# Reconstruction of $K_s$ from $K_L + p \rightarrow K_s + p$ with uniformly distributed beam momentum.

# Plugin fcal_tree vs Reaction Filter.

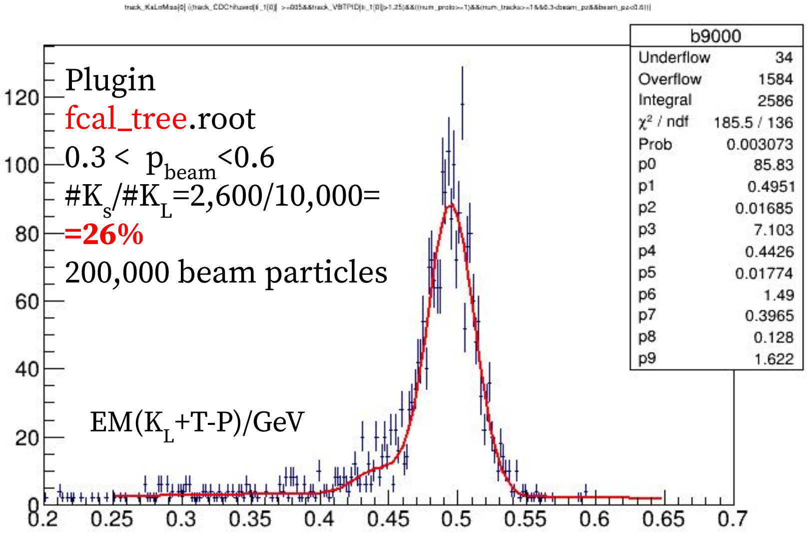
```
hd_root --nthreads=8 --sodir=$HALLD_MY/Linux_Alma9-x86_64-gcc11.4.1/plugins -PPRINT_PLUGIN_PATHS=1
-PPLUGINS=EVENTRFBUNCH:USE_TAG=KLong -PVERTEX:USEWEIGHTEDAVERAGE=0
-PPLUGINS=monitoring_hists
-PPLUGINS=fcal_tree
hdgeant4_output_smeared.hddm

hd_root --nthreads=8 -PTRIG:BYPASS=1
-PEVENTRFBUNCH:USE_TAG=KLong -PVERTEX:USEWEIGHTEDAVERAGE=1 -PVERTEX:USE_KLONG_VERTEX=1
-PPLUGINS=monitoring_hists,Reaction Filter
-PReaction1=10_14__16_14
-PReaction1:Flags=B0_m0_F0 (or B0_m16_F0 )
hdgeant4_output_smeared.hddm
```

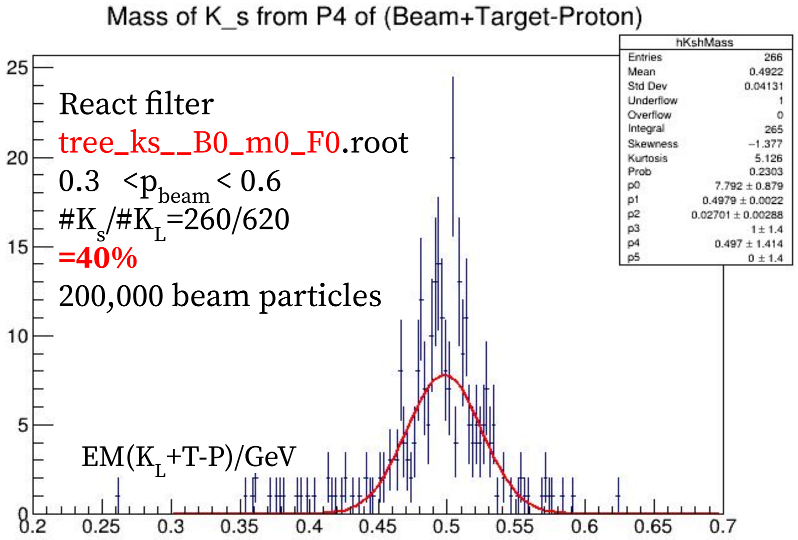
The $K_L + p \rightarrow \mathbf{K_s} + p$ reaction was used to reconstruct the mass of $K_s$ via 4-momentum of P4($K_L$) +P4(target)-P4(p).

