

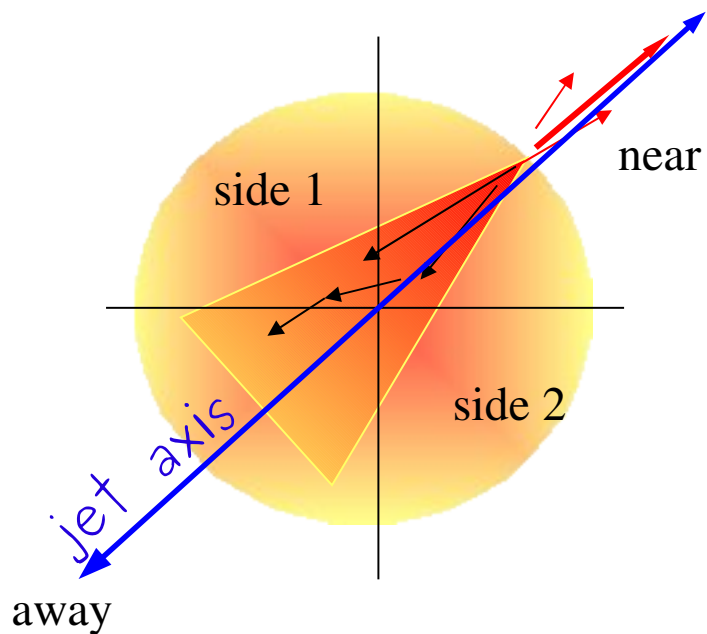


Jet-resonance studies

Renaud Vernet (INFN Catania)

EMCal offline meeting – Frascati

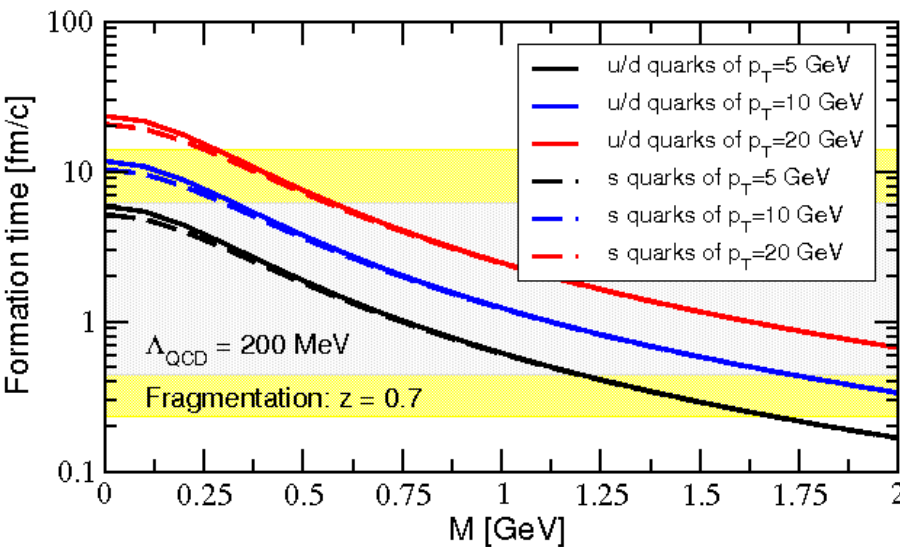
Motivation



Resonances from away-side jets could be formed inside the Chiral-Symmetry-Restored medium

- => expect mass/width modification
- => need mixed phase of partons+hadrons
- => high- p_T resonance daughters interact little with the late hadronic medium

Markert, Bellwied, Vitev
Phys.Lett.B669:92-97,2008



	Low pt	High pt
near side	No medium or late hadronic medium	No medium (reference data)
away side	Late hadronic medium	Partonic or early hadronic medium (formation time) CSR?
side 1&2	Thermal hadronic medium	Thermal hadronic medium

Algorithm

- Loop on events (sequentially) and store "mini-AOD" events :

my simple event class (*preliminary shape*) :

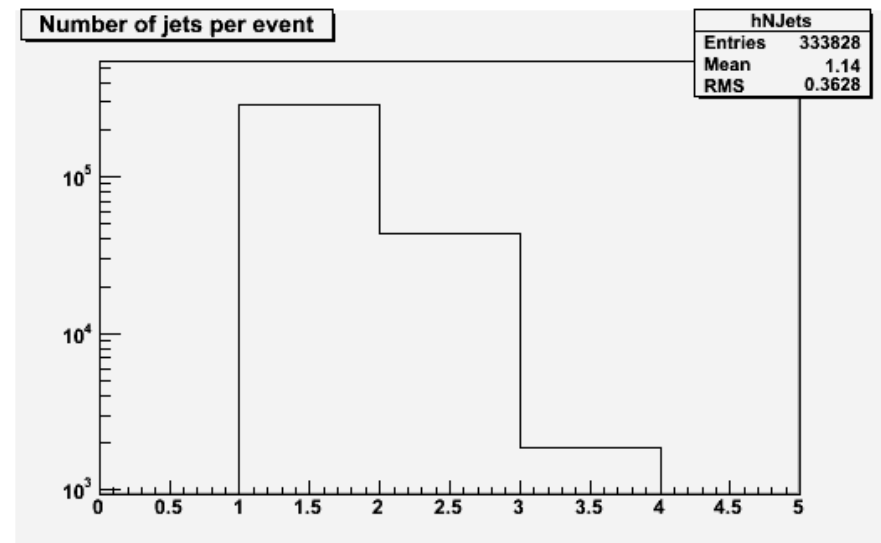
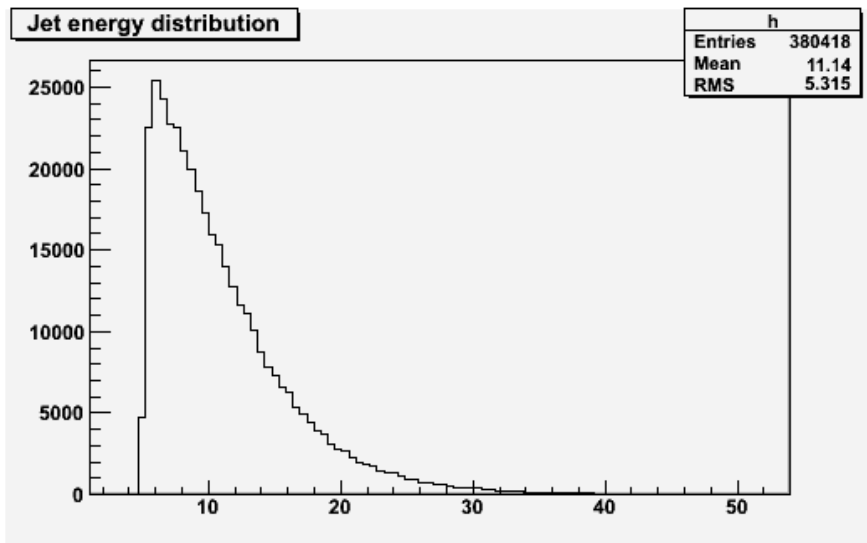
- * minimal jet info
 - *energy*
 - *momentum*
- * minimal resonance info (pairs of opposite-charge primaries)
 - *momentum*
 - *invariant mass*
 - *PDG used for mass hypothesis*
 - *is associated (or not) to a MC resonance with same PDG*
- * minimal track info (primaries)
 - *momentum*
 - *MC PDG code*

- processing performance and data size (*pp@14TeV data*)

- ✓ *CPU time* : *3ms/event*
- ✓ *output tree size* : *5.5kb/event*

Preliminary tests : jet-jet production

- Production LHC09a1 (February 2009)
 - ✓ jet-jet production, *pythia@14TeV*
 - ✓ Monte-Carlo $15 < pT_{hard} < 50 \text{ GeV}/c$
- ~800k events processed (~70% of full production)
 - ✓ run jet reconstruction + store MC particles
 - ✓ minimum reconstructed jet energy $> 5 \text{ GeV}$ was required
- Filter events with at least one reconstructed jet
 - ✓ => ~330k output events for jet-resonance analysis
 - ✓ => among which ~45k output events have ≥ 2 reconstructed jet
- PID on resonance daughters : *perfect* (for the moment...)



