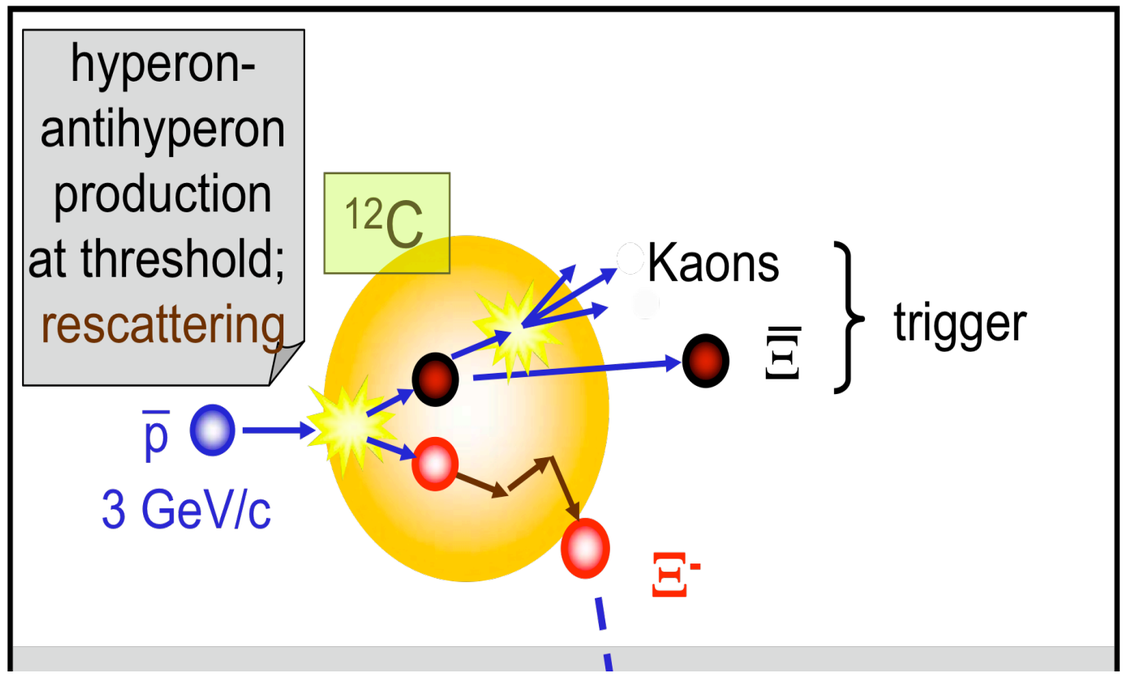
Hypernuclei status report

Alicia Sanchez Lorente

1. New event generator for $\bar{p}$ + ^{12}C-> Ξ^- Ξ^+ based on Urqmd.

1. Low kaon identification studies based on tof measurements.

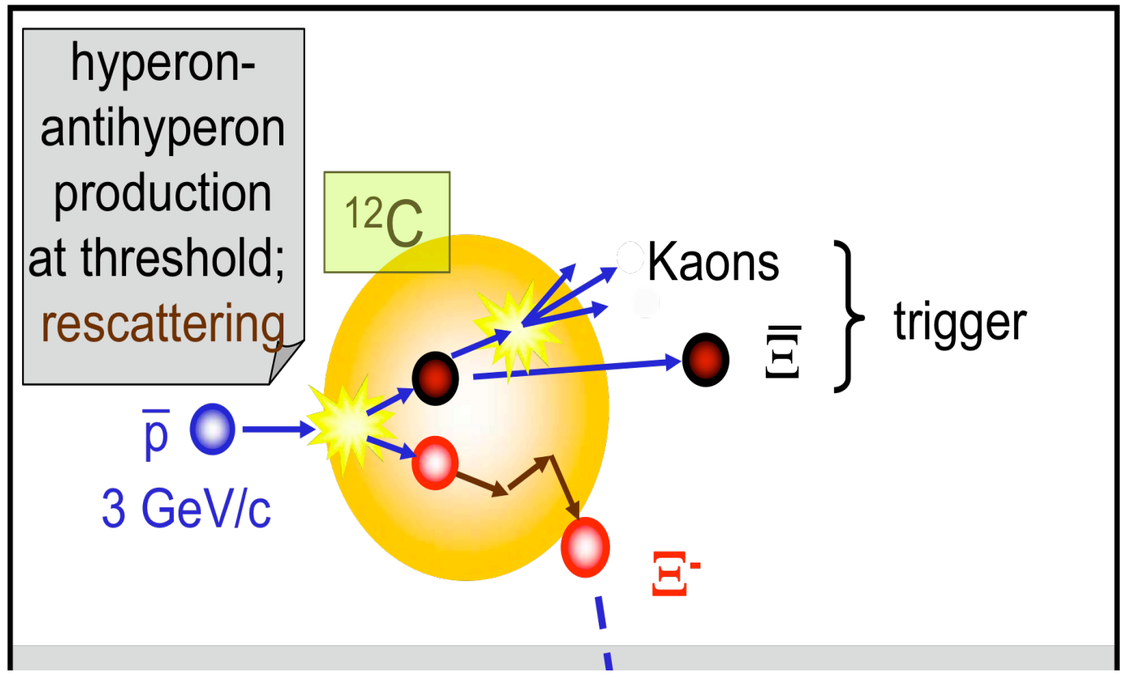
New event generator for $\bar{p}$ + ^{12}C-> Ξ^- Ξ^+



- $\bar{p}$ +Nucleus->Ξ^- +Ξ^+ at 3GeV/c
- Cross section 2μb
- UrqmdSmm, extended version
  (A. Galoyan, J.Pochodzalla, V.Uzhinski)
- Hyperons Potential (Λ, Ξ, Σ..)

Background reactions and Ξ^- +Ξ^+ generated by Urqmd

low kaon identification based on tof measurement



- $\bar{p}$ +Nucleus->Ξ^- +Ξ^+ at 3GeV/c
- Cross section 2μb
- $\bar{p}$ + p , cross section 50 mb

1. Background reactions are a factor 25000 larger than Ξ^- +Ξ^+ prod.
2. background suppression is mandatory
3. low momenta kaons (Ξ^+ annihilation) can be used to tag the Ξ^- +Ξ^+ prod.

Possibilities:

- TPC/STT Use of (dE/dx) for PID
- TPC/STT + TOF detector system for low kaon identification:
  - Start scintillator fibers ~1250 fibers
  - Stop tof barrel ~16 Slabs ~6 bars

STRATEGY : identification of at least one kaon per event.
(kaon multiplicity trigger)

Requirements :

