W→τν Note
&
Tau candidates in first data

Lidia e Attilio

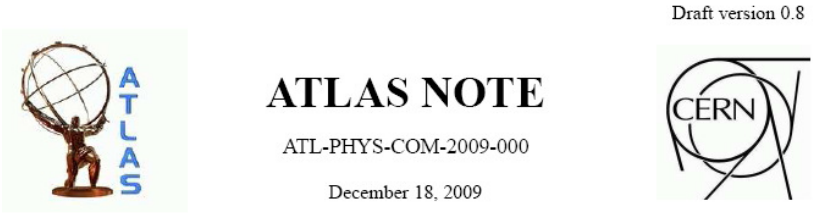
ATLASMi – 22nd December 2009

W→τν Note

✓ Prospects for Studying $W \to \tau_{had}\nu$ 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



Draft version 0.8

ATLAS NOTE

ATL-PHYS-COM-2009-000

December 18, 2009

Prospects for Studying $W \to \tau_{had}\nu$ 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

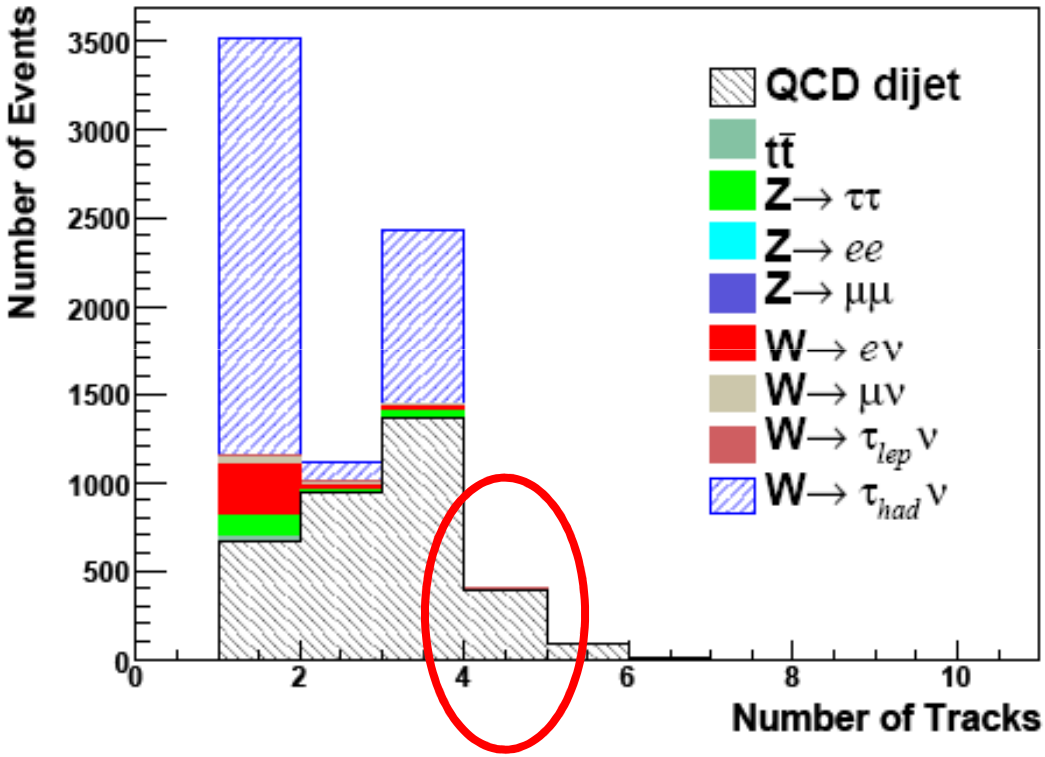
W→τν Note – Event Selection

Cut	$W \to \tau_{had}\nu$	$W \to \tau_{lep}\nu$	$W \to e\nu$	$W \to \mu\nu$	$t\bar{t}$
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	$Z \to \tau\tau$	$Z \to ee$	$Z \to \mu\mu$	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)