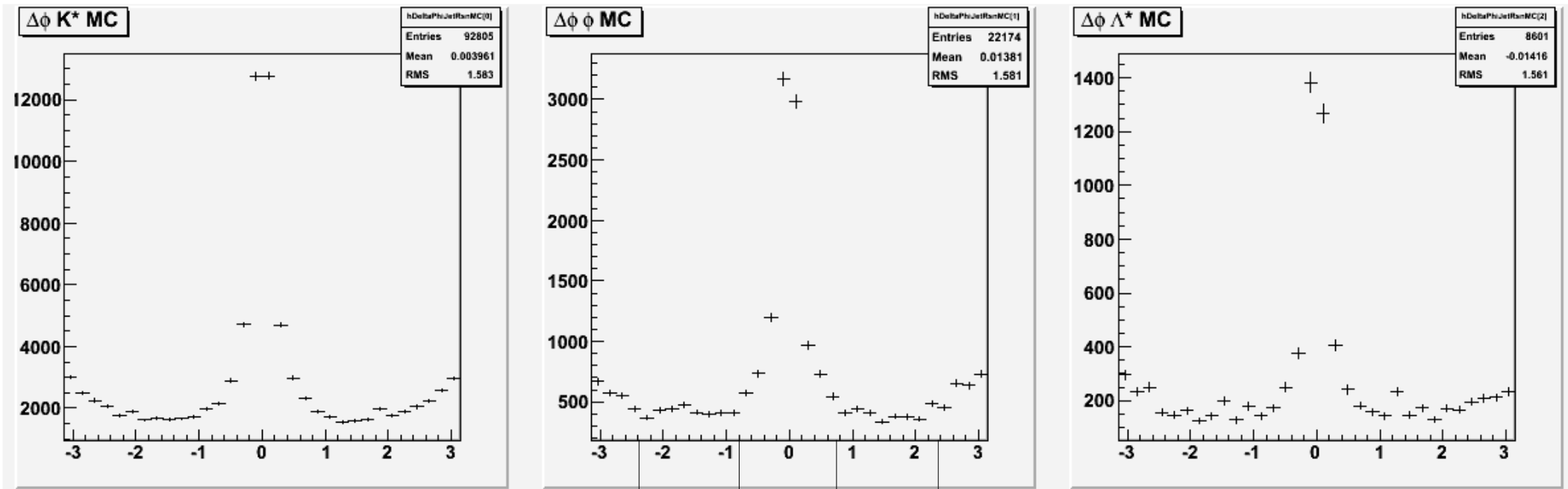
Angular production of resonances

- minimum # reconstructed jets per event ≥ 1

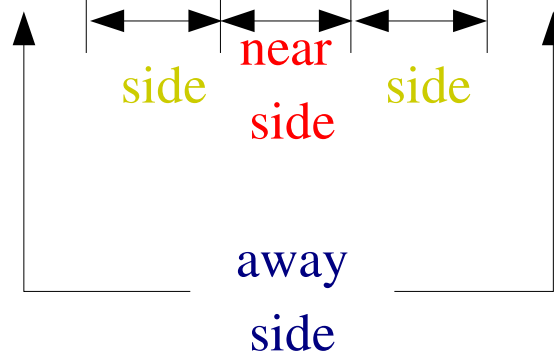
$K^* \rightarrow \pi K$

$\phi \rightarrow KK$

$\Lambda^* \rightarrow pK$



*azimuthal angles
wrt jet axis*



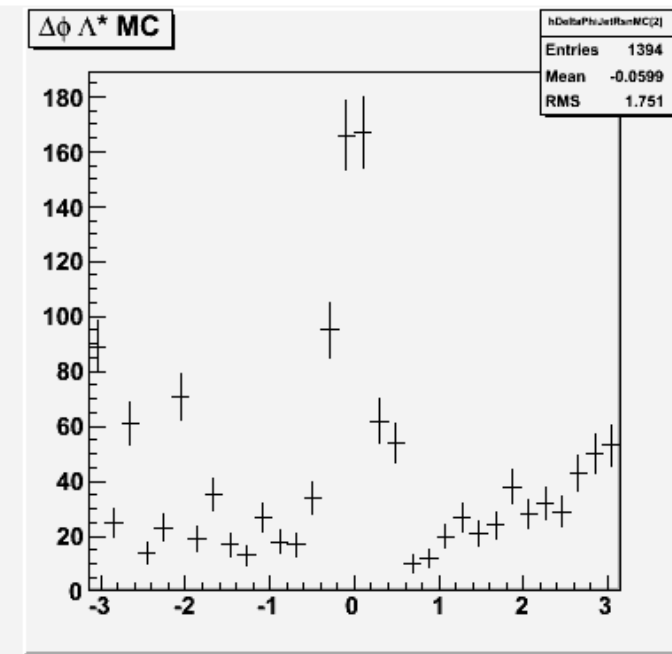
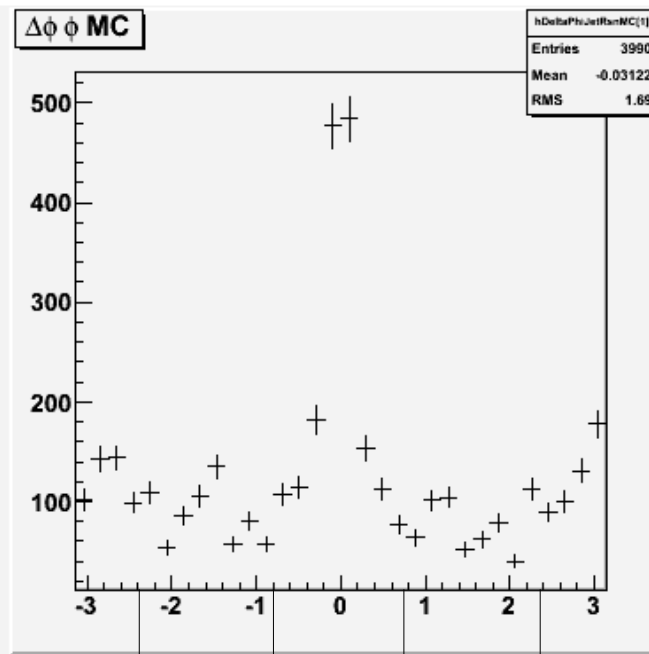
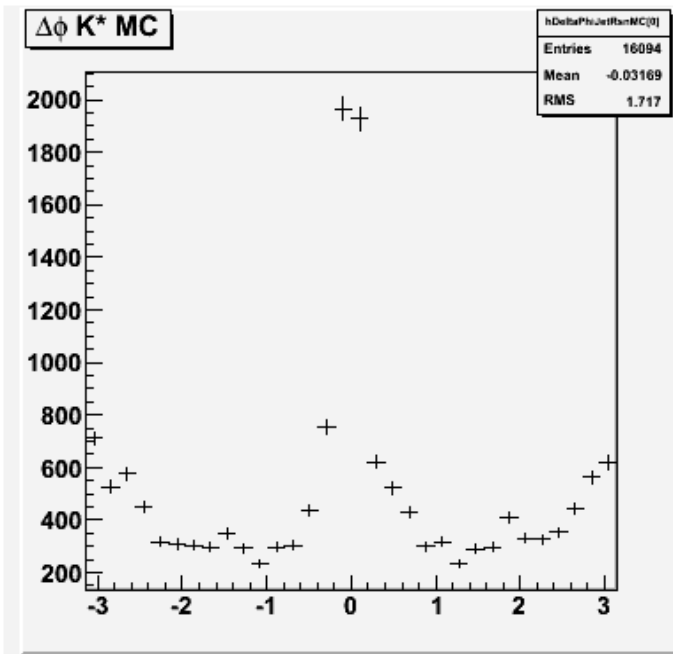
Angular production of resonances