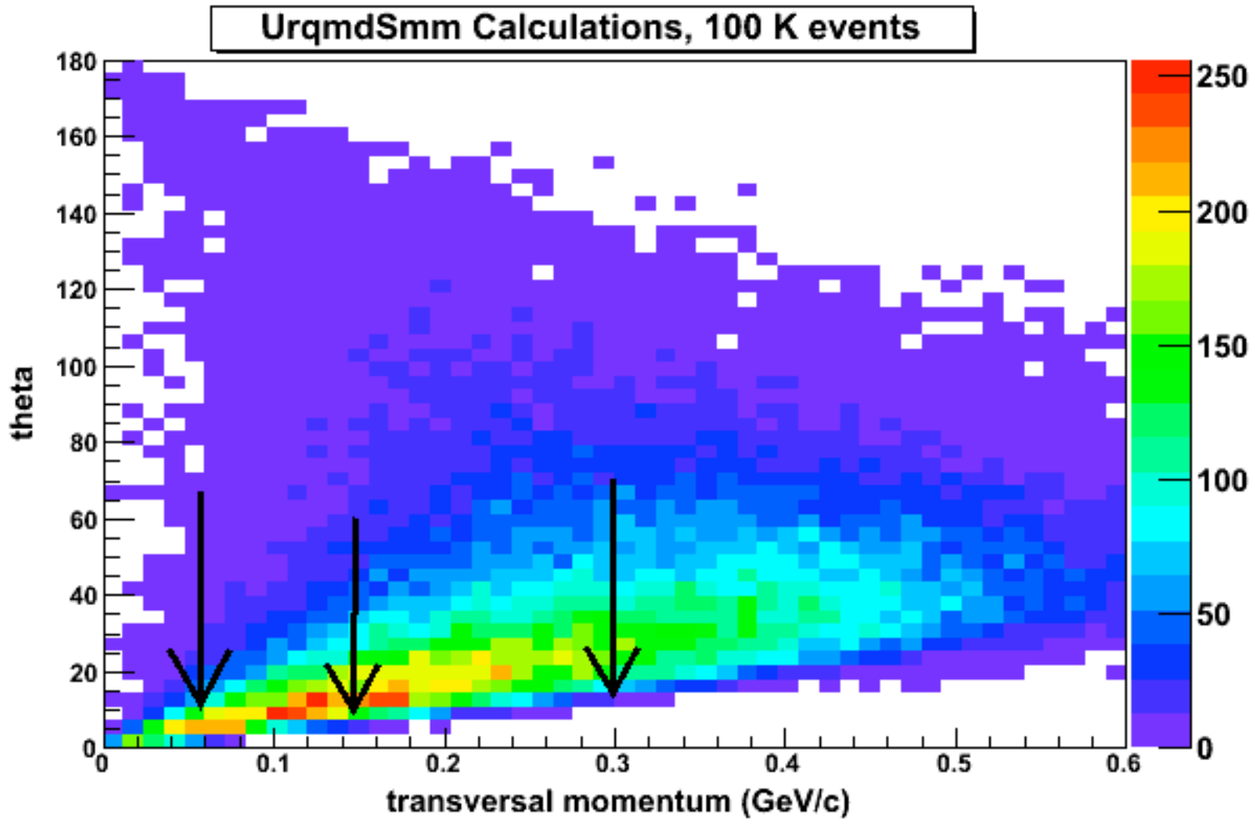
Central Tracker + Tof radius ≈ 0.5 m

$P_T = 0.3*Q*B*Radius$

B = 2 T, kaon Pt ≈ 0.3 GeV/c

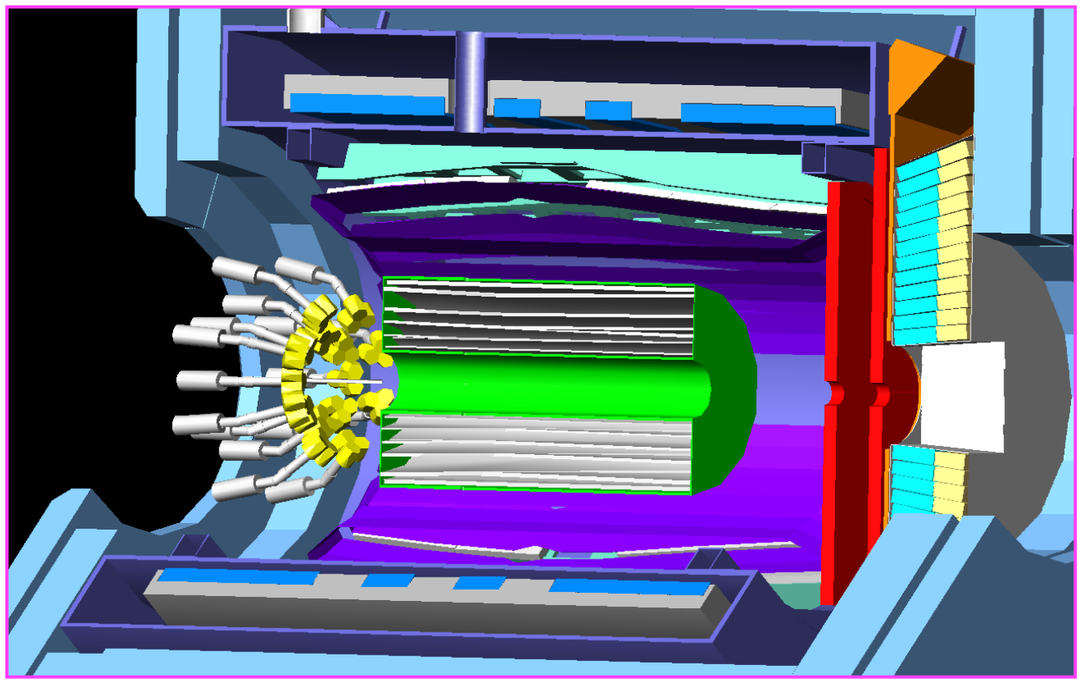
B = 1T, kaon Pt = 0.150 GeV/c

B = 0.5 , kaon Pt = 0.075 GeV/c



associated postive kaon distribution
at generation vertex

SciF+TPC + TOF



- **Tof barrel (STOP)**

