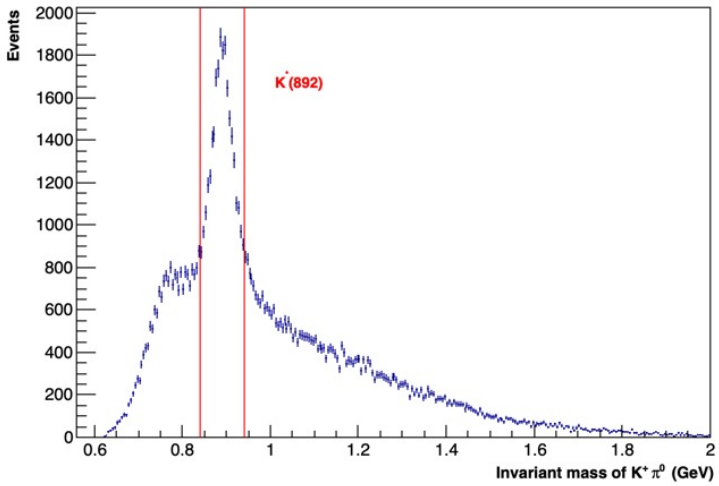
A study of meson resonances decaying into $K^-K^+\pi^0$, with emphasis on mass(K^-K^+) near mass(ϕ)

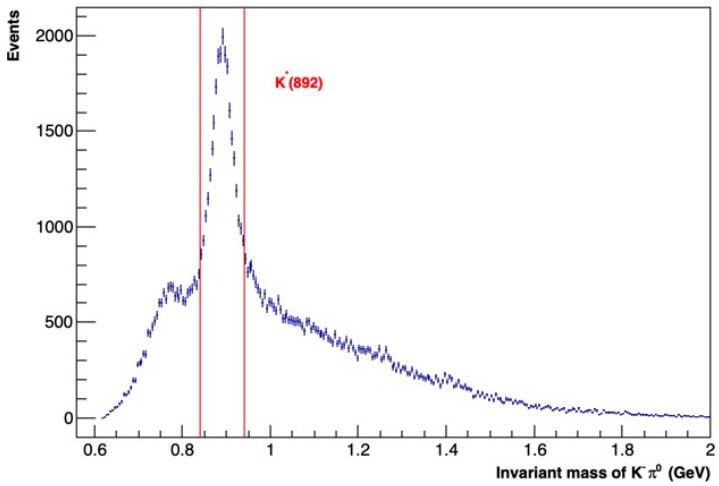
Motivation:

- Investigating K^* K final states as a decay mode of possible hybrid mesons candidates
- Mapping the low-lying meson spectrum