- minimum # reconstructed jets per event ≥ 2

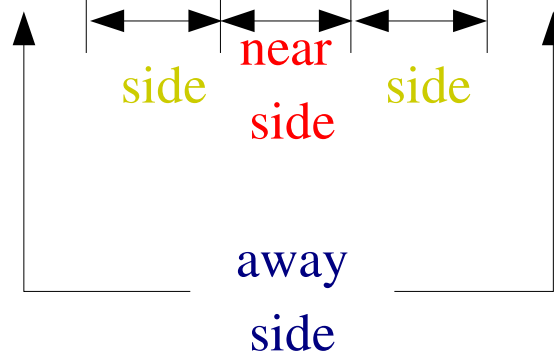
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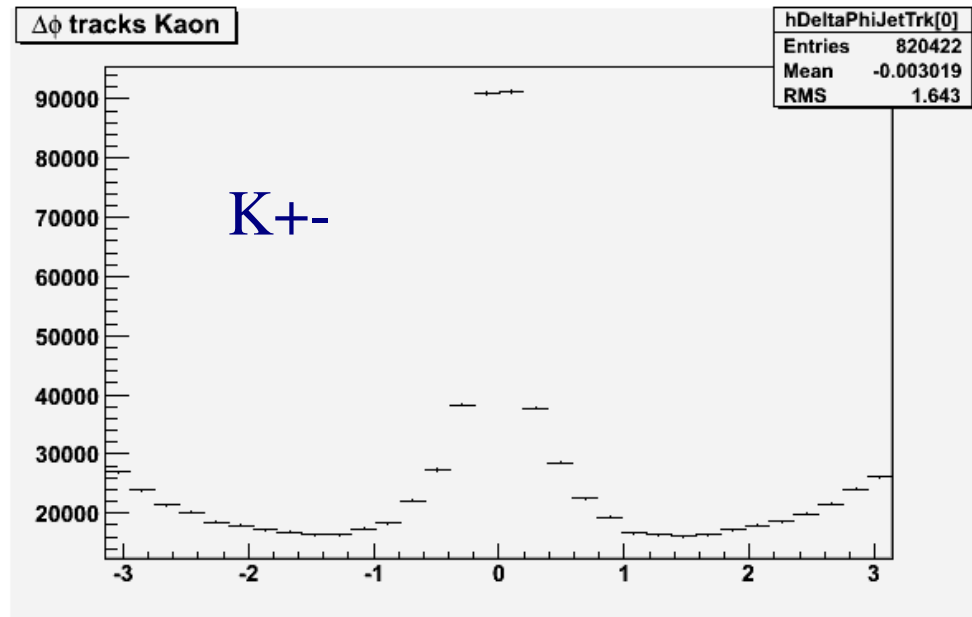


*azimuthal angles
wrt jet axis*



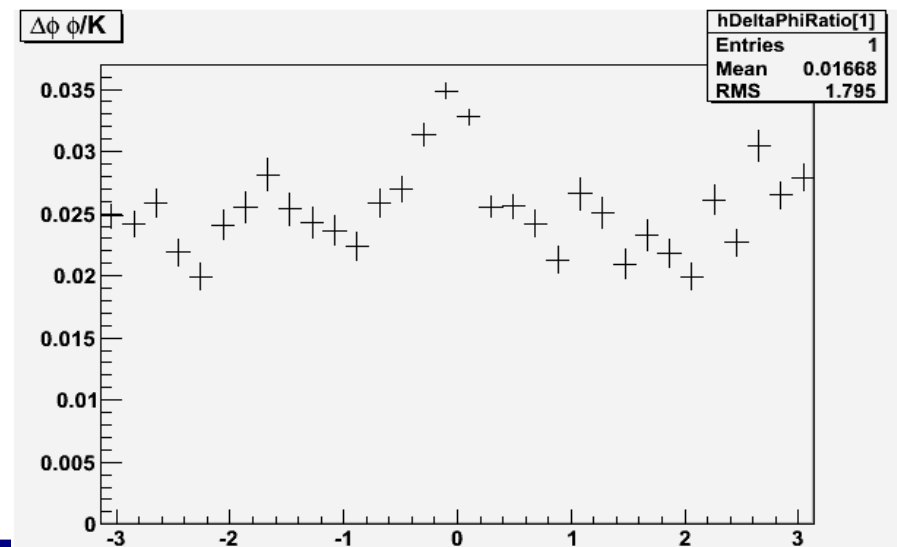
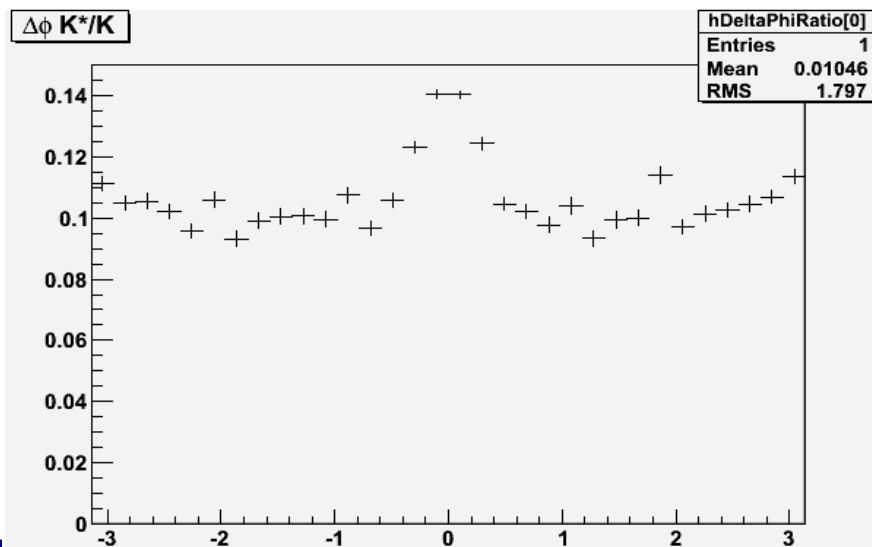
Angular ratio resonance/non-resonance