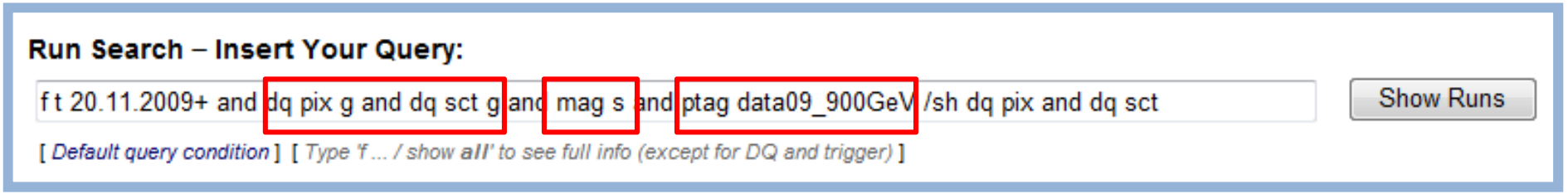
- Data(*): only some LumiBlocks from
  - data09_900GeV.00142383.physics_MinBias.merge.DESD_COLLCAND.f190_m311
  - data09_900GeV.00142195.physics_MinBias.merge.DESD_COLLCAND.f189_m305
  - data09_900GeV.00142193.physics_MinBias.merge.DESD_COLLCAND.f195_m326
  - data09_900GeV.00142191.physics_MinBias.merge.DESD_COLLCAND.f189_m305
  - data09_900GeV.00142189.physics_MinBias.merge.DESD_COLLCAND.f189_m305
  - data09_900GeV.00142174.physics_MinBias.merge.DESD_COLLCAND.f189_m305
  - data09_900GeV.00142171.physics_MinBias.merge.DESD_COLLCAND.f189_m305
  - data09_900GeV.00142166.physics_MinBias.merge.DESD_COLLCAND.f189_m305
  - data09_900GeV.00142165.physics_MinBias.merge.DESD_COLLCAND.f189_m305
  - data09_900GeV.00142154.physics_MinBias.merge.DESD_COLLCAND.f188_m305
  - data09_900GeV.00142149.physics_MinBias.merge.DESD_COLLCAND.f188_m305
  - data09_900GeV.00141811.physics_MinBias.merge.DESD_COLLCAND.f187_m305
  - data09_900GeV.00141749.physics_MinBias.merge.DESD_COLLCAND.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 on DESD_COLLCAND to produce D3PD
- ✓ run the same code on MonteCarlo to produce D3PD