  Time resolution ~ 80-100 ps

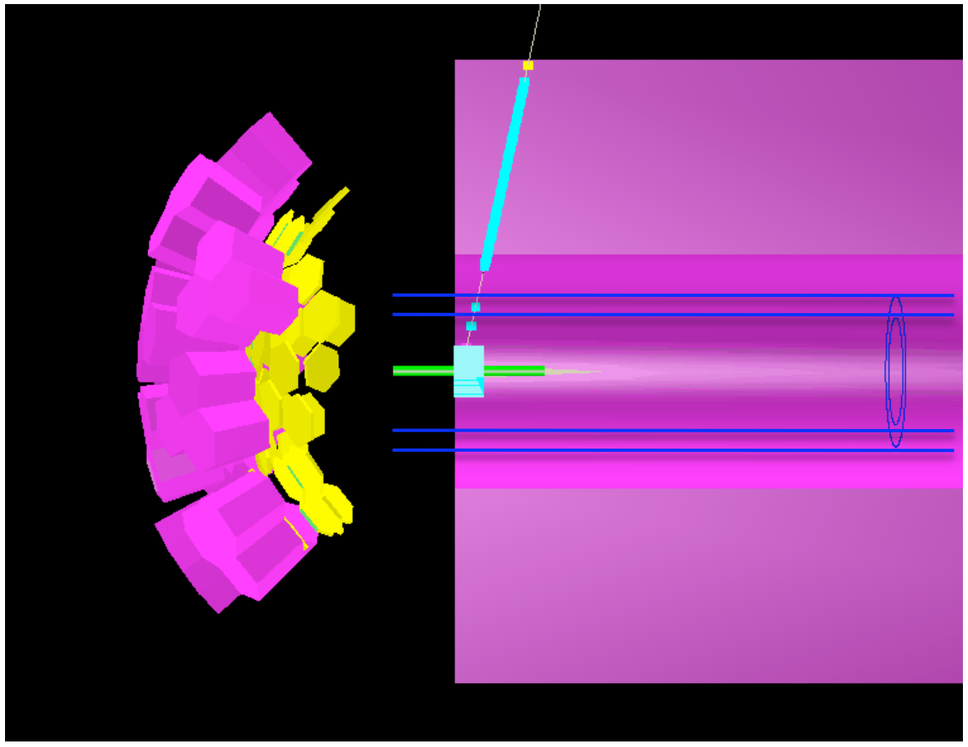
- **SciF + SiPMT (START)**

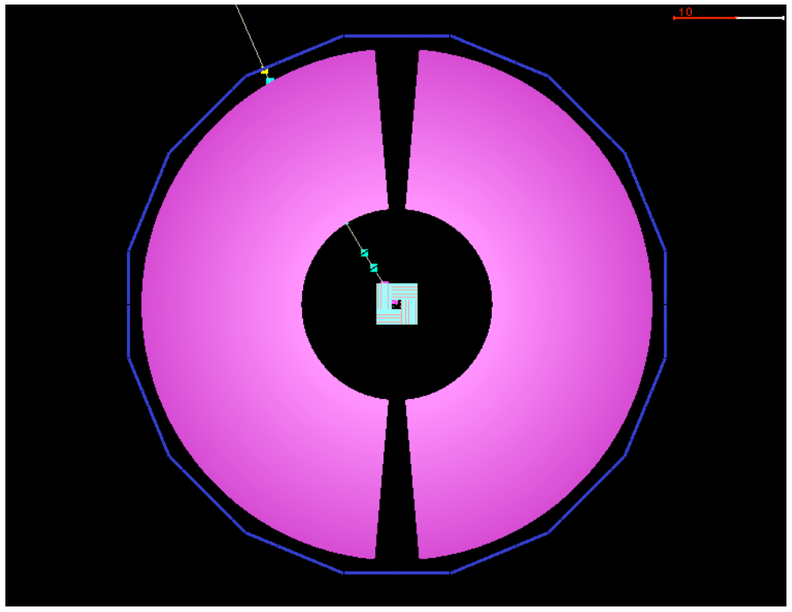
  ~ 450 ps

- **TPC + Others (SCT): tracking**

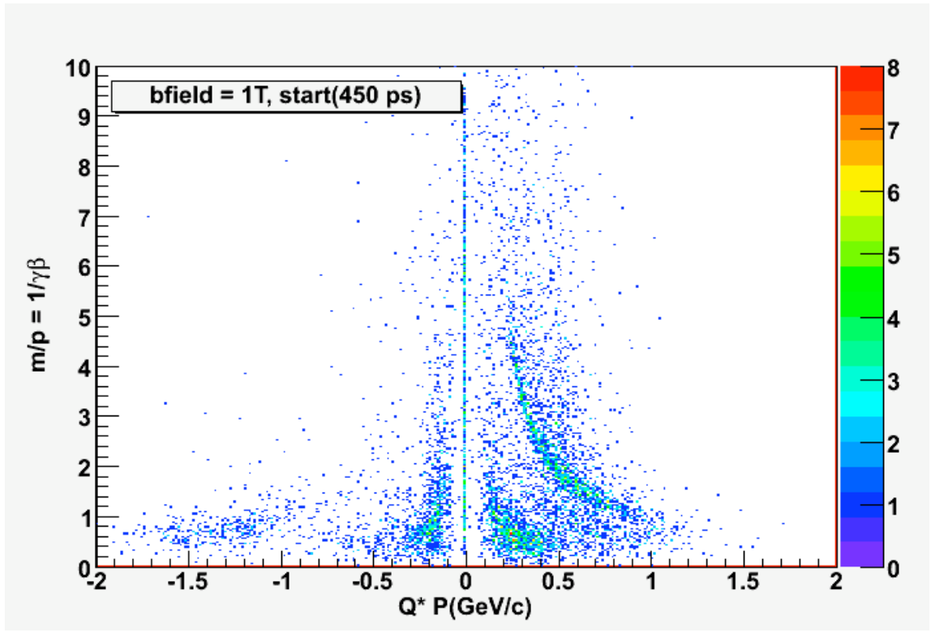
  Track Length + P

P/Mass = β * γ

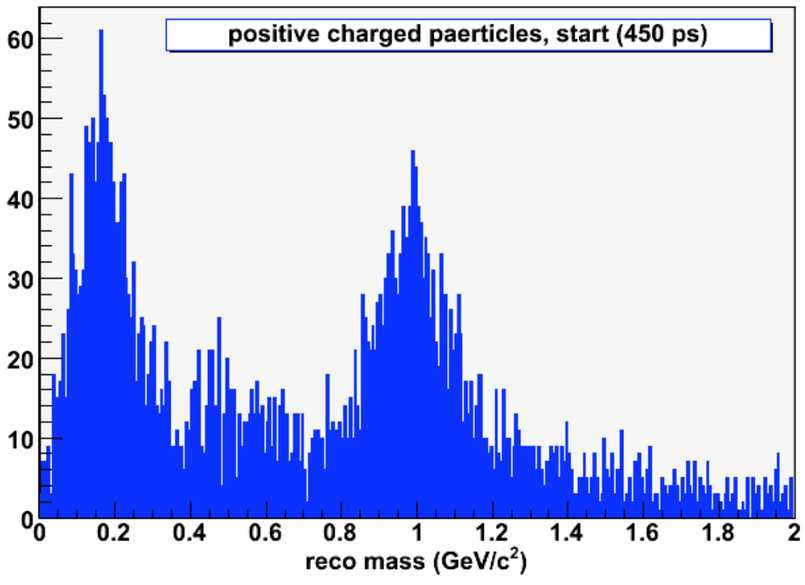


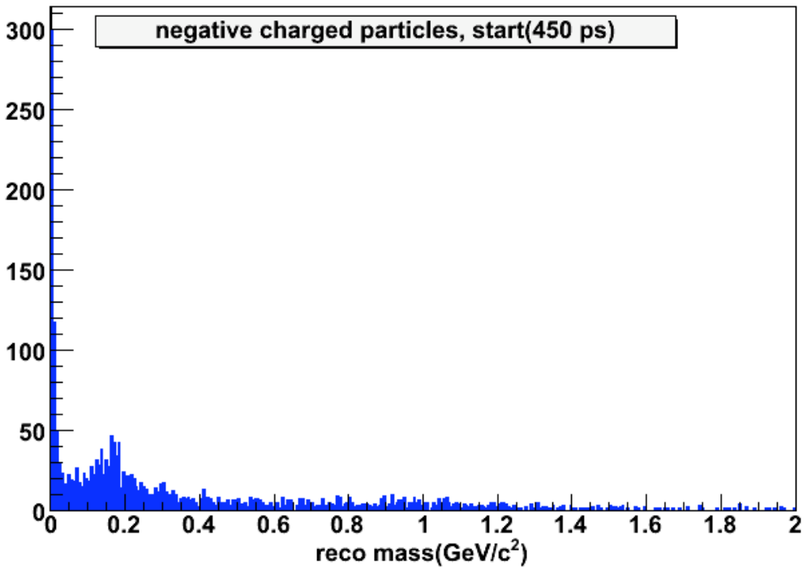