- minimum # reconstructed jets per event ≥ 1



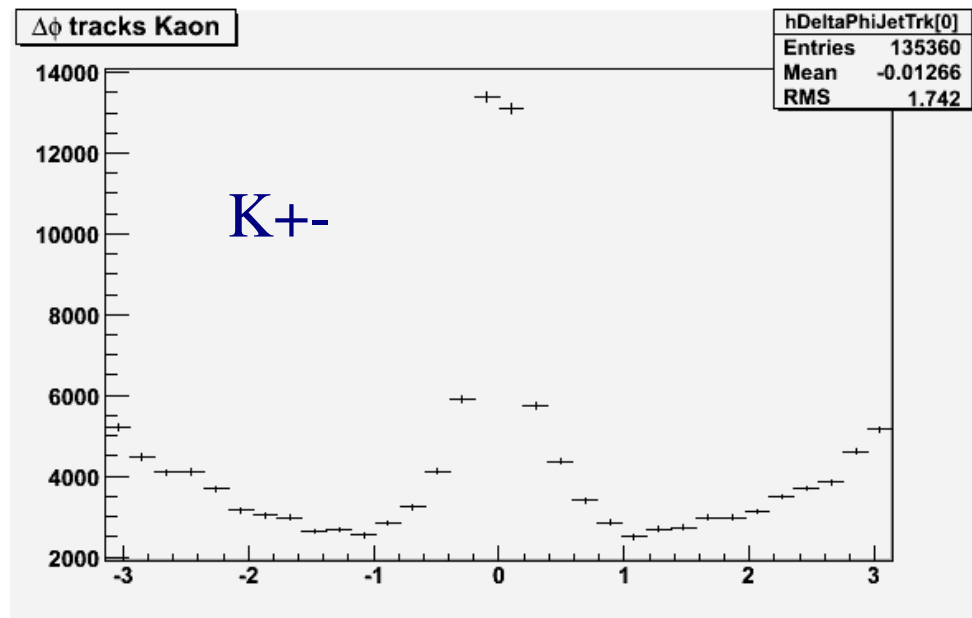
K^{*}/K

ϕ /K



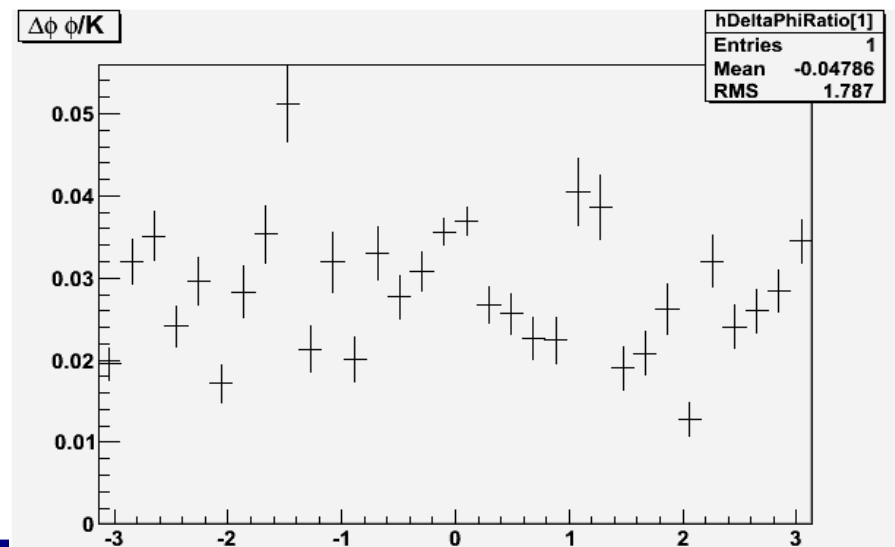
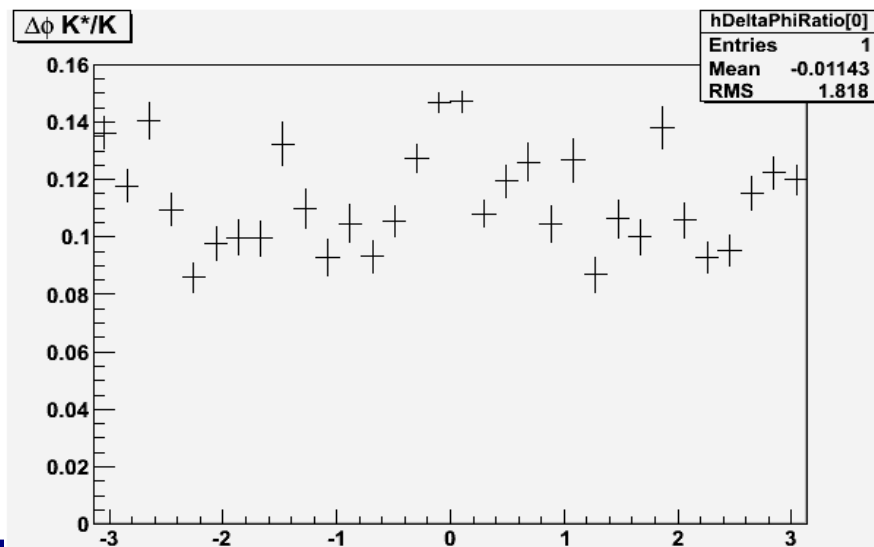
Angular ratio resonance/non-resonance