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

- ✓ 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

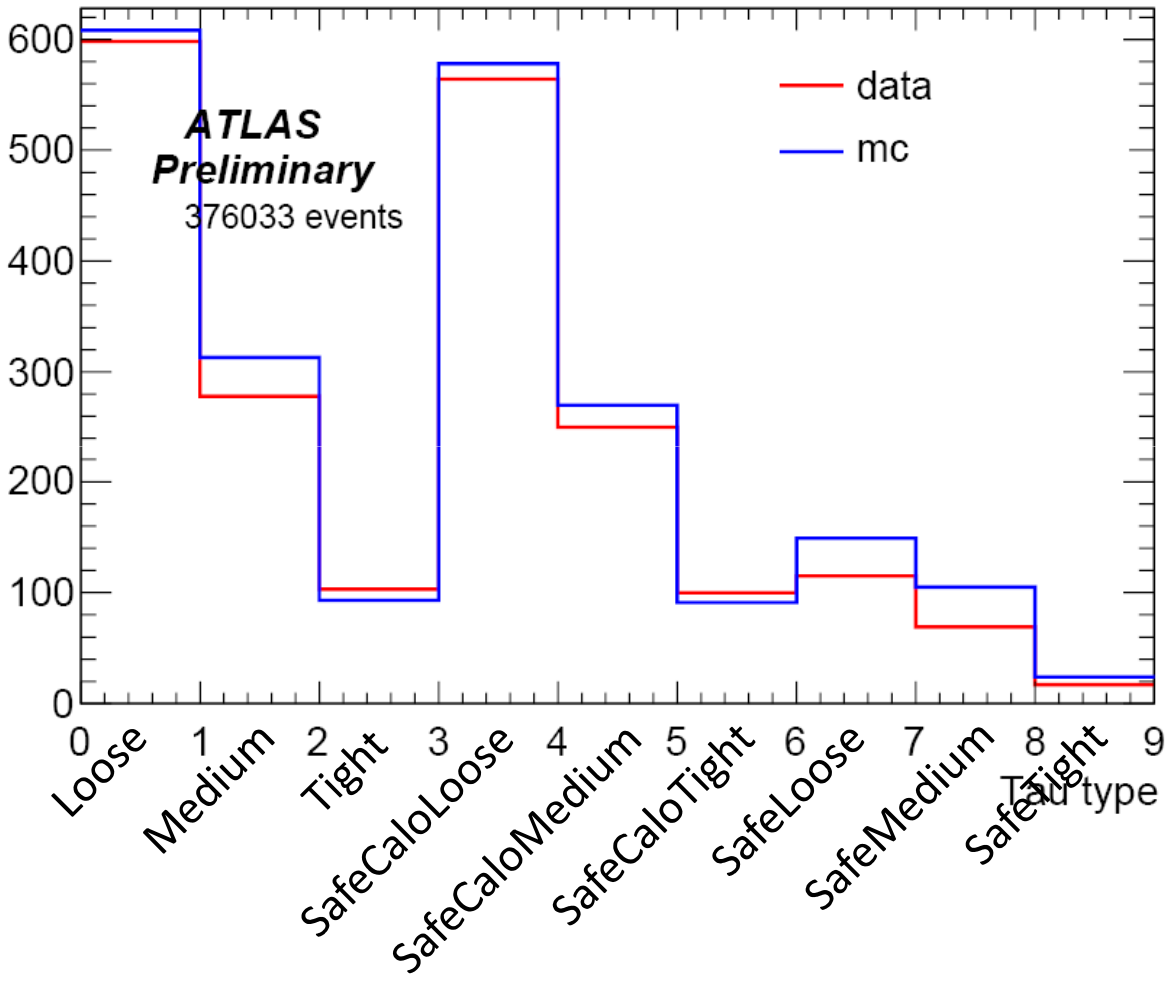
Some very preliminary plots…

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

✓ "SafeCalo" variables based on calorimetric variables

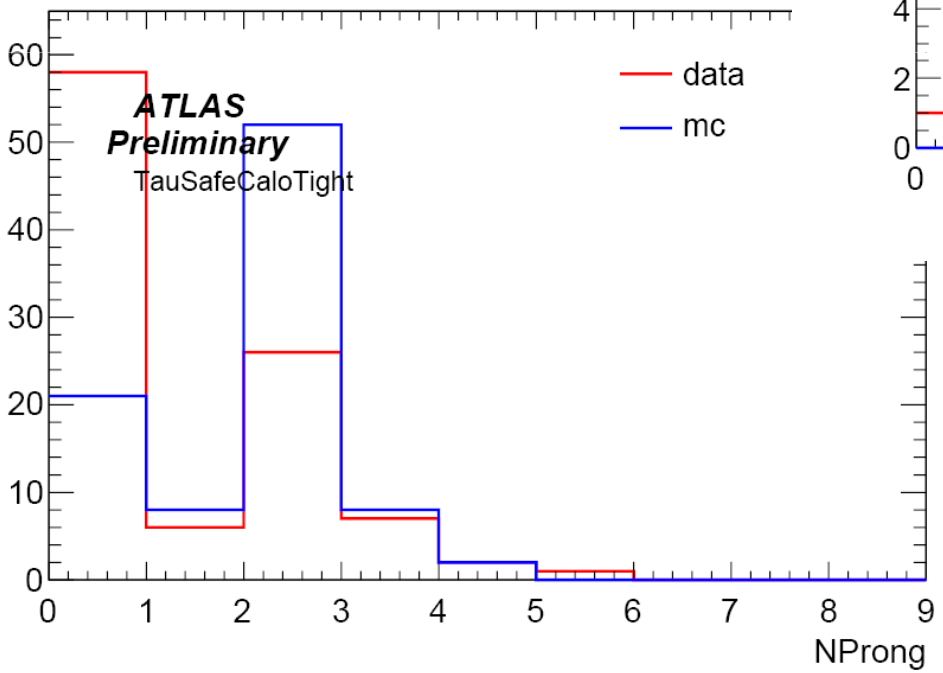
✓ "Safe" variables based on calorimetric and tracking variables

