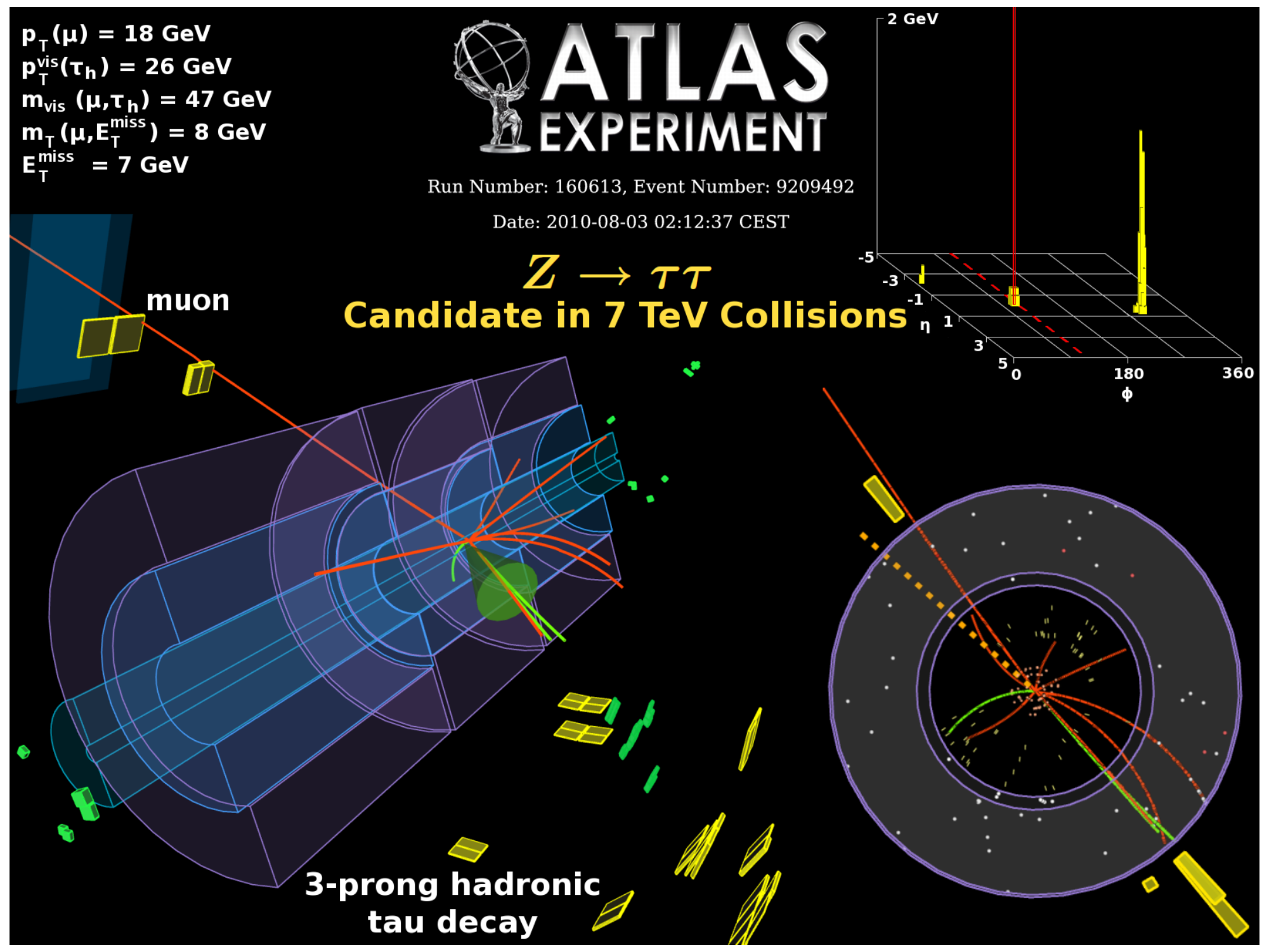
Event Display of $Z \longrightarrow \tau^+ \tau^- \longrightarrow \mu^+ \nu \nu \tau_{\mathrm{h}}^- \nu$

- This document shows a display of an event with a candidate $Z \longrightarrow \tau^+ \tau^- \longrightarrow \mu^+ \nu \nu \tau_{\mathrm{h}}^- \nu$ decay in the ATLAS detector. In the hypothesized decay, one tau decays hadronically, the other to a muon, both accompanied by neutrinos.
- The hadronic tau candidate has three well identified tracks.
- The hadronic tau candidate passes the tight cut-based identification requirements (ATLAS-CONF-2010-086).
- The muon and tau candidate have opposite sign reconstructed charges.
- There is an additional forward track with $\eta = -2.0$, deemed to be part of the underlying event. It has no TRT hits, $p_{\mathrm{T}} = 3$ GeV, and $p = 13$ GeV. The mass of the combination of this track with the muon is 21 GeV, and they have the same sign charge.
- The remaining six tracks in the event all have $p_{\mathrm{T}} = 300 - 700$ MeV, are disperse, and are believed to be part of the underlying event. There is no momentum cut on the tracks shown in the event display.
- Otherwise, there is very little activity in the rest of the event, leaving the muon and tau candidate very well isolated.
- For the selection used to pick the events from which this one was chosen, we expect the signal to background ratio to be about 3.

Caption

This is a display of an event with a candidate $Z \rightarrow \tau^+ \tau^- \rightarrow \mu^+ \nu \nu \tau_{\mathrm{h}}^- \nu$ decay in the ATLAS detector, where τ_{h} denotes a hadronic tau decay. Event properties:

- $p_{\mathrm{T}}(\mu) = 18$ GeV
- $p_{\mathrm{T}}^{\mathrm{vis}}(\tau_{\mathrm{h}}) = 26$ GeV
- $m_{\mathrm{vis}}(\mu, \tau_{\mathrm{h}}) = 47$ GeV
- $m_{\mathrm{T}}(\mu, E_{\mathrm{T}}^{\mathrm{miss}}) = 8$ GeV
- $E_{\mathrm{T}}^{\mathrm{miss}} = 7$ GeV
- The hadronic tau candidate has three well identified tracks.
- The muon and tau candidate have opposite sign reconstructed charges.
- No additional electron, muon, or jet was reconstructed in this event.


$p_T(\mu)$ = 18 GeV
$p_T^{vis}(\tau_h)$ = 26 GeV
m_{vis} (μ,τ_h) = 47 GeV
$m_T(\mu,E_T^{miss})$ = 8 GeV
E_T^{miss} = 7 GeV
ATLAS EXPERIMENT
Run Number: 160613, Event Number: 9209492
Date: 2010-08-03 02:12:37 CEST
$Z \rightarrow \tau\tau$
Candidate in 7 TeV Collisions
muon
2 GeV
-5
-3
-1
η
1
3
5
0
180
360
ϕ
3-prong hadronic
tau decay