- minimum # reconstructed jets per event ≥ 2



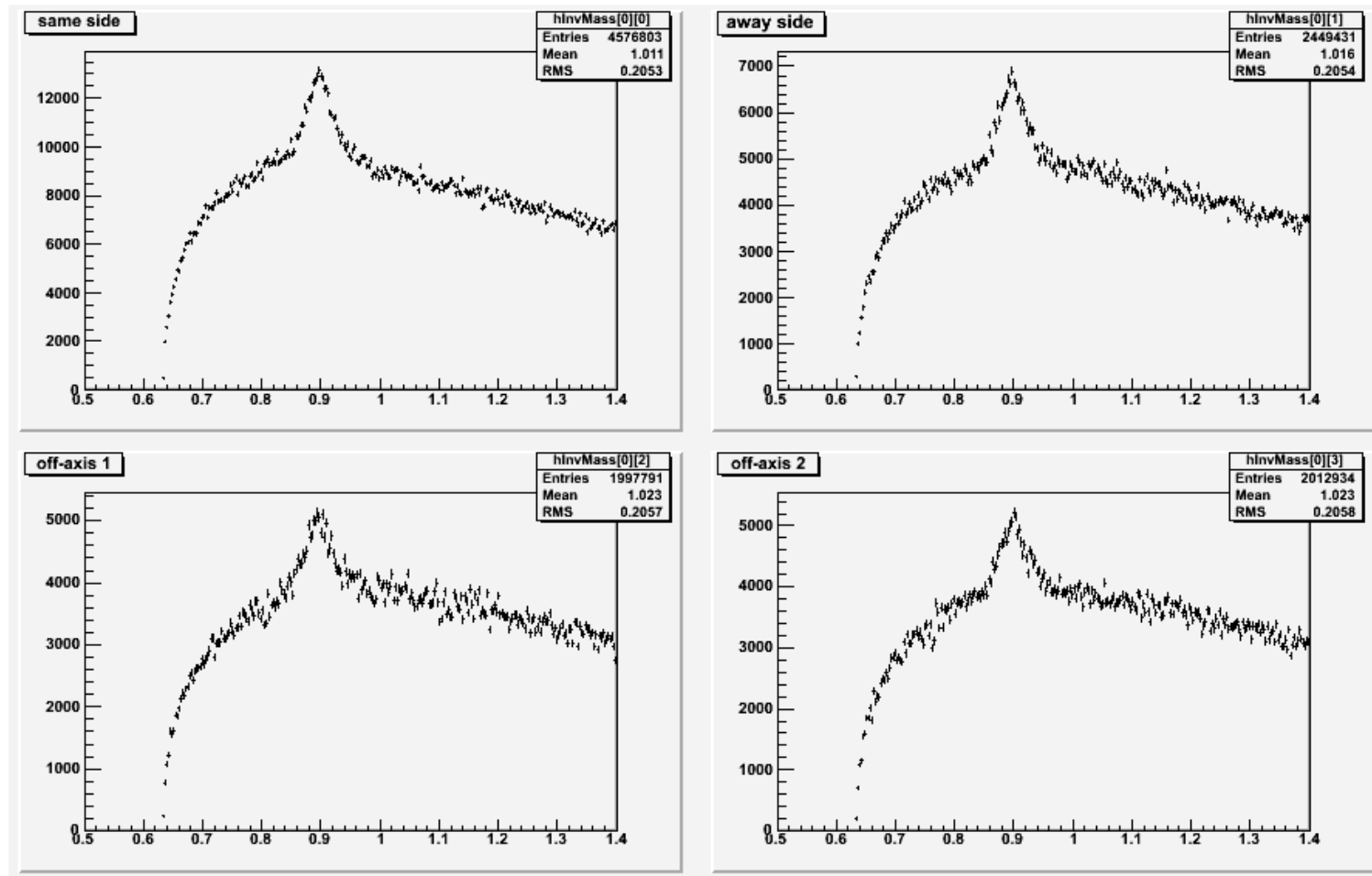
K^{*}/K

ϕ /K



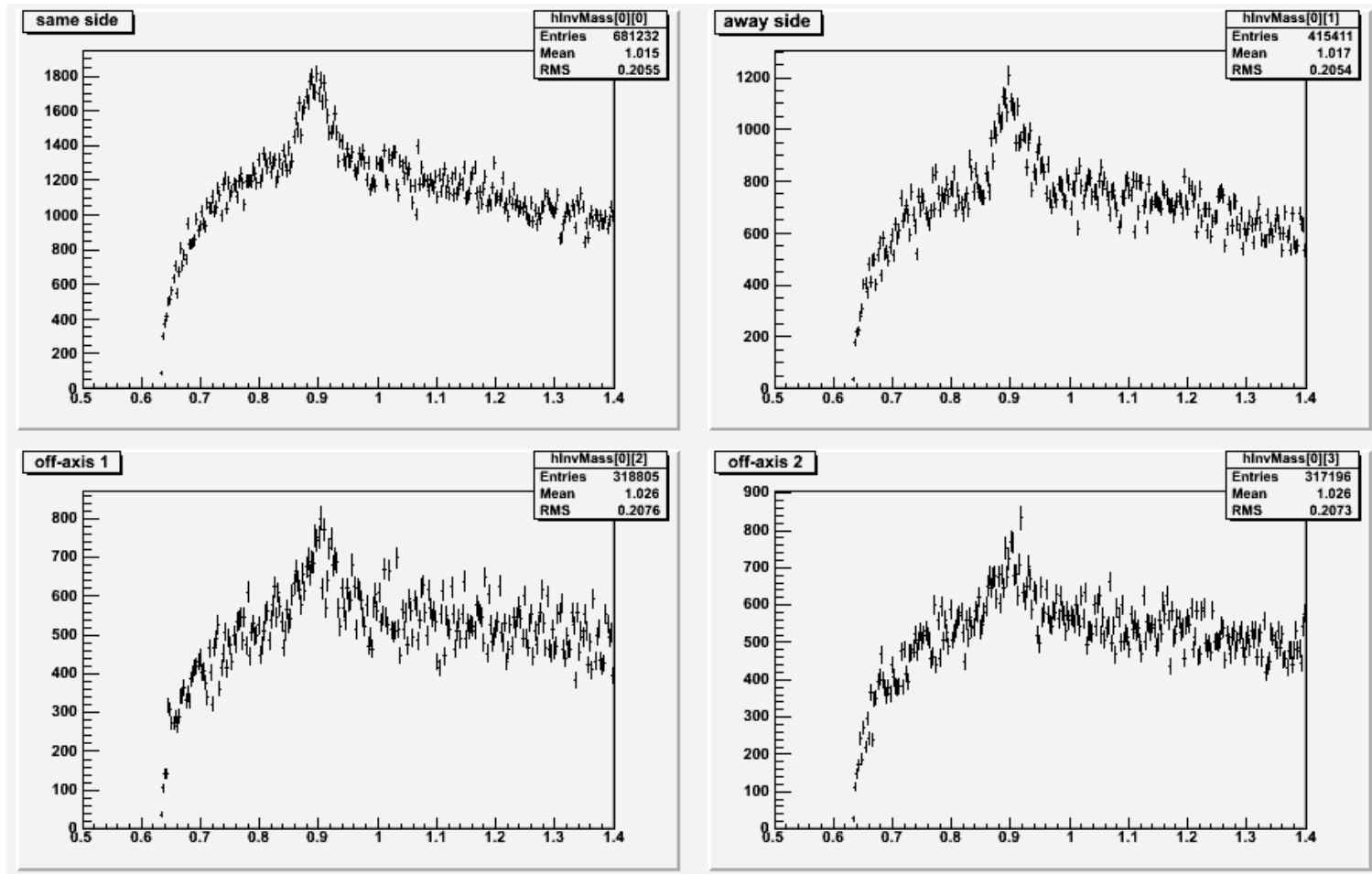
Invariant mass spectra : K^*

- minimum # reconstructed jets per event ≥ 1