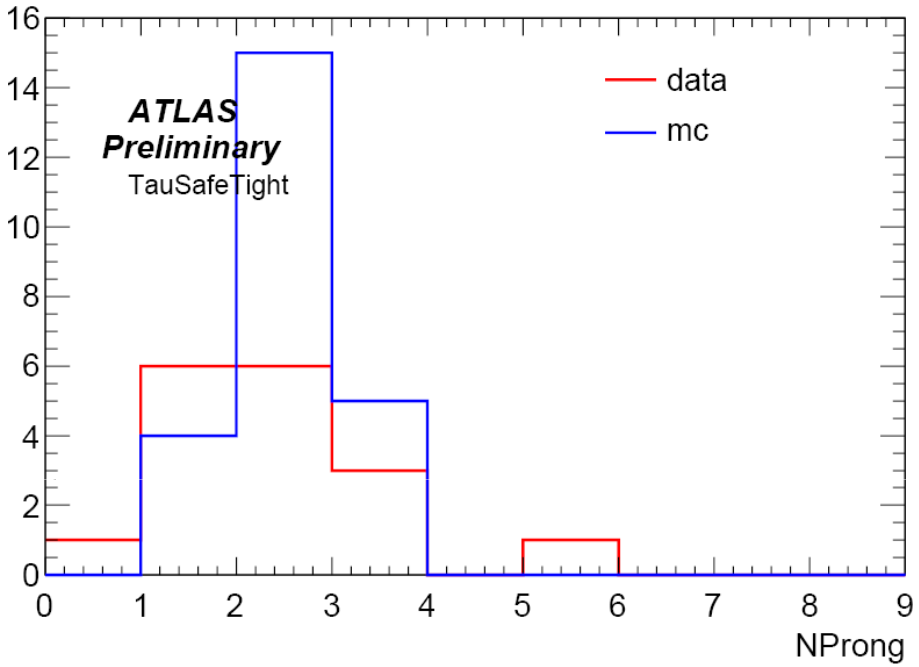
✓ quite good agreement, except for "Safe" variables…



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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Contents

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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