Tof Studies at different magnetic field values



1. magnetic field value 1 T
2. start(450 ps)
3. annihilation products from Ξ^+





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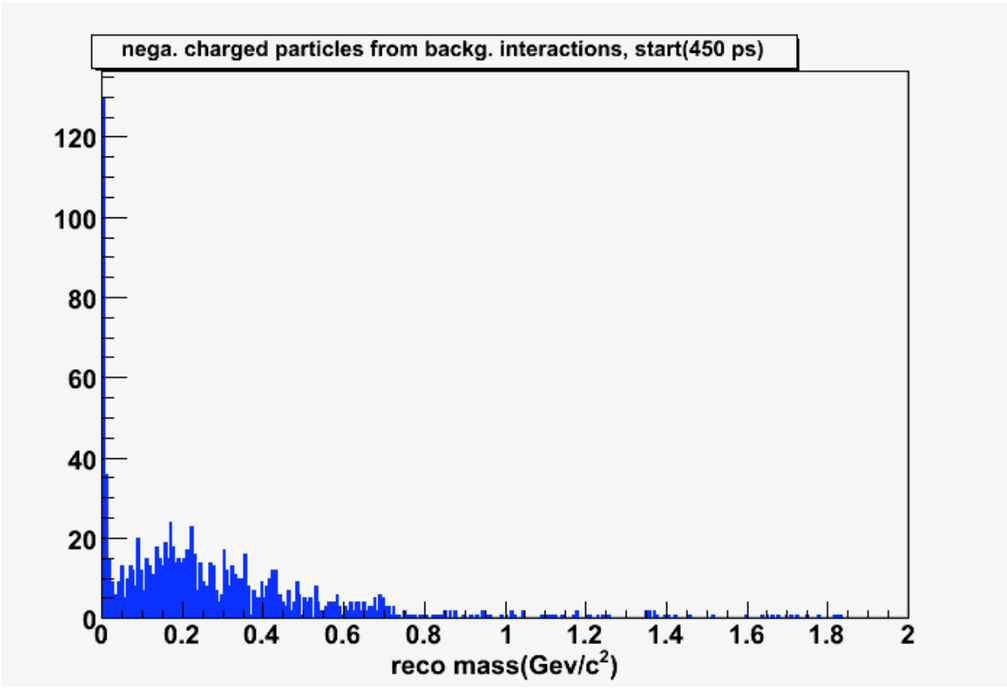
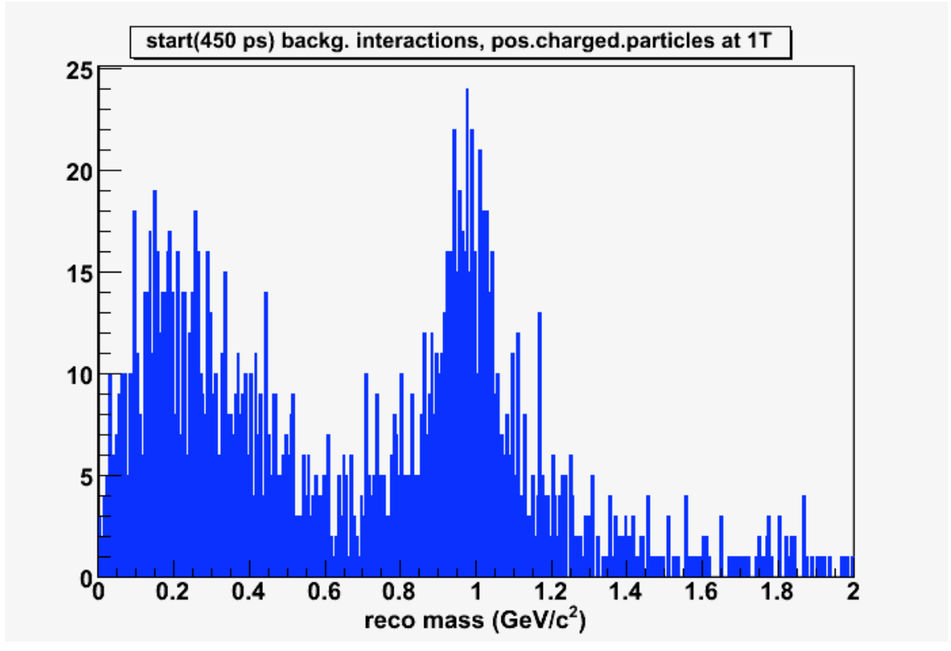


1. magnetic field value 1 T
2. start(450 ps)
3. Background reactions $\bar{p}$ + ^{12}C