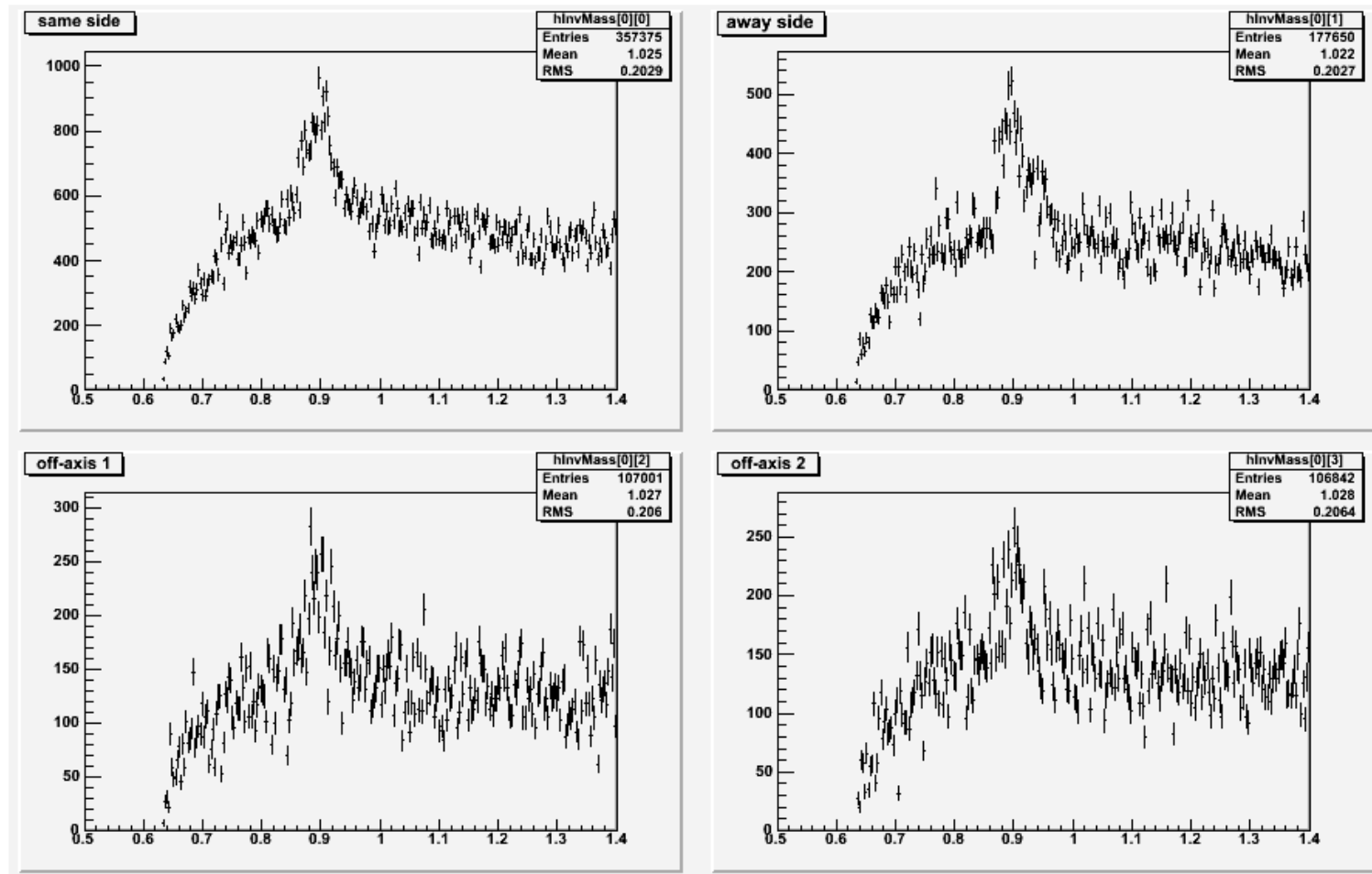
Invariant mass spectra : K^*

- minimum # reconstructed jets per event ≥ 2



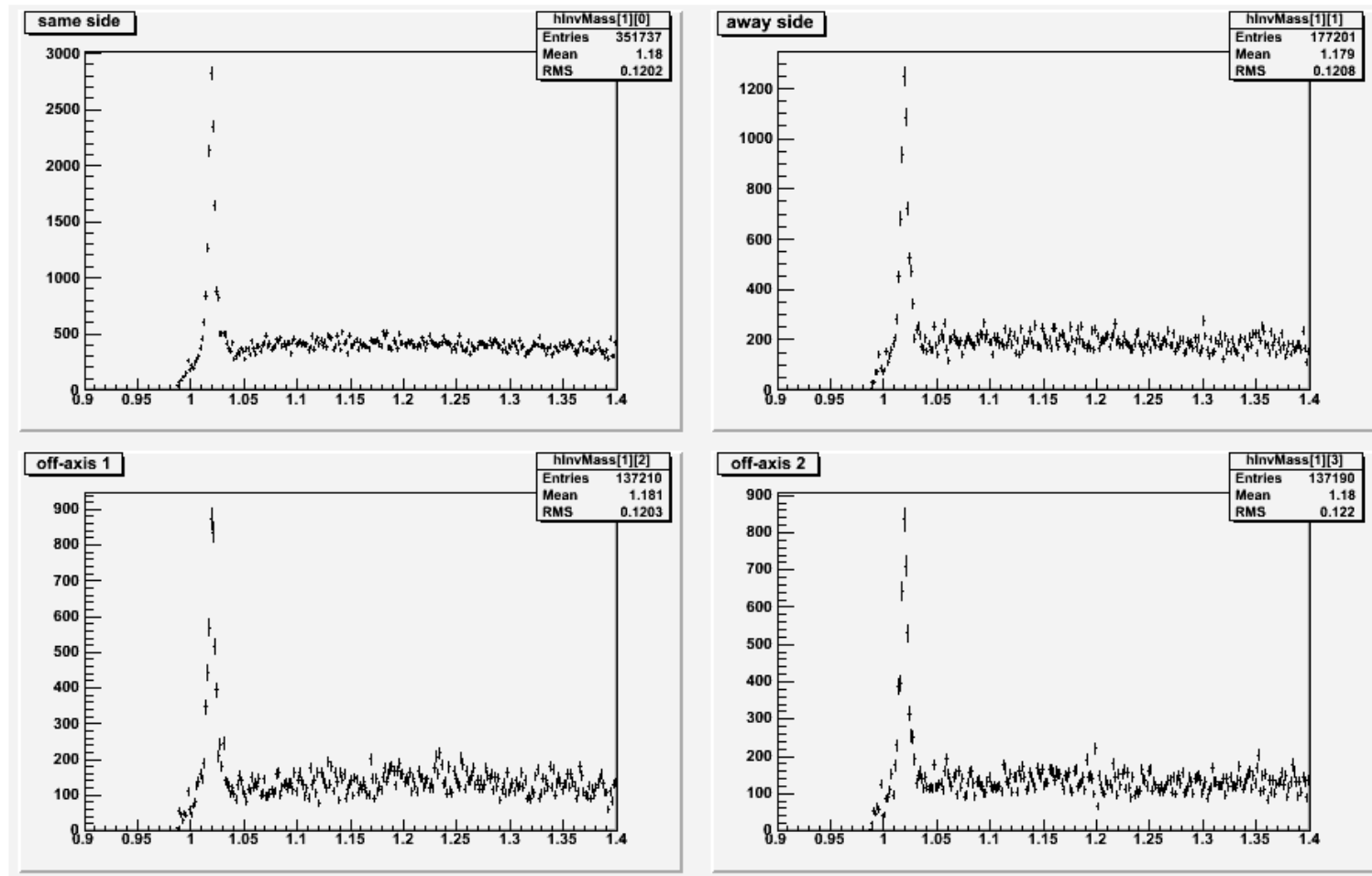
Invariant mass spectra : K^* ($pT > 2\text{GeV}$)