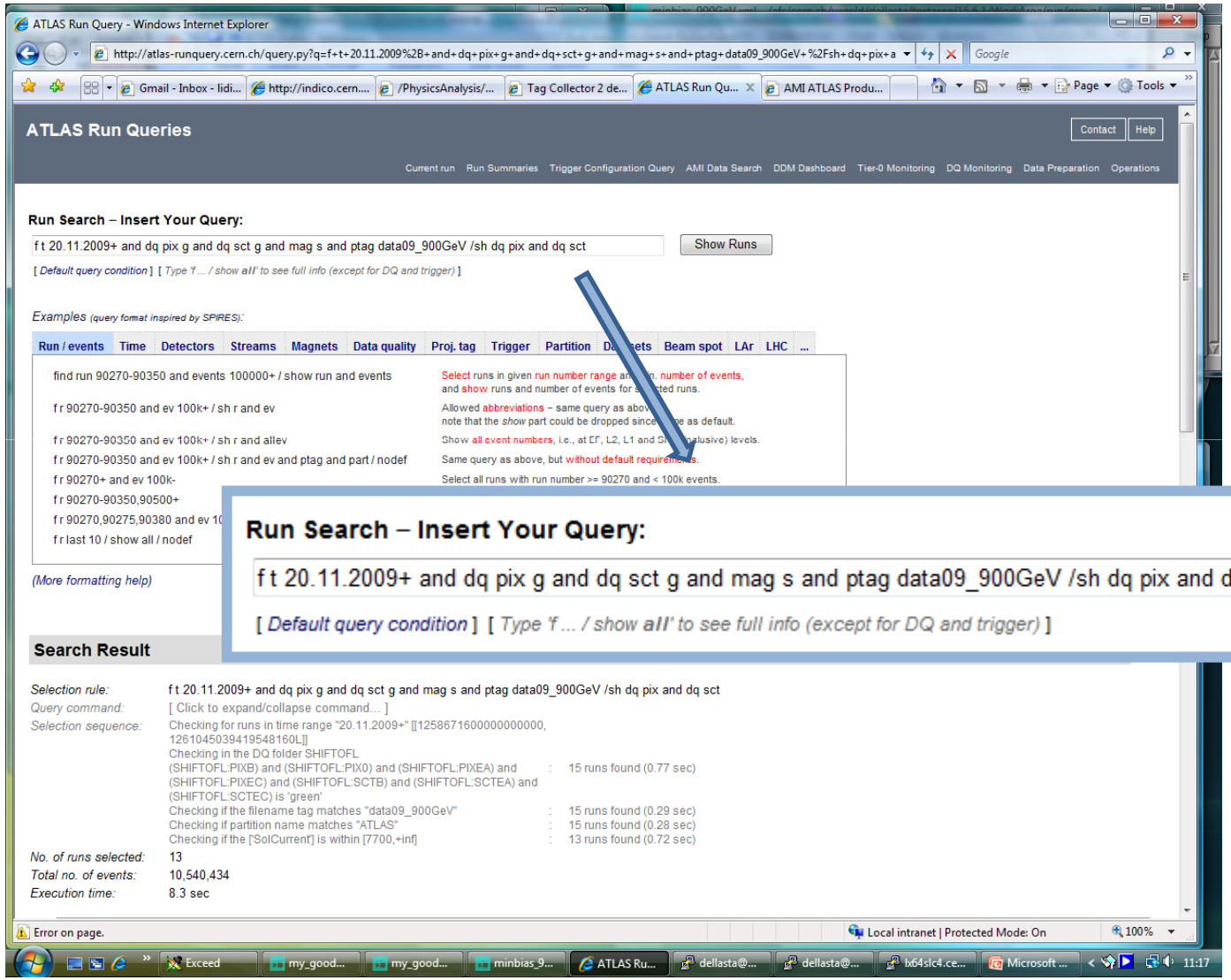
Atlas Run Query

✓ 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



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

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

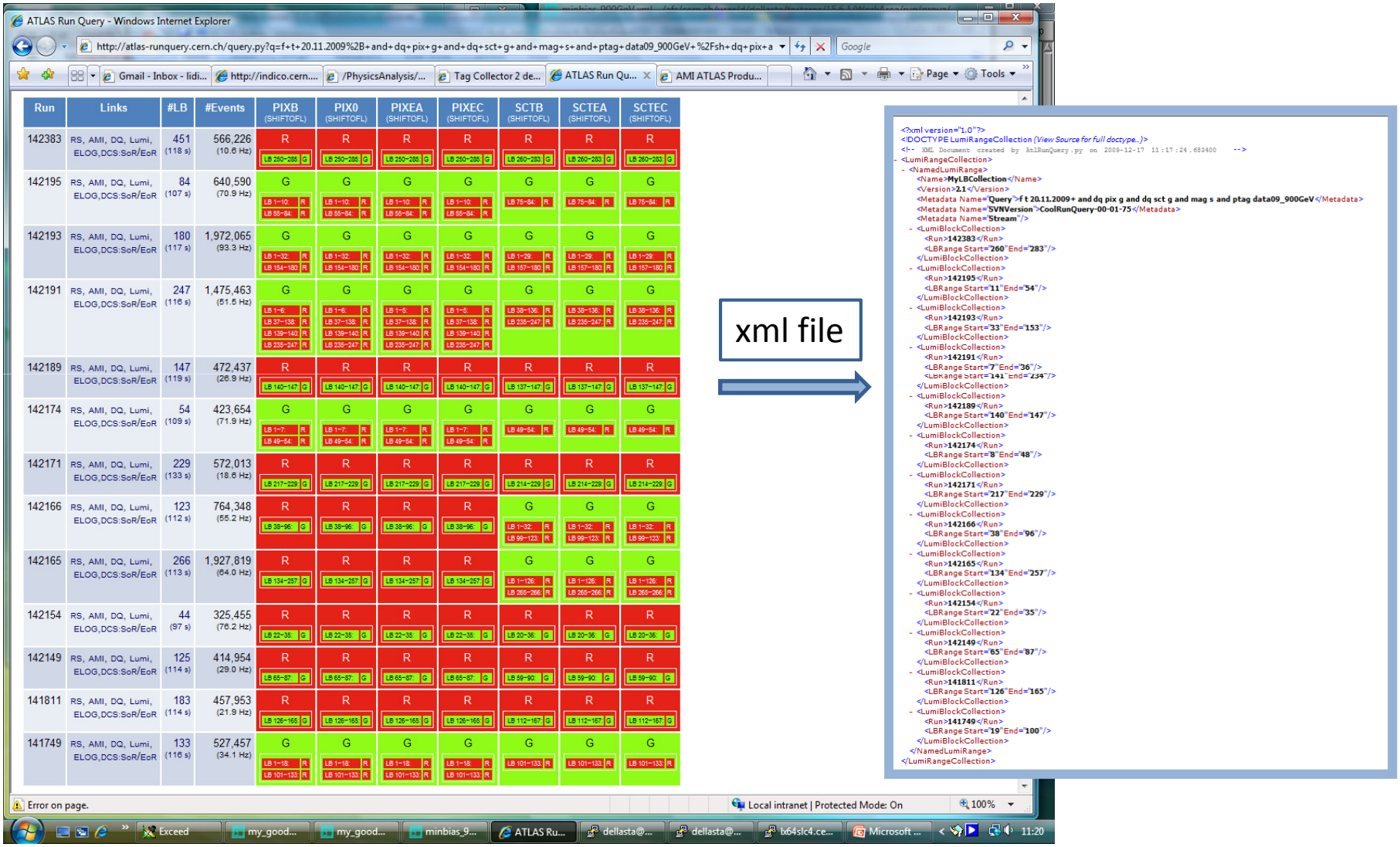