Alan Gardner
October 5th, 2021

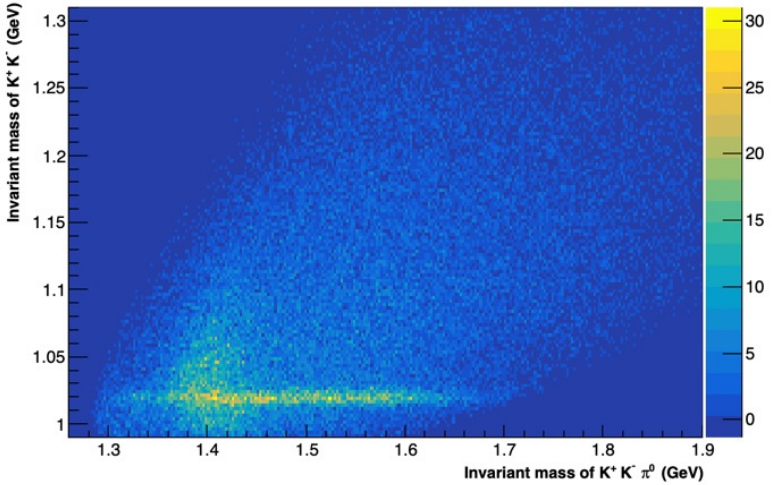
Study of $K^-K^+\pi^0$ events

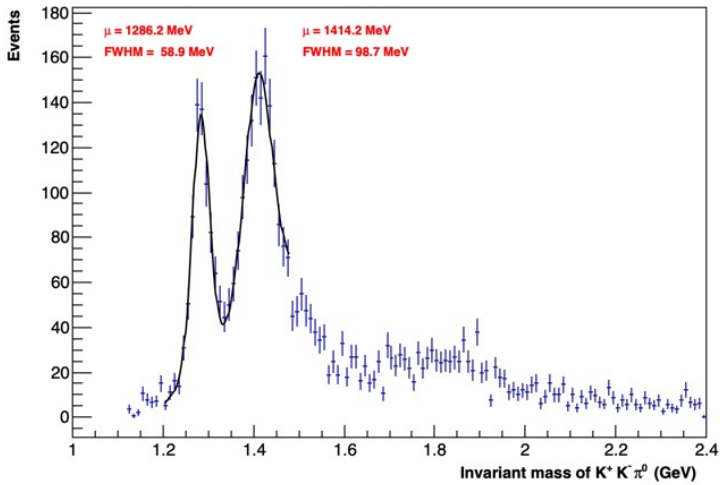




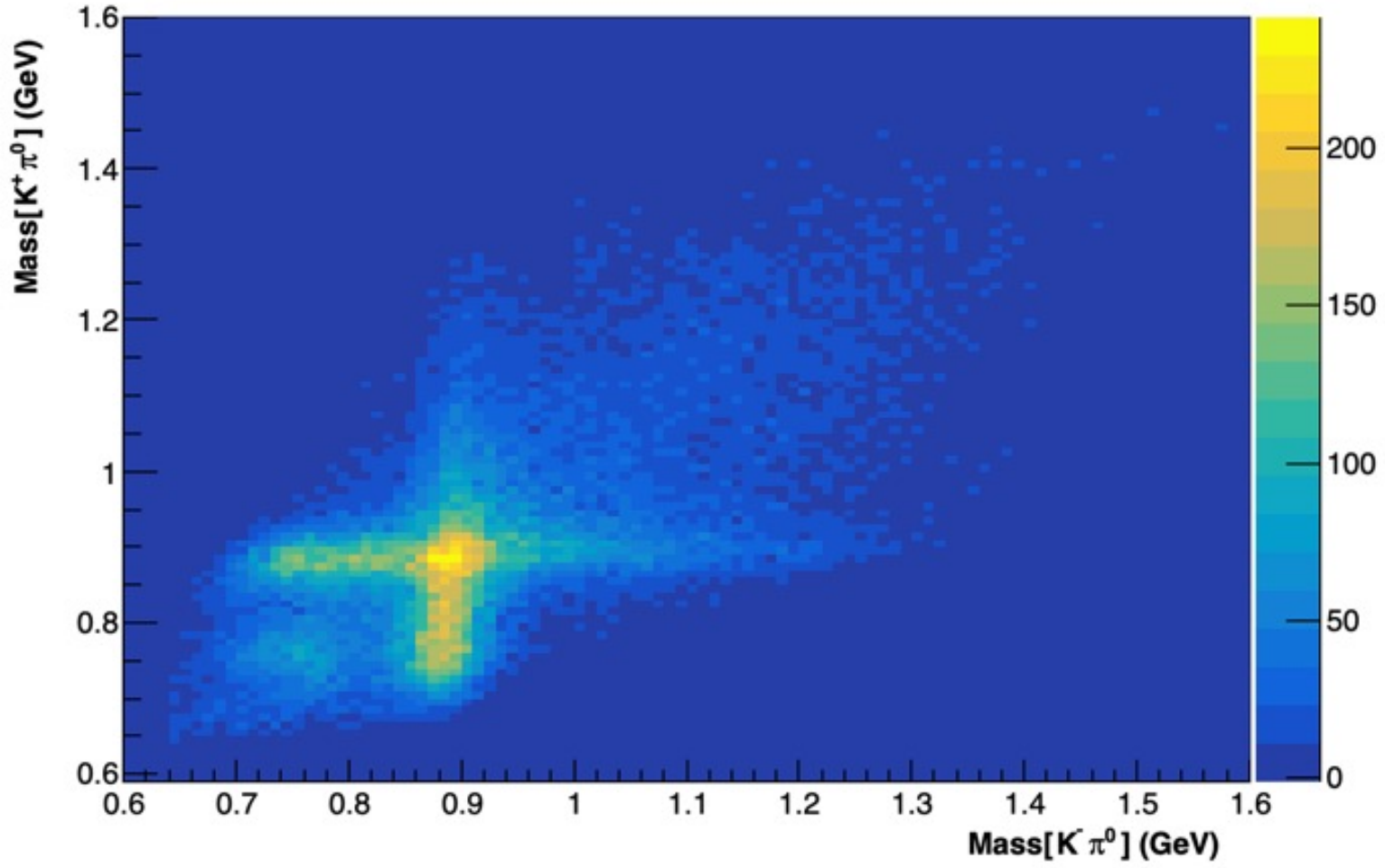
$K^*(892) \longrightarrow K\pi^0$

Invariant mass(K^+K^-) < mass(ϕ)