- minimum # reconstructed jets per event ≥ 2



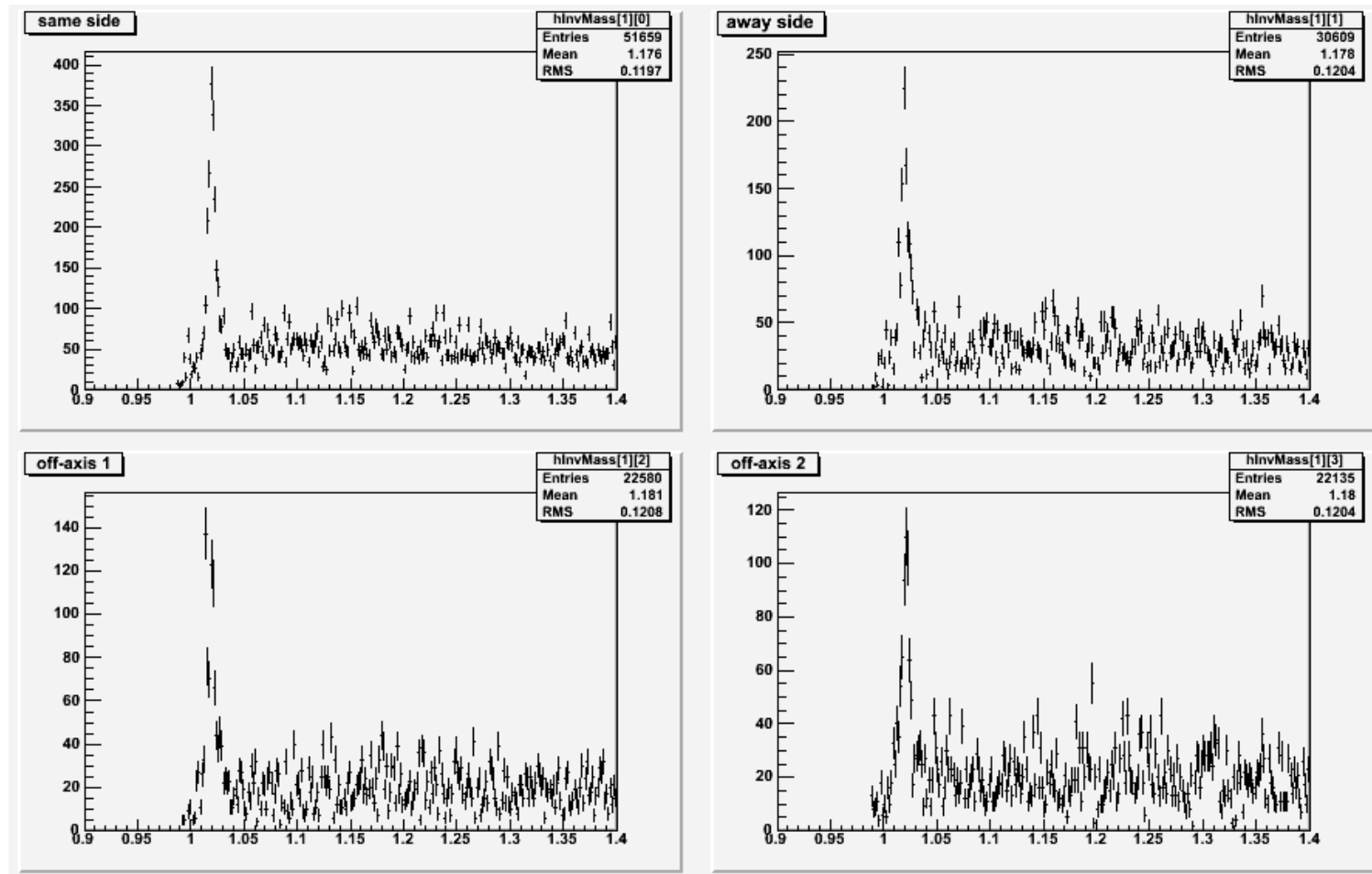
Invariant mass spectra : ϕ

- minimum # reconstructed jets per event ≥ 1



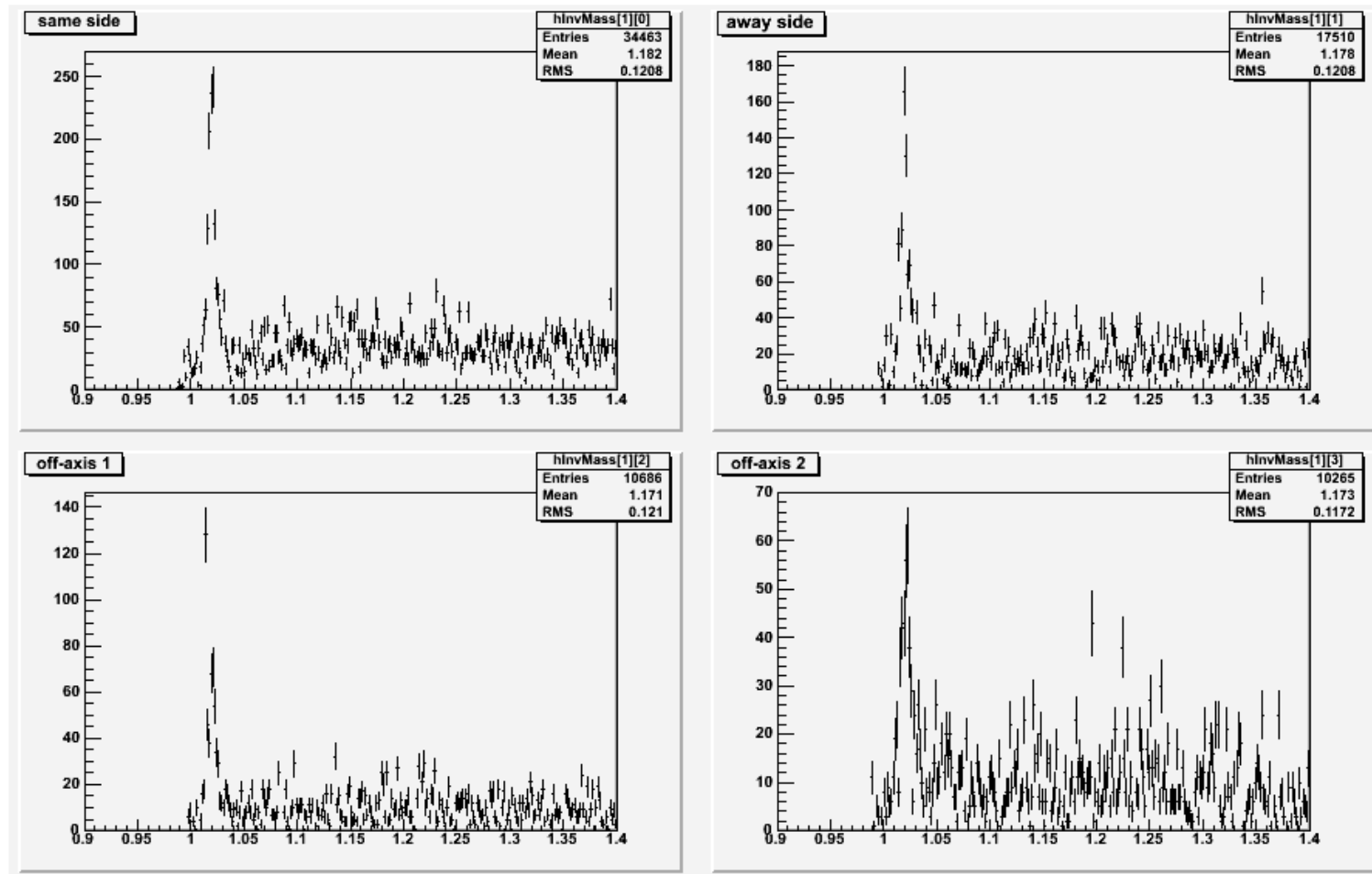
Invariant mass spectra : ϕ

- minimum # reconstructed jets per event ≥ 2



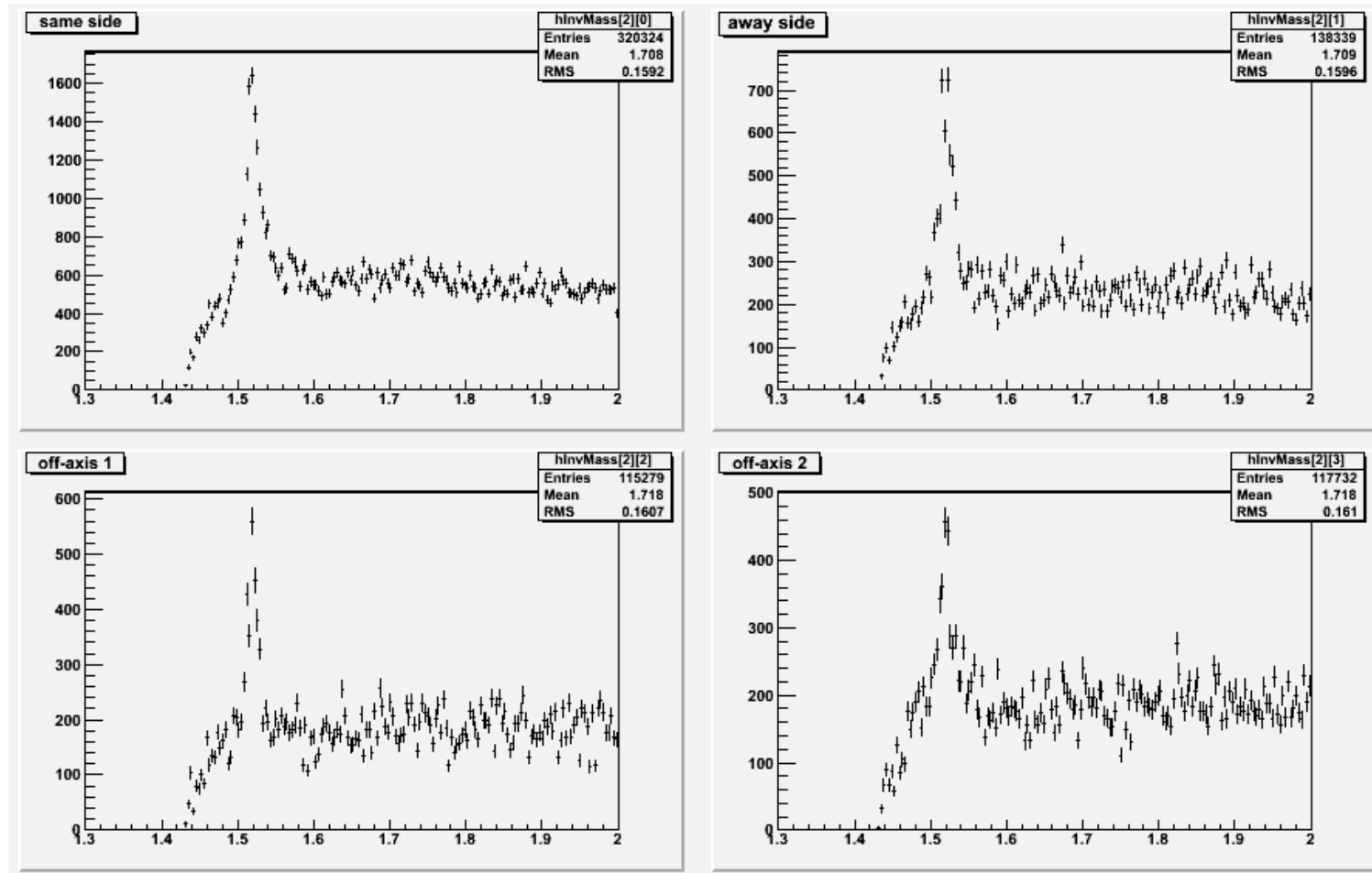
Invariant mass spectra : ϕ ($pT > 2\text{GeV}$)

