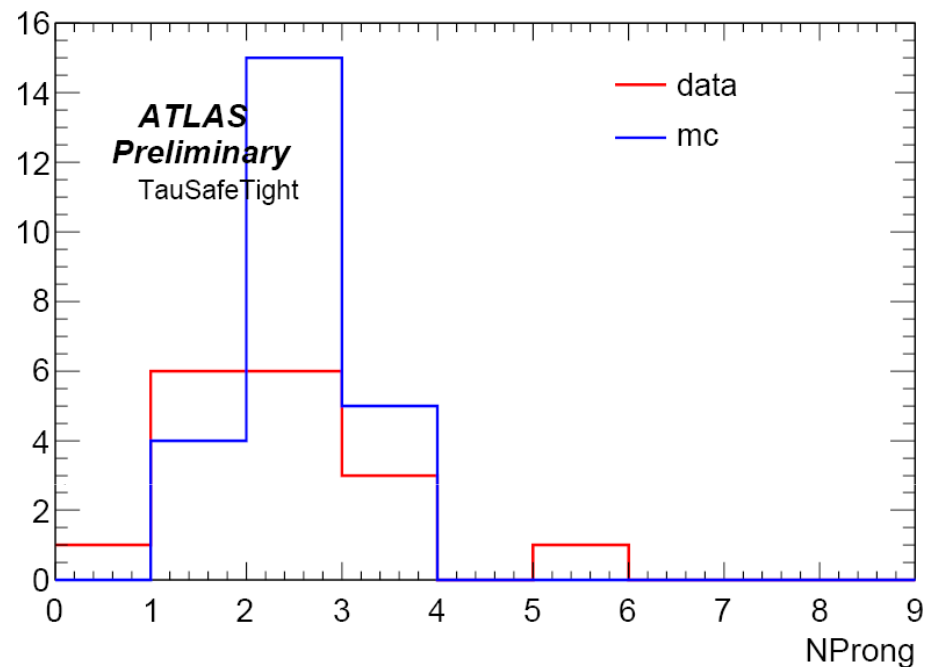
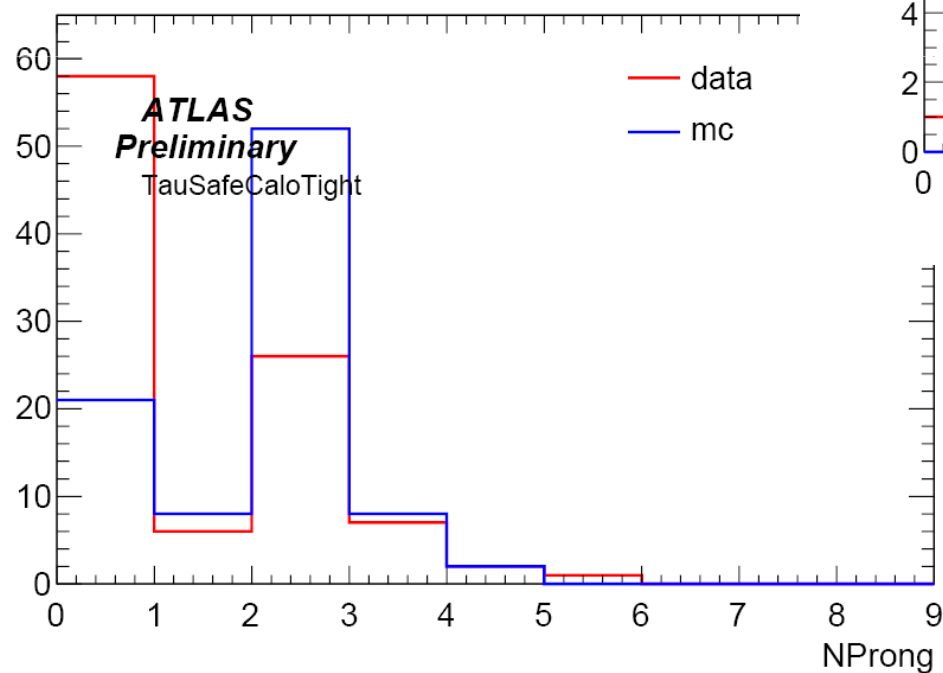
✓ “Safe” variables based on calorimetric and tracking variables

✓ quite good agreement, except for “Safe” variables...