Enhancement in mass($K^{\pm}\pi^{0}$) < mass($K^{*}(892)$)



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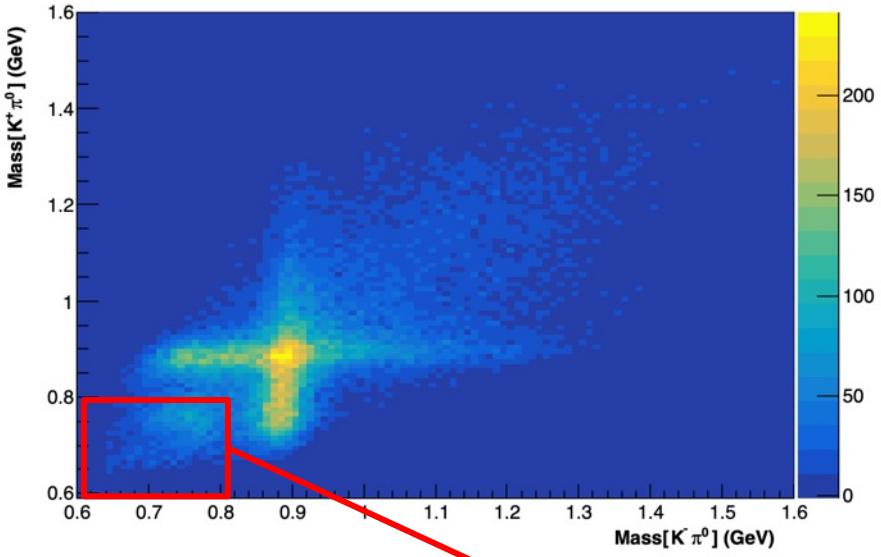
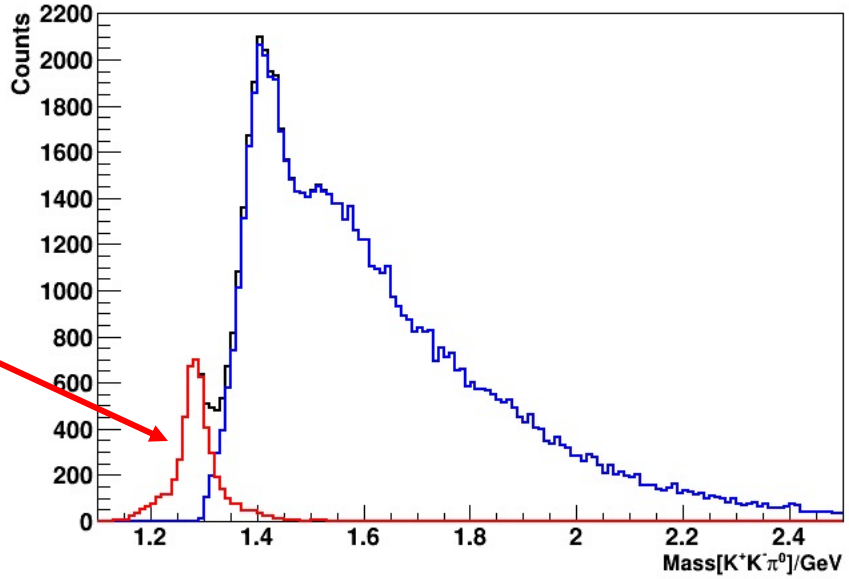
Enhancement in mass($K^{\pm}\pi^{0}$) < mass($K^{*}(892)$)