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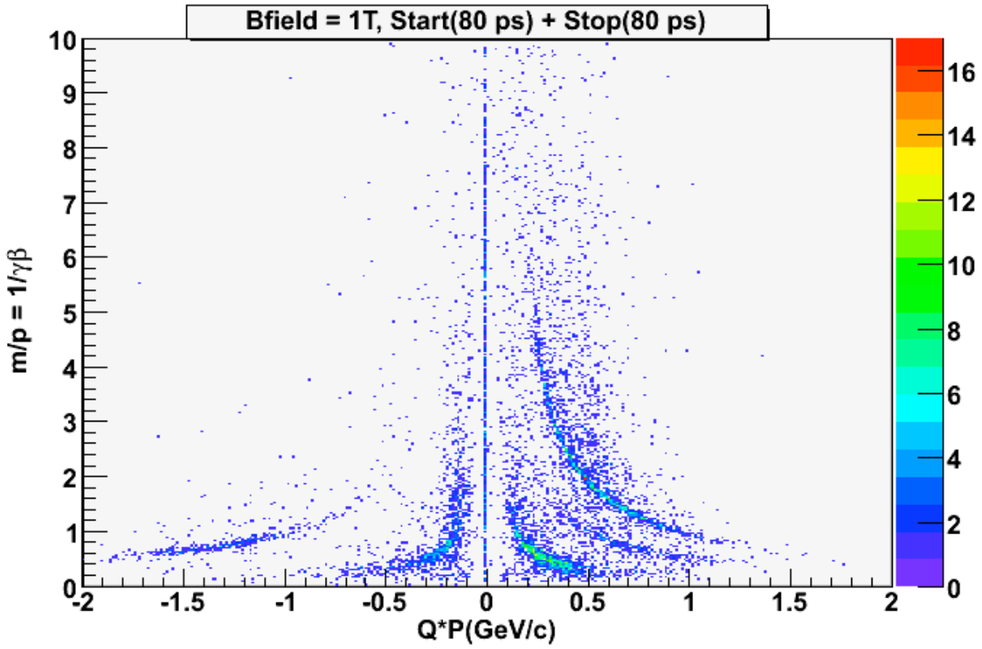
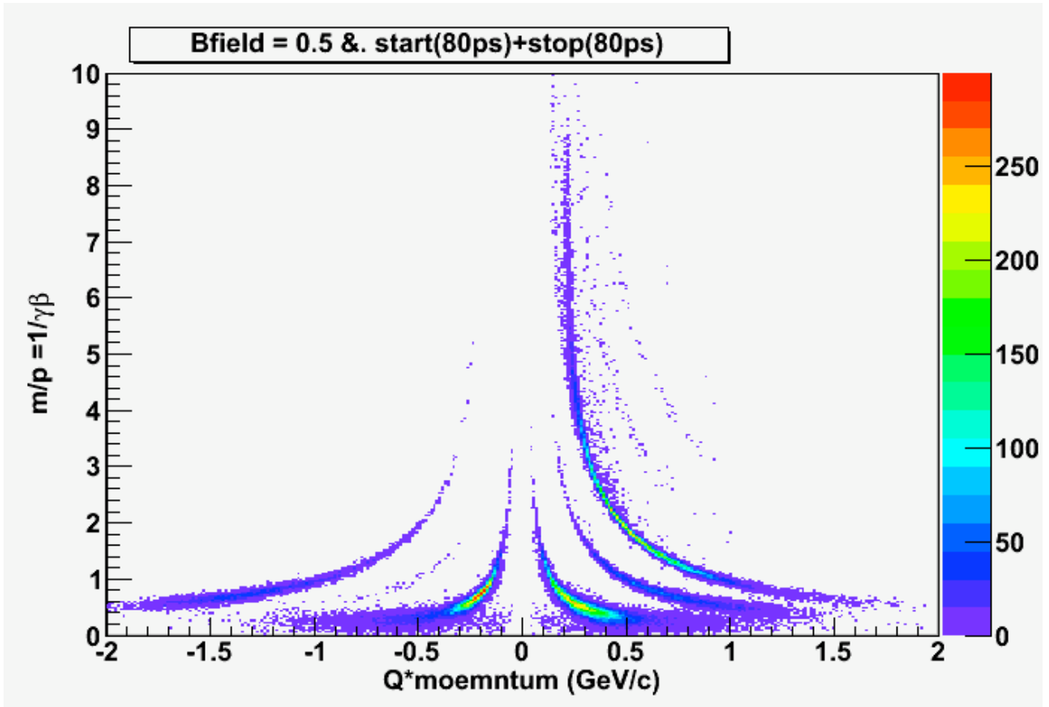
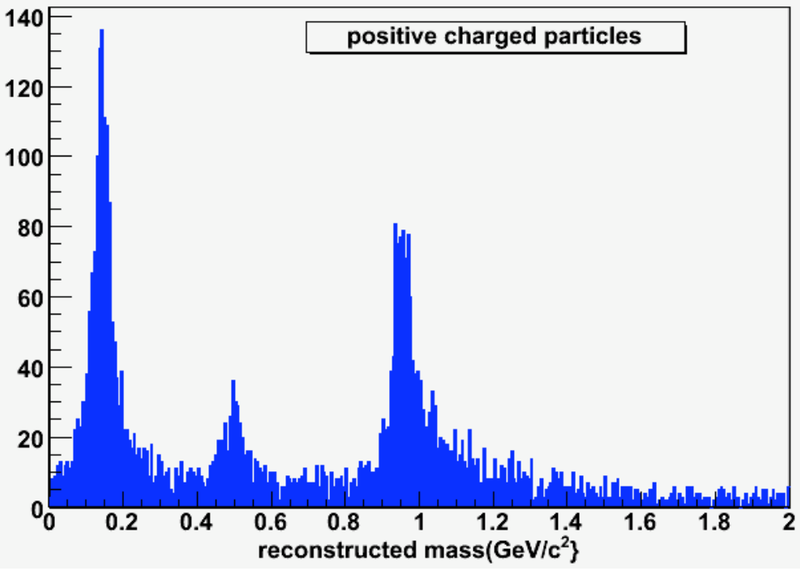
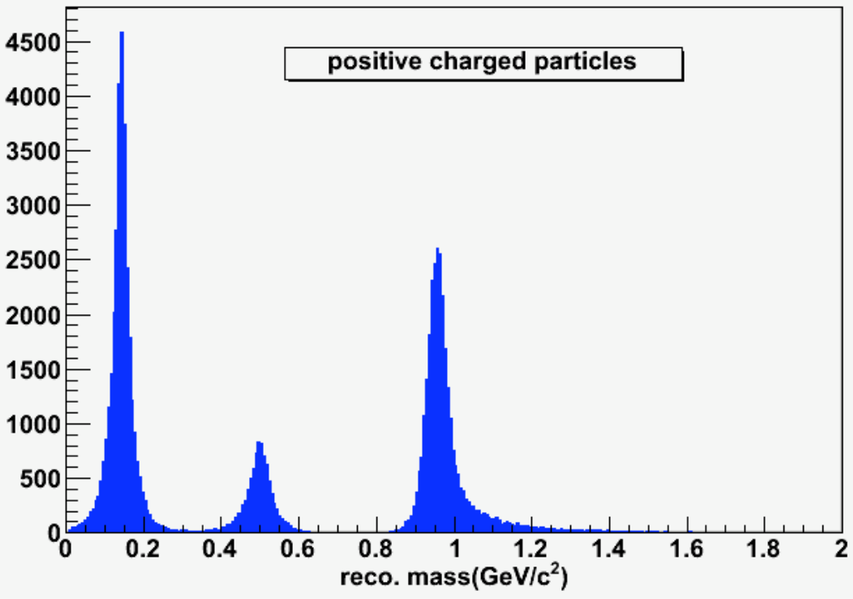
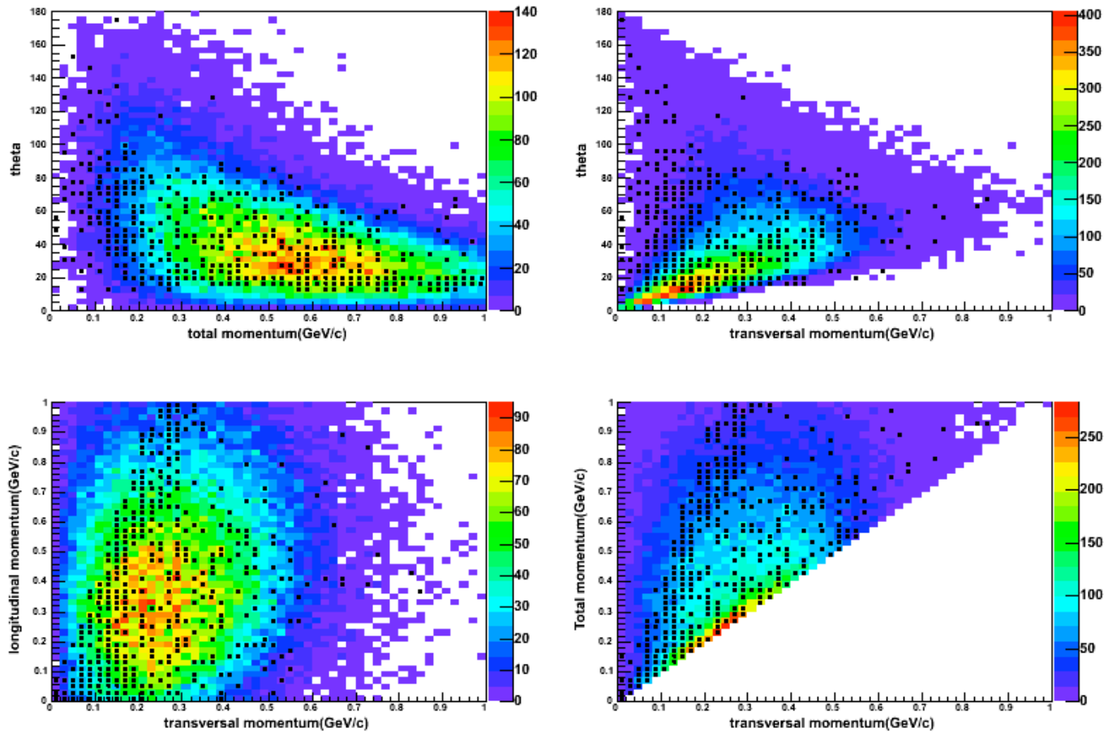