Similar reconstruction may be done in near future for $K_L + p \rightarrow \mathbf{K_L} + p$

# Reconstruction of the $K_{s,L}$ mass via its 4-momentum

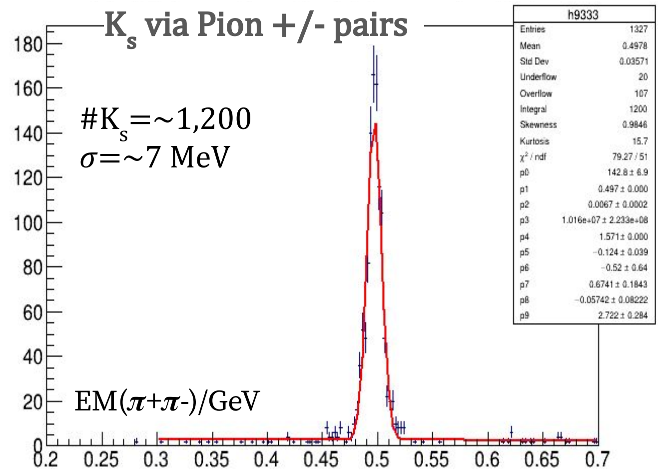
$$P4(K_{s,L}) = P4(K_L) + P4(\text{Target proton}) - P4(p).$$



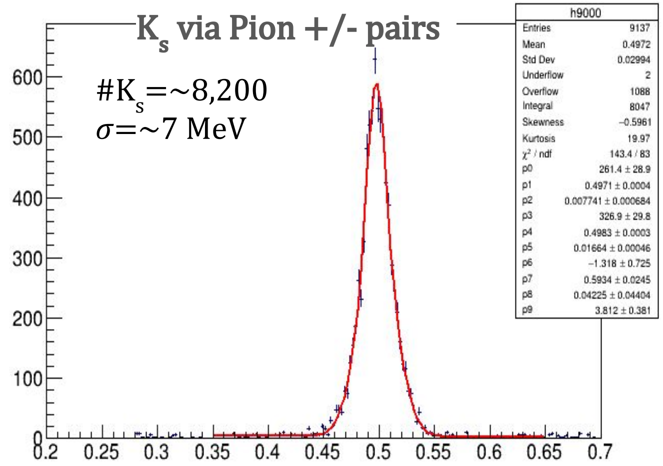




- For configuration B0_m0_F0 Reaction Filter reconstruction efficiency is twice higher, but the yield of events is 5-10 times lower. Same true for B0_m16_F0.

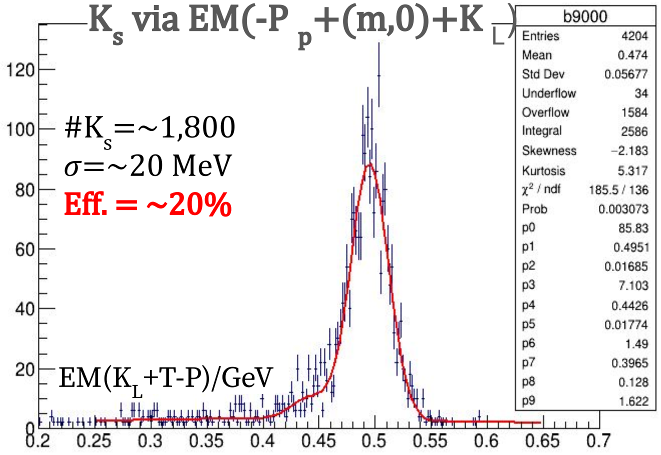
**#K$_L$ =10,000** ; beam momentum (0.1,0.6) GeV/c