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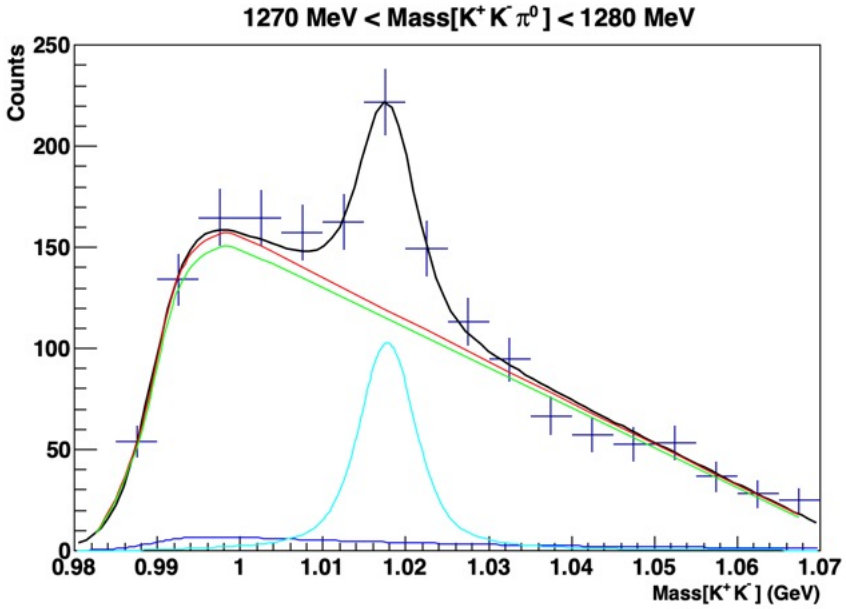
Emphasis on mass(K^-K^+) near mass(ϕ)