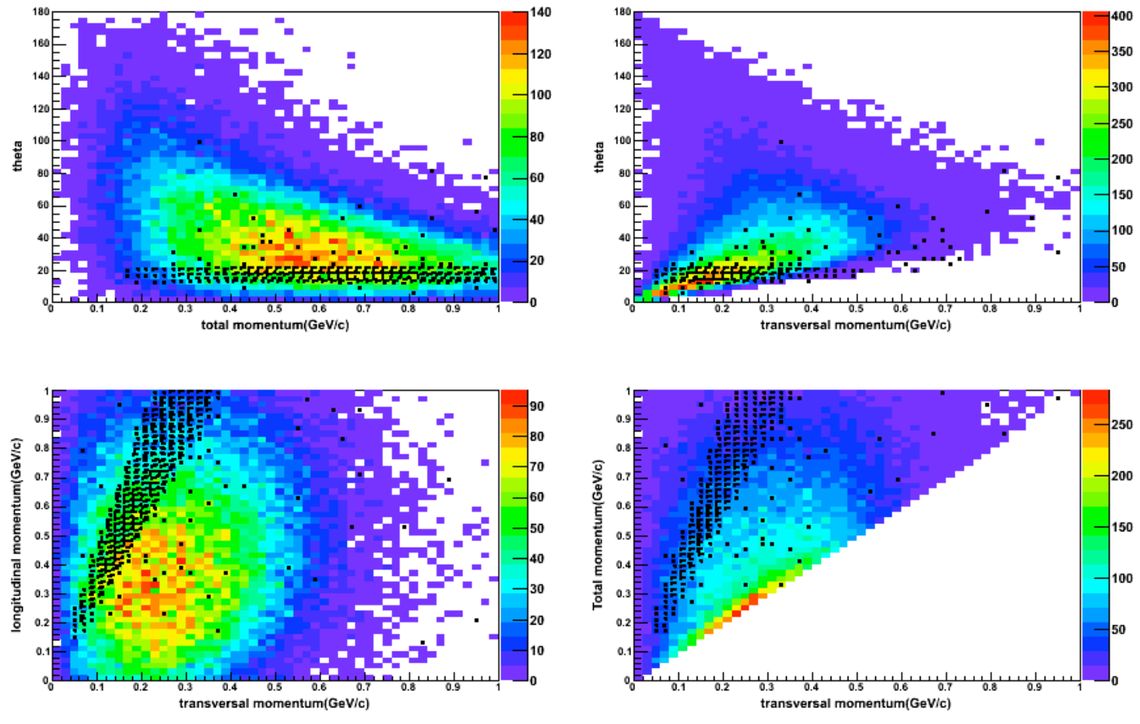






Kaon identification acceptance:

1. accepted kaons tracks at 1 T, requiring hit on SciF, TPc and TOF barrel.
2. Start(80 ps)

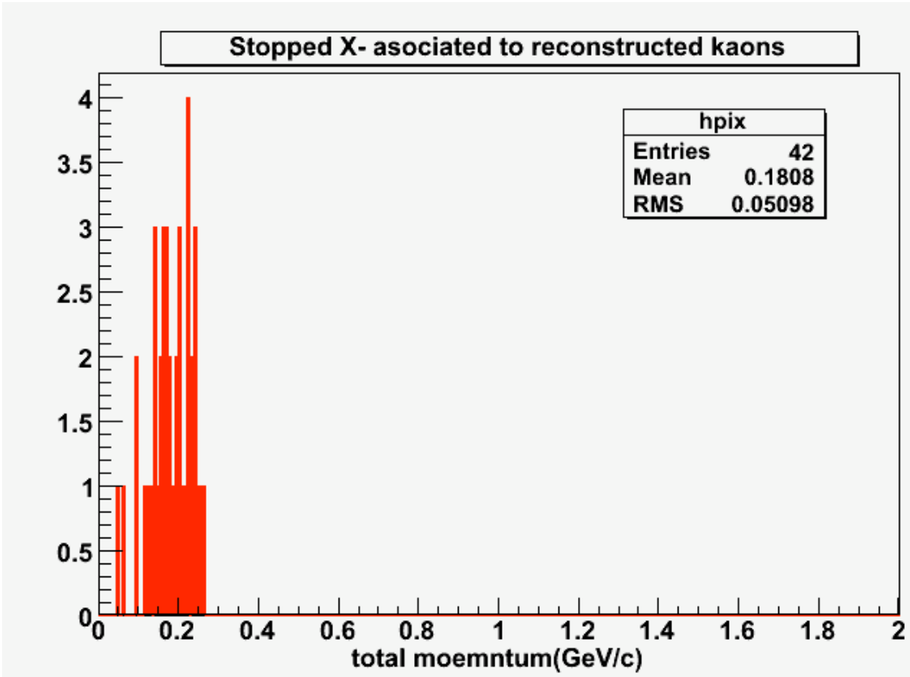


1. accepted kaons tracks at 0.5 T, requiring hit on SciF, TPc and TOF barrel.
2. Start(80 ps)

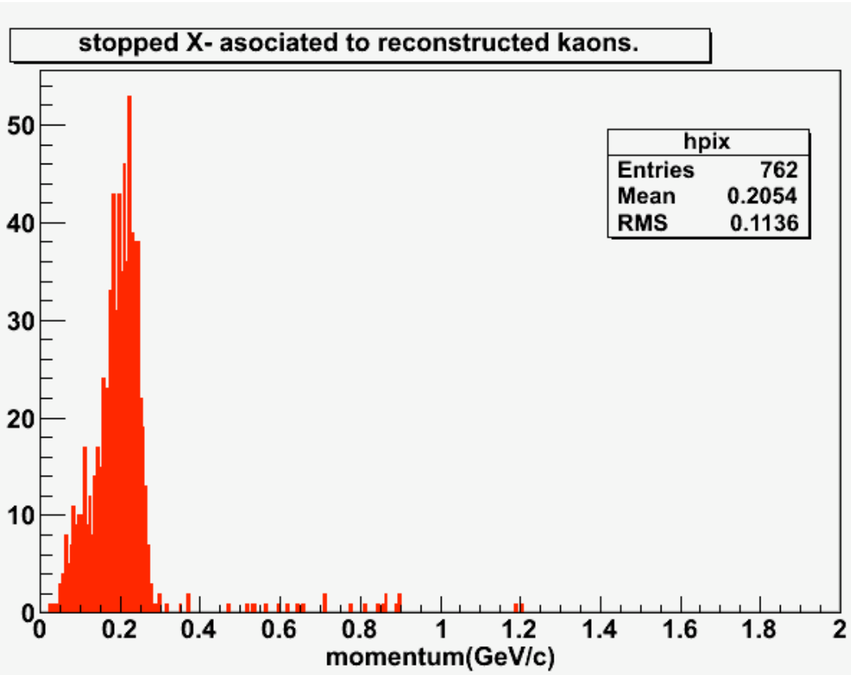
• Tagging on at least one kaon.

• Secondary target: MC provides about1 5000 Ξ stopped, out of 200 k generated events