- minimum # reconstructed jets per event ≥ 2



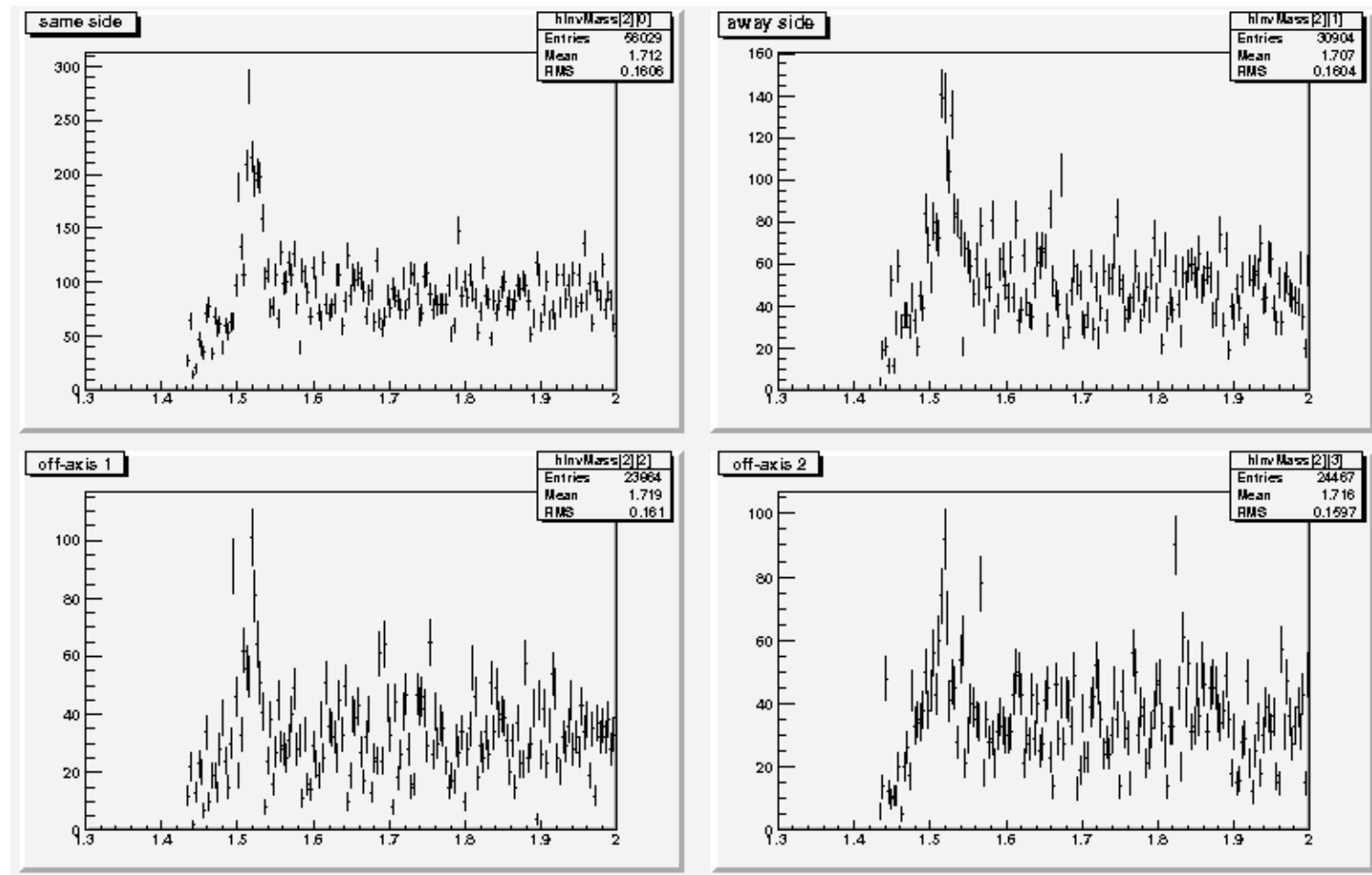
Invariant mass spectra : Λ^*

- minimum # reconstructed jets per event ≥ 1



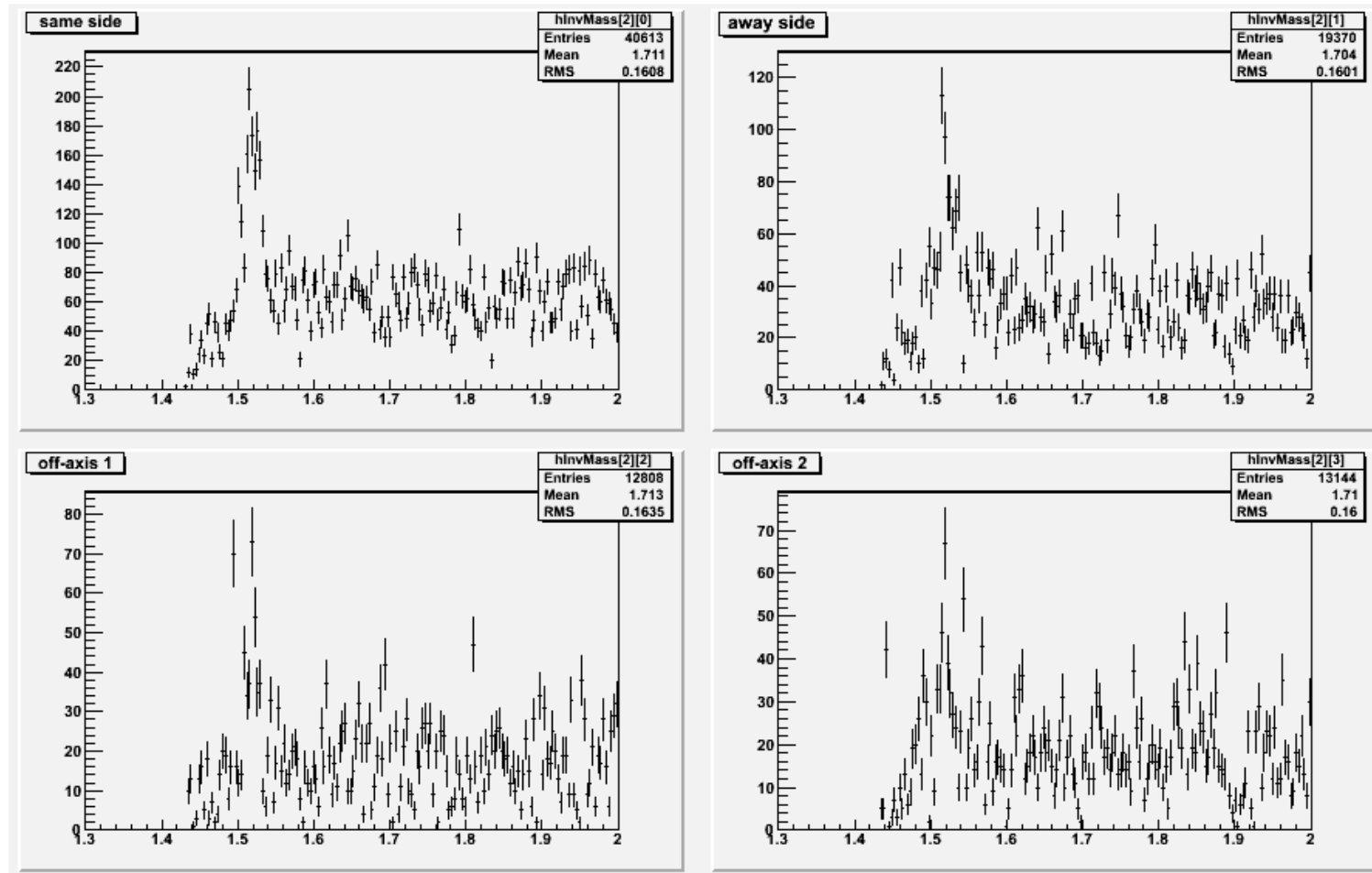
Invariant mass spectra : Δ^*

- minimum # reconstructed jets per event ≥ 2



Invariant mass spectra : Λ^* ($pT > 2\text{GeV}$)

- minimum # reconstructed jets per event ≥ 2



Summary

- Resonance-Jet code in a preliminary shape
 - ✓ *simple and light structure was preferred*
- Need to understand better the data
- Improvements/add-ons to be discussed.
 - ✓ *event selection*
 - ✓ *jet and resonance cuts (momentum, energy...)*
- Daughter PID selections use MC truth => must be done with realistic PID instead
 - ✓ *we should expect a S/N worse by a factor ~2 (pT-integrated)*
 - ✓ *high-pT selection on resonance may imply no PID on daughters... but better for S/N !*
- Background estimation
 - ✓ *may be needed at some point*
 - ✓ *like-sign : no technical problem*
 - ✓ *event-mixing : should be possible (in a longer term)*
- Need to run on PbPb !