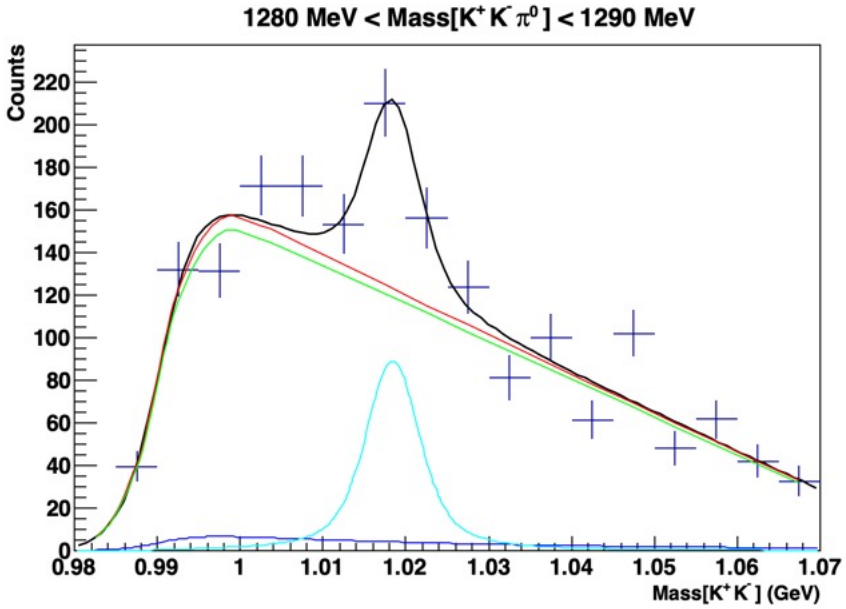
Event Selection

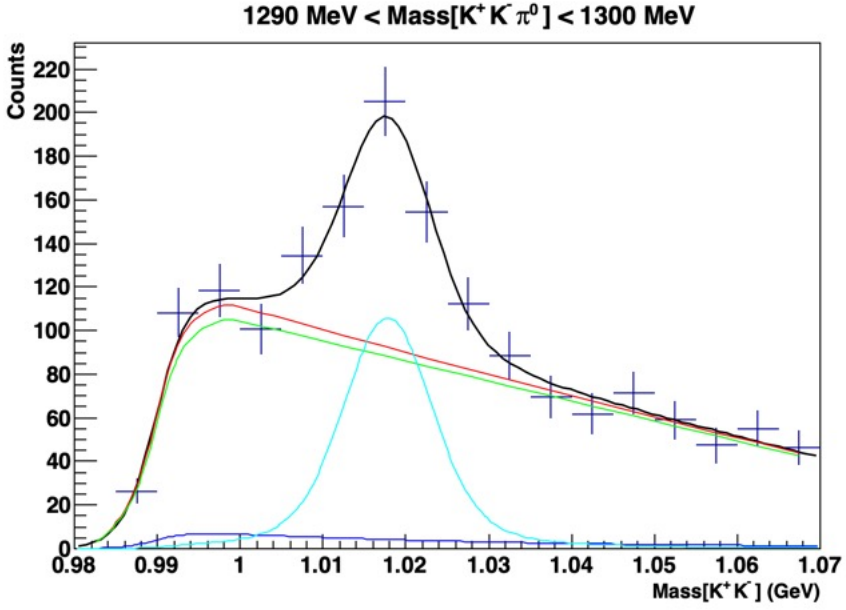
- $K^{\pm}$ hit in the TOF
- $K^{\pm}$ momentum is < 3.0 GeV
- Measured mass(p) > measured mass(K^{+})
- π^{0} reconstructed from γ γ