✓ data@900GeV

✓ 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



NTau

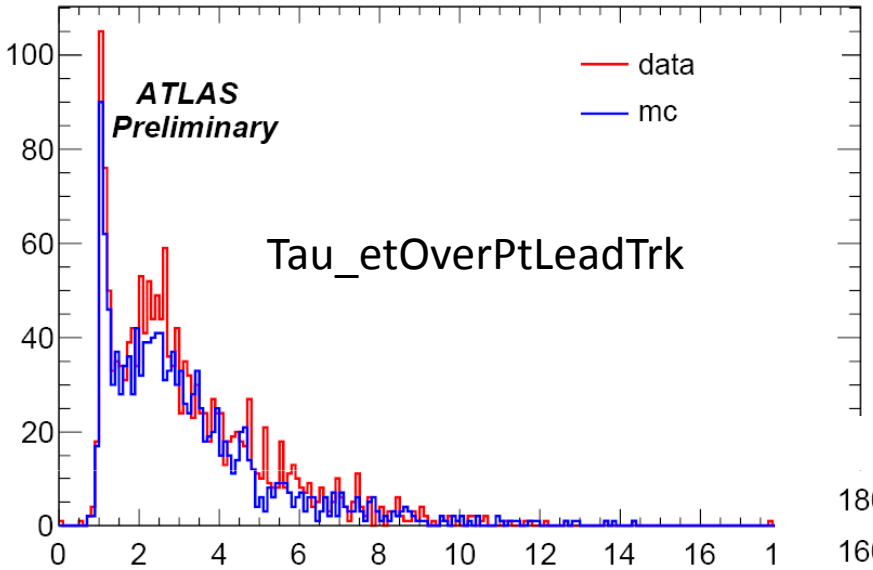
DATA

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



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