Tau Nprong for different identifications

- ✓ reconstructed taus
- ✓ no cuts applied
- ✓ different number of reconstructed taus in Data and MC on the same number of events



Backup

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D3PD – technical details

- ✓ to produce D3PD, check out and compile:
 - ✓ JetD3PDMaker-r252088
 - ✓ MinBiasD3PDMaker-00-00-05
 - ✓ MissingETD3PDMaker-00-03-02
 - ✓ TauD3PDMaker-r254873
 - ✓ TrackD3PDMaker-00-01-03
 - ✓ MissingETGoodness-00-00-09
 - ✓ MissingETPerformance-00-05-34
- ✓ DATA
 - ✓ EventDetails (EventNumber, lbn...)
 - ✓ electrons, photons, muons (StacoMuonCollection)
 - ✓ jets (Cone4H1TopoJets, Cone4H1TowerJets, AntiKt4H1TopoJets...)
 - ✓ missingET (RefFinal, Final, Topo, Base...)
 - ✓ taus (TauRecContainer)
 - ✓ tracks and vertexes (primary, conversions)
- ✓ MC: DATA + ...
 - ✓ missingET: truth
- ✓ no trigger info for the moment
- ✓ all the other truth information have just been added in the D3PDMaker package

Atlas Run Query

- ✓ make your selection:
 - time
 - run duration
 - number of events collected
 - data type (900GeV or 2(!)TeV)
 - beam conditions (stable beam, number of bunches, beam energy, fill number...)
 - magnets
 - detectors in the data taking
 - data quality
 - trigger
 - ...

- ✓ AtlasRunQuery gives a list of runs (and lumi block) with the selected conditions

- ✓ It is possible to download “GoodRunList” as an xml file to be used by the analysis

Atlas Run Query

ATLAS Run Query - Windows Internet Explorer

http://atlas-runquery.cern.ch/query.py?q=f+t+20.11.2009%2B+and+dq+pix+g+and+dq+sct+g+and+mag+s+and+ptag+data09_900GeV+%2Fsh+dq+pix+a

ATLAS Run Queries

Current run Run Summaries Trigger Configuration Query AMI Data Search DDM Dashboard Tier-0 Monitoring DQ Monitoring Data Preparation Operations

Run Search - Insert Your Query:

ft 20.11.2009+ and dq pix g and dq sct g and mag s and ptag data09_900GeV /sh dq pix and dq sct

[Default query condition] [Type 'f...' / show all' to see full info (except for DQ and trigger)]

Examples (query format inspired by SPIRES):

Run / events Time Detectors Streams Magnets Data quality Proj. tag Trigger Partition Datasets Beam spot LAR LHC ...

find run 90270-90350 and events 100000+ / show run and events

fr 90270-90350 and ev 100k+ / sh r and ev

fr 90270-90350 and ev 100k+ / sh r and allew

fr 90270-90350 and ev 100k+ / sh r and ev and ptag and part / nodef

fr 90270+ and ev 100k-

fr 90270-90350,90500+

fr 90270,90275,90380 and ev 10

fr last 10 / show all / nodef

(More formatting help)

Run Search - Insert Your Query:

ft 20.11.2009+ and dq pix g and dq sct g and mag s and ptag data09_900GeV /sh dq pix and dq sct

[Default query condition] [Type 'f...' / show all' to see full info (except for DQ and trigger)]

Show Runs

Search Result

Selection rule: ft 20.11.2009+ and dq pix g and dq sct g and mag s and ptag data09_900GeV /sh dq pix and dq sct

Query command: [Click to expand/collapse command...]

Selection sequence:

Checking for runs in time range "20.11.2009+" [1258671600000000000, 1261045039419548160L]

Checking in the DQ folder SHIFTOFL (SHIFTOFL:PIXB) and (SHIFTOFL:PIX0) and (SHIFTOFL:PIXEA) and (SHIFTOFL:PIXEC) and (SHIFTOFL:SCTB) and (SHIFTOFL:SCTEA) and (SHIFTOFL:SCTEC) is 'green'

Checking if the filename tag matches "data09_900GeV"

Checking if partition name matches "ATLAS"

Checking if the [SolCurrent] is within [7700,+inf]

15 runs found (0.77 sec)

15 runs found (0.29 sec)

15 runs found (0.28 sec)

13 runs found (0.72 sec)

No. of runs selected: 13

Total no. of events: 10,540,434

Execution time: 8.3 sec

Error on page.

Local intranet | Protected Mode: On

100%

11:17

<http://atlas-runquery.cern.ch/>

Tool to:

- ✓ look for all the useful information about runs and data quality

- ✓ define a GoodRunList

My selection:

- ✓ time: from 24 Nov 2009

- ✓ data@900GeV

- ✓ solenoid ON

- ✓ DataQuality for pixels and SCT green

N.B. In the pixel dq green flag there is no request that the preamplifiers are not killed (with no stable beam HV is OFF and preamplifiers killed), so some data may not be optimal anyway, due to transition...