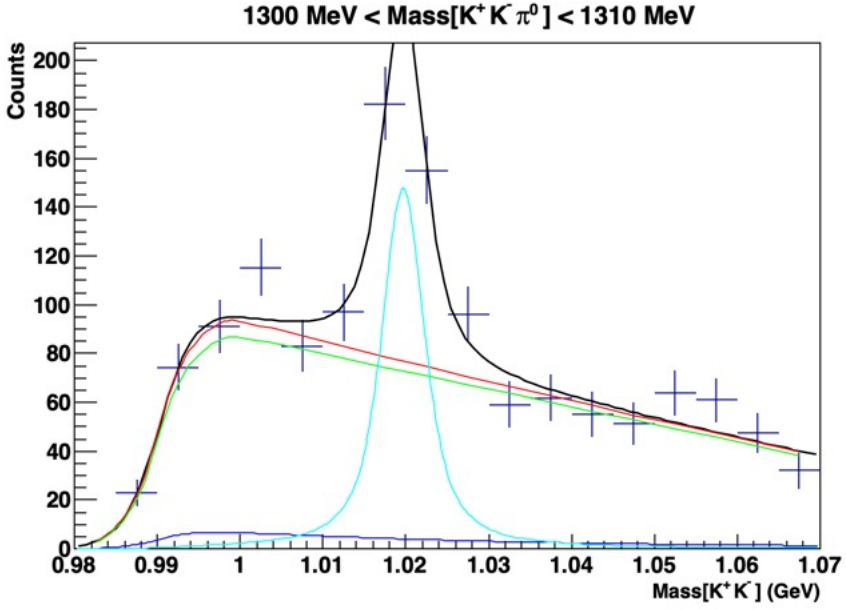
Fitting of K^+K^-

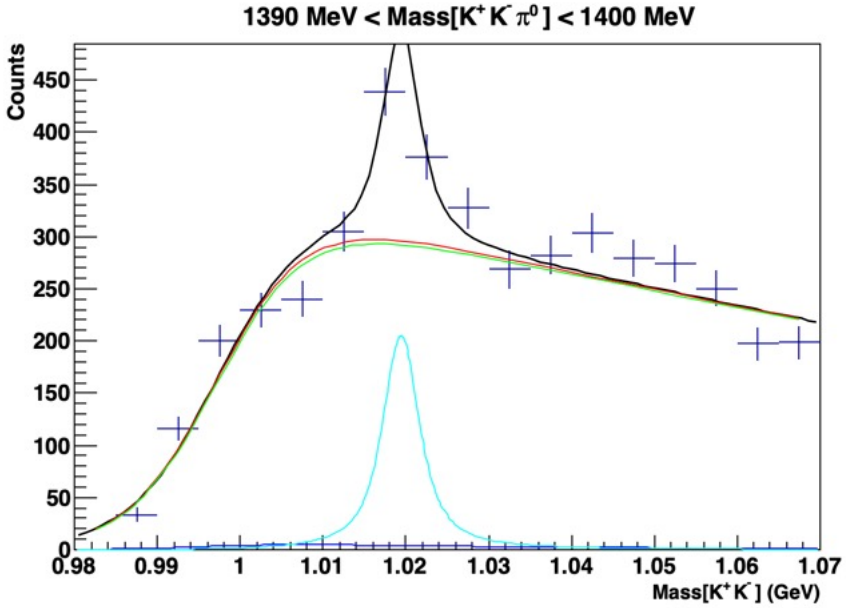
- Voigt function used
- Smear parameter calculated by fitting mass(K^+K^-) with Gaussian near mass(ϕ(1020)) and comparing resulting width to PDG width of ϕ(1020) equal to 4.249 MeV
- First-order polynomial multiplied by sigmoid function used for background to simulate near-threshold behavior