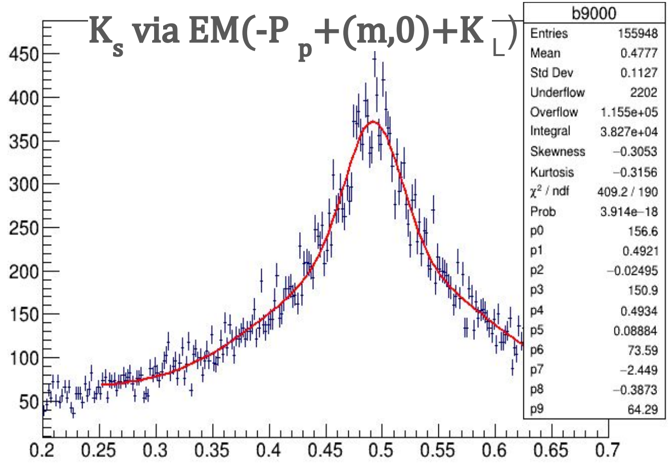

K$_L$ beam momentum (0.6,12.) GeV/c



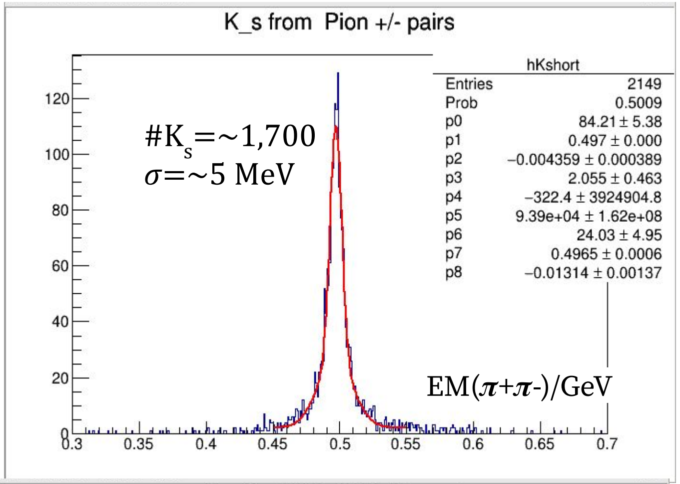

**Plugin**
#Beam
K-long =
=**0.2** Mpart.

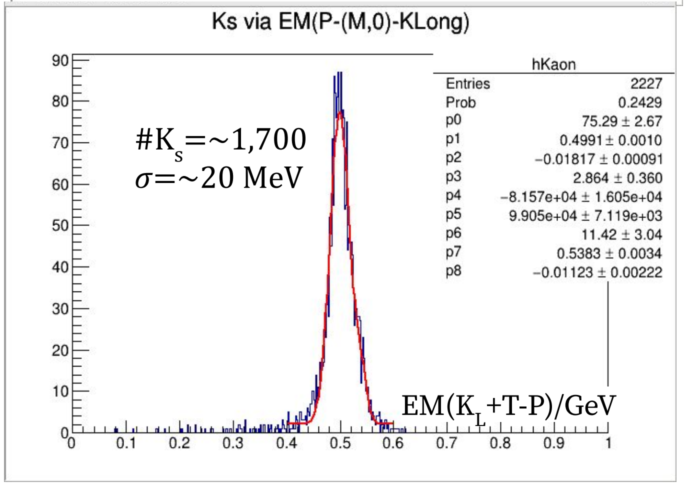



#K$_s$/#K$_L$=1.8k/10k
=20%



## $K_L$ beam momentum (0.1,0.6) GeV/c



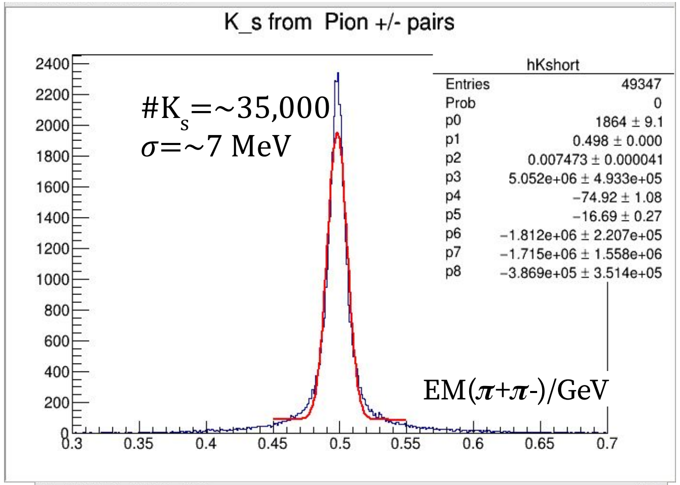



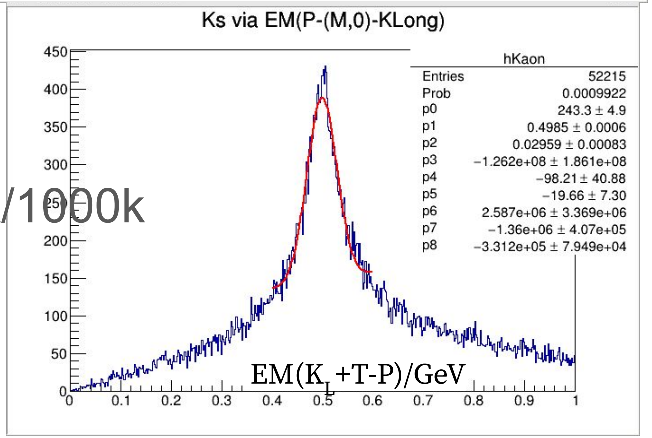

**React. Filt.**

#Beam K-Long = =1 Mpart.

#Ks/#KL=1.7k/1000k =0.2%

## $K_L$ beam momentum (0.6,12.) GeV/c



Using a plugin such as “fcal_tree” we may reconstruct the reaction $K_L$+p → $K_L$+p with relatively high effectiveness of ~20% in low beam momentum domain (eff.=#reconstructed final kaon/# beam kaons ).