Atlas Run Query

ATLAS Run Query - Windows Internet Explorer

http://atlas-runquery.cern.ch/query.py?q=f+t+20.11.2009%2B+and+dg+pix+g+and+dg+sct+g+and+mag+s+and+ptag+data09_900GeV+%2Fsh+dg+pix+a

Run	Links	#LB	#Events	PIXB (SHIFTOFL)	PIX0 (SHIFTOFL)	PIXEA (SHIFTOFL)	PIXEC (SHIFTOFL)	SCTB (SHIFTOFL)	SCTEA (SHIFTOFL)	SCTEC (SHIFTOFL)
142383	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	451 (118 s)	566,226 (10.6 Hz)	R	R	R	R	R	R	R
142195	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	84 (107 s)	640,590 (70.9 Hz)	G	G	G	G	G	G	G
142193	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	180 (117 s)	1,972,065 (83.3 Hz)	G	G	G	G	G	G	G
142191	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	247 (116 s)	1,475,463 (51.5 Hz)	G	G	G	G	G	G	G
142189	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	147 (119 s)	472,437 (26.9 Hz)	R	R	R	R	R	R	R
142174	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	54 (109 s)	423,654 (71.9 Hz)	G	G	G	G	G	G	G
142171	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	229 (133 s)	572,013 (18.6 Hz)	R	R	R	R	R	R	R
142166	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	123 (112 s)	764,348 (55.2 Hz)	R	R	R	R	G	G	G
142165	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	266 (113 s)	1,927,819 (84.0 Hz)	R	R	R	R	G	G	G
142154	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	44 (97 s)	325,455 (76.2 Hz)	R	R	R	R	R	R	R
142149	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	125 (114 s)	414,954 (29.0 Hz)	R	R	R	R	R	R	R
141811	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	183 (114 s)	457,953 (21.9 Hz)	R	R	R	R	R	R	R
141749	RS, AMI, DQ, Lumi, ELOG, DCS, SoR/EoR	133 (116 s)	527,457 (34.1 Hz)	G	G	G	G	G	G	G

Error on page.

Local intranet | Protected Mode: On

xml file

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NTau

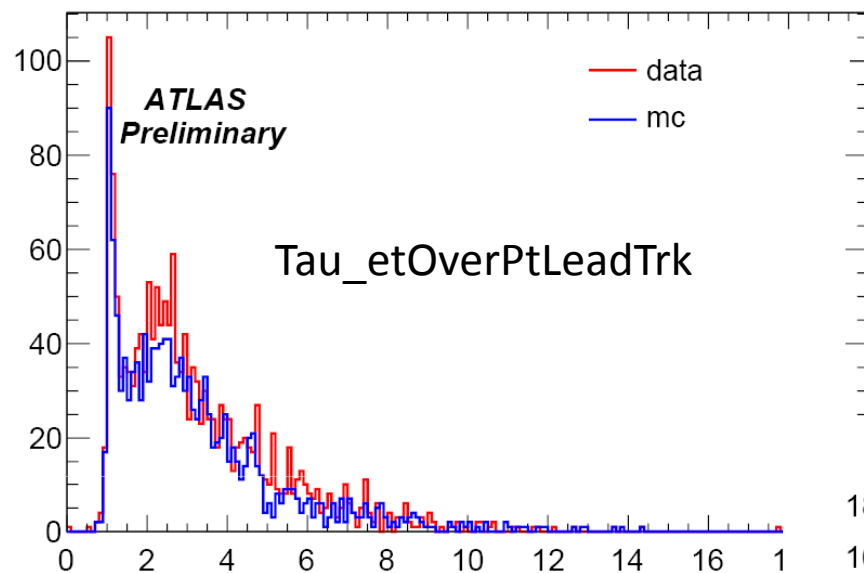
DATA

Events with Taus	2120
Taus	2395
Taus CutLoose	598
Taus CutMedium	278
Taus CutTight	103
Taus CutSafeCaloLoose	564
Taus CutSafeCaloMedium	250
Taus CutSafeCaloTight	100
Taus CutSafeLoose	115
Taus CutSafeMedium	69
Taus CutSafeTight	17

MC

Events with Taus	1502
Taus	1734
Taus CutLoose	608
Taus CutMedium	313
Taus CutTight	93
Taus CutSafeCaloLoose	578
Taus CutSafeCaloMedium	270
Taus CutSafeCaloTight	91
Taus CutSafeLoose	149
Taus CutSafeMedium	105
Taus CutSafeTight	24

Tracking variables for SafeTaus



- ✓ reconstructed taus
- ✓ no cuts applied
- ✓ different number of reconstructed taus in Data and MC on the same number of events