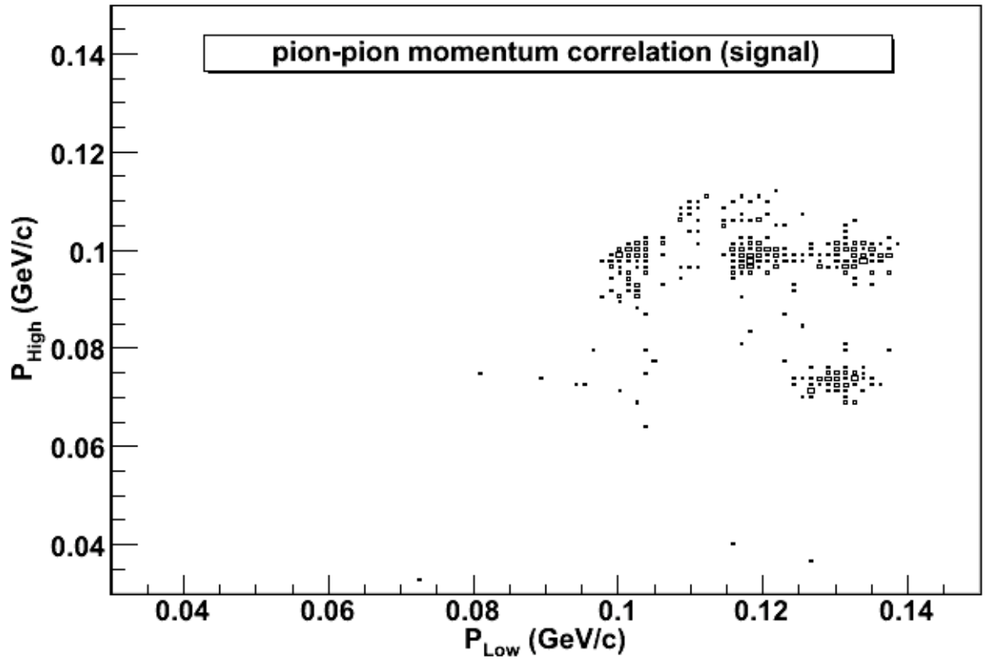
550 reco. kaons

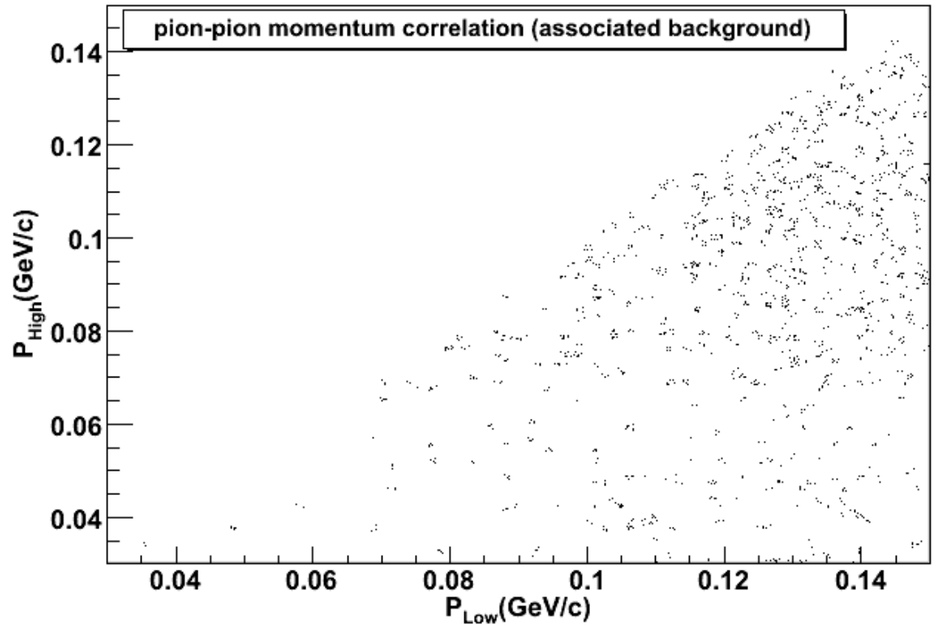


8900 reco. kaons



Cut on accepted kaon candidates





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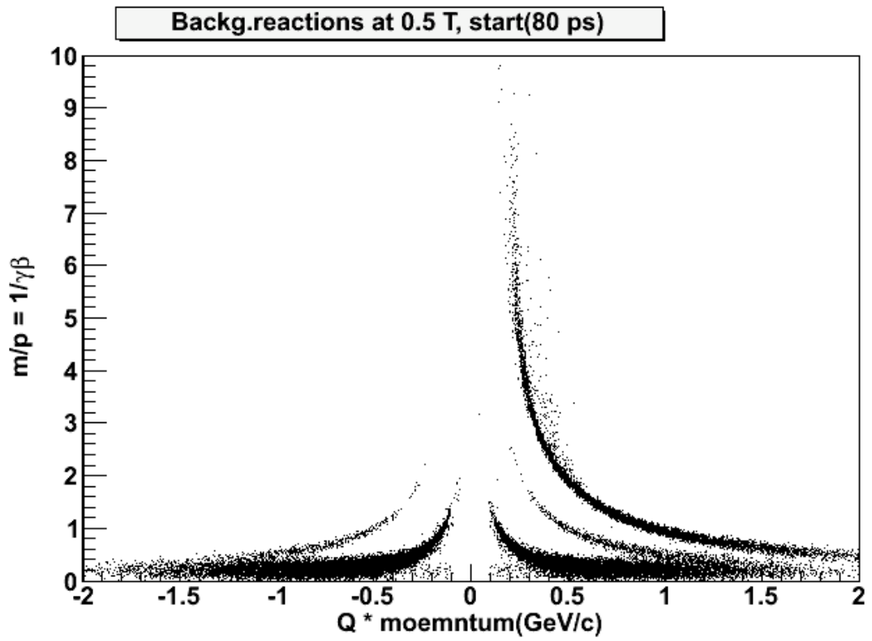
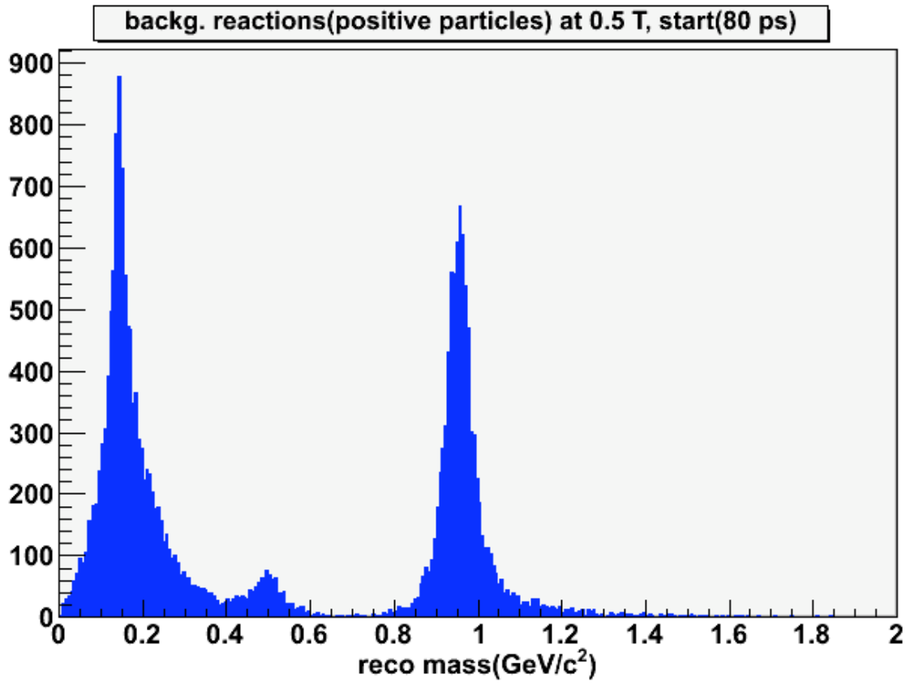


1. magnetic field value 0.5T
2. start(80 ps)
3. $\bar{p}+^{12}C$ reactions



Conclusions:

1. Multiplicity kaon trigger based on TOF will be not enough.

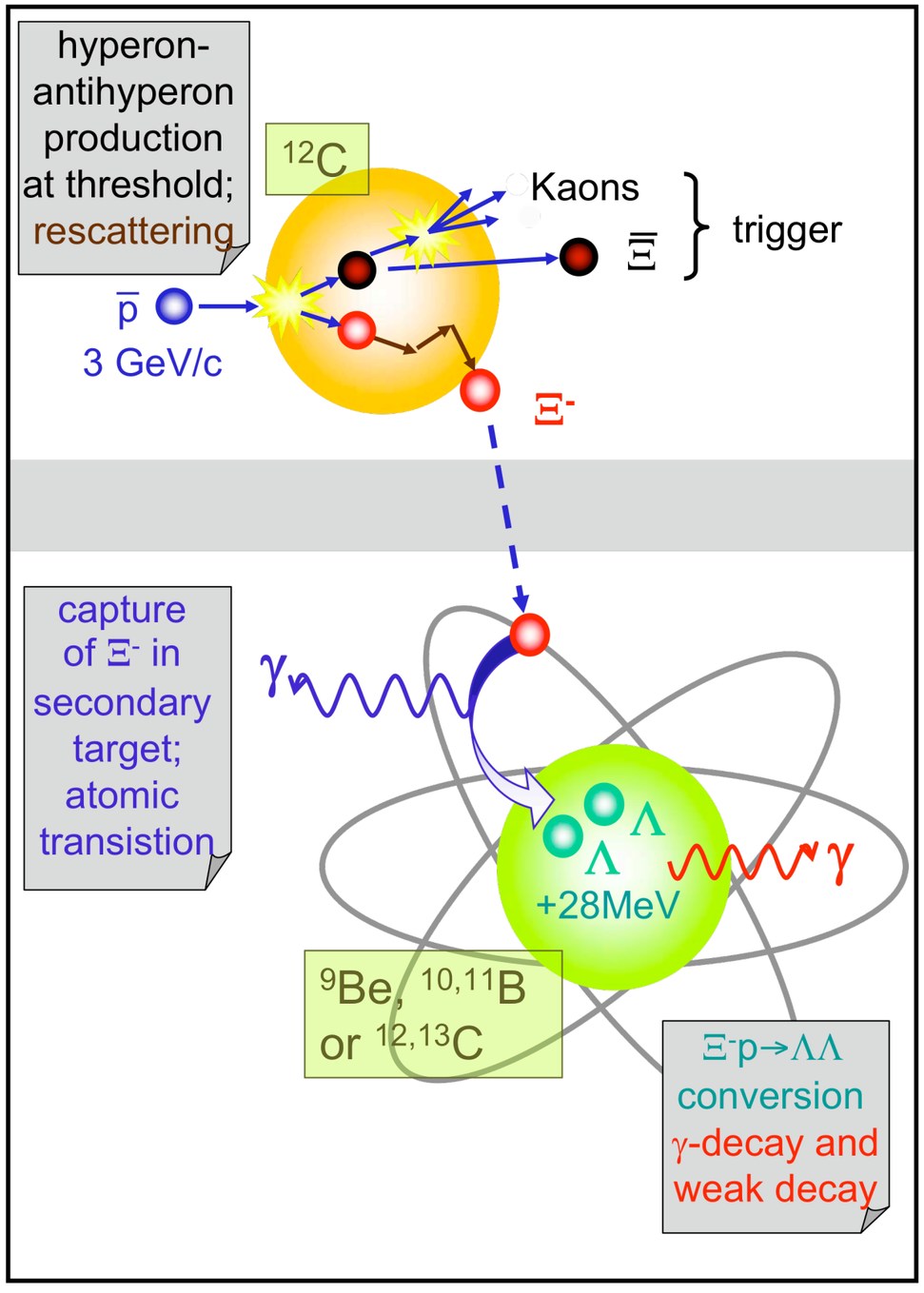
2. Tracking information from Sec. Target has to be used complementary.

3. the start detector has to have a time resolution similar to the tofbarrel.

4. A possible start detector solution: diamond detector with a time resolution of about 90 ps, example. HADES)

5. The most of the kaons are emitted into the forward region, which suggests the possibility of a tof forward disc inmediatly after the disc dirc can be useful.

Production of double hypernuclei at PANDA



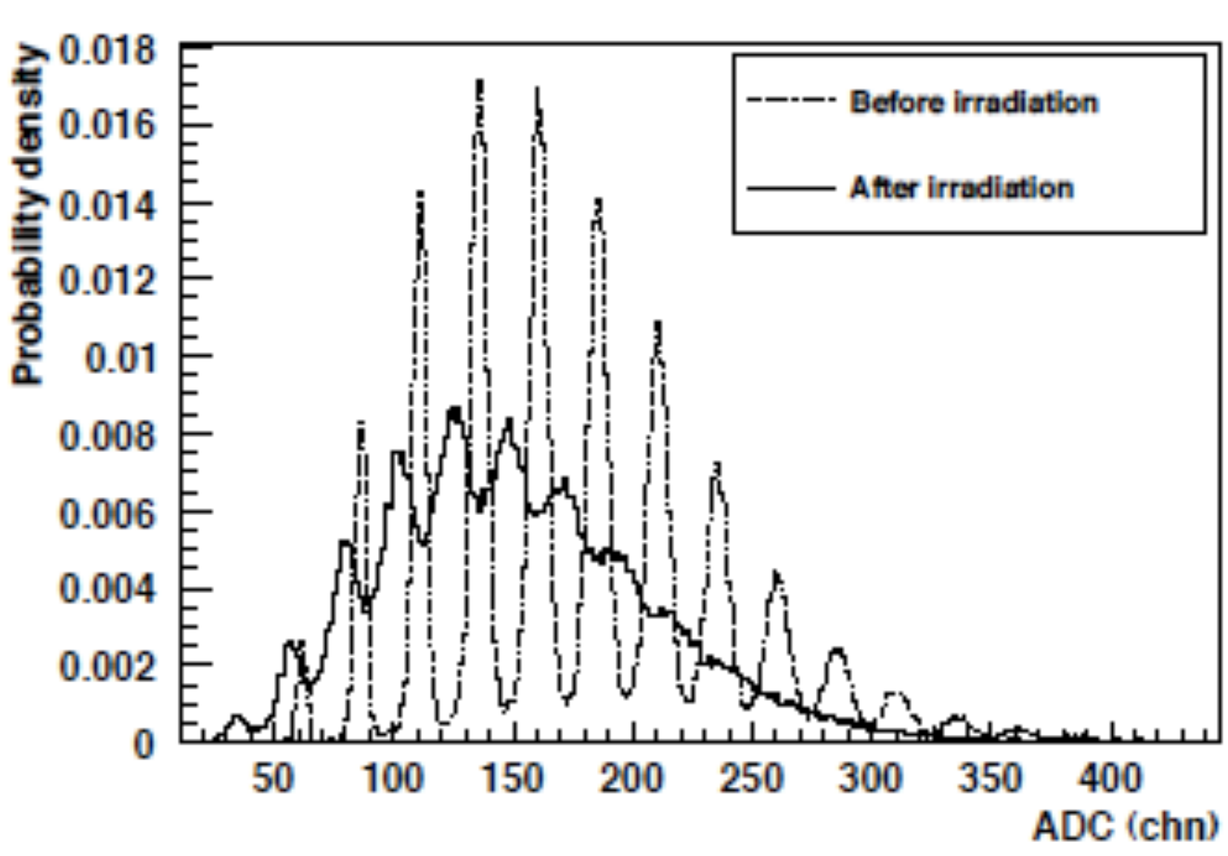
- $\bar{p}$ +Nucleus->Ξ^- +Ξ^+ at 3GeV/c
- Cross section 2μb
- Luminosity 10^{32} cm^{-2}/s to 7.10^5 Ξ^- +Ξ^+ hour
- Ξ^- p -> ΛΛ + 28 MeV
- energy release may give rise to the emission of excited hyperfragments
- Two-step production mechanism requires a devoted setup

Radiation hardness study

- Sim. 2.3 10^4 n+p/s at av. 25 MeV
- Rad. Damage:
  electron irrad. vs (NIEL) of p/n
  had. damage ~64 times stronger
  annealing will not help
  12 days at 5 10^6 collions/s

ADC spectra from SiPMT before and after radiation with 3 10^8 electrons

by S. Sanchez Majos



Secondary target