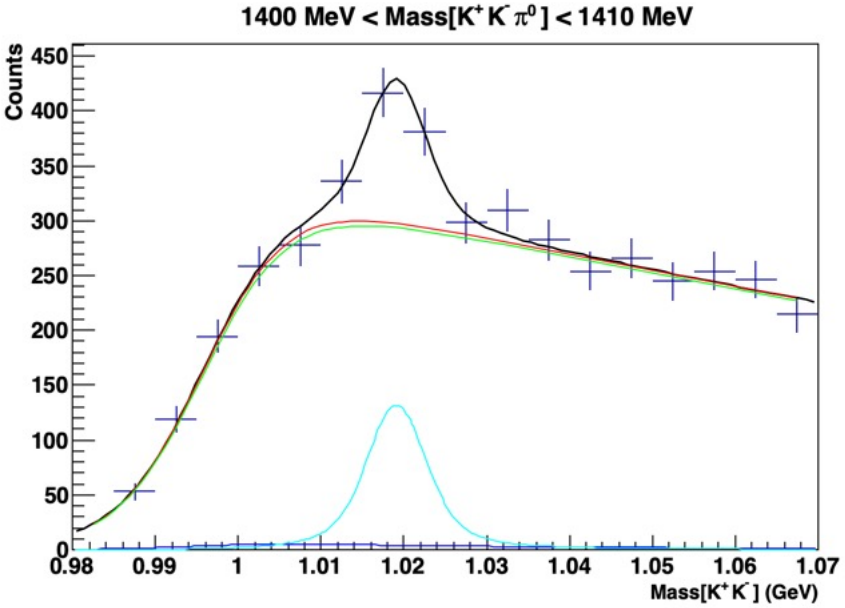

1270 MeV < Mass[K⁺K⁻π⁰] < 1280 MeV
Counts
Mass[K⁺K⁻] (GeV)

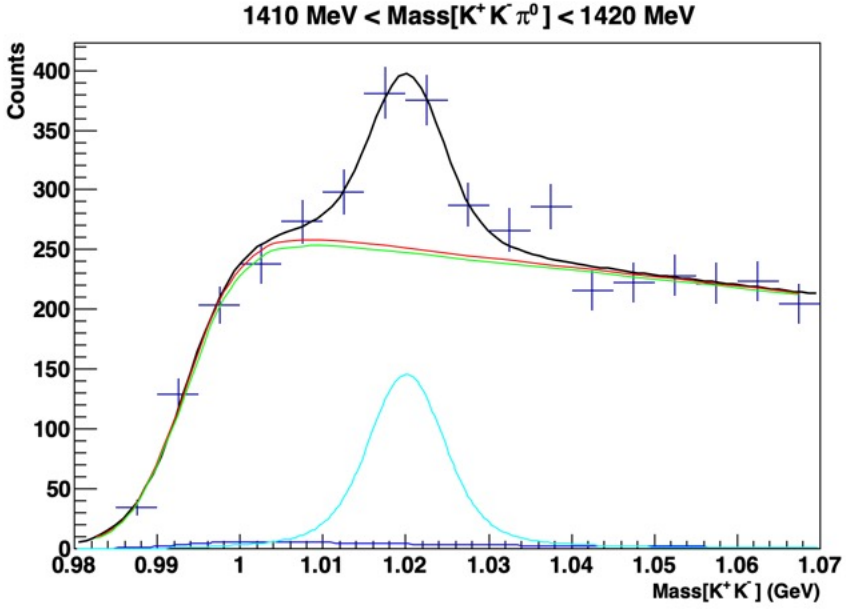

1280 MeV < Mass[K⁺K⁻π⁰] < 1290 MeV
Counts
Mass[K⁺K⁻] (GeV)

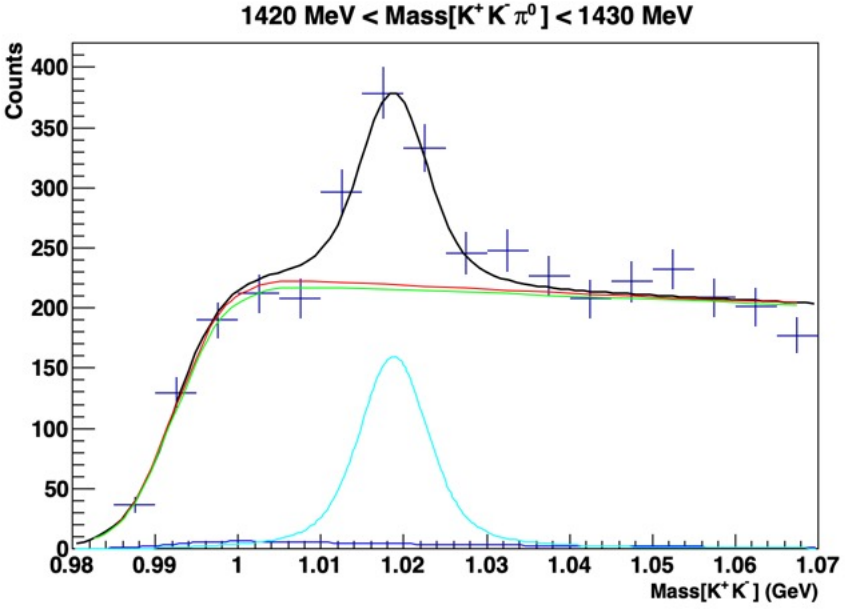

1290 MeV < Mass[K⁺K⁻π⁰] < 1300 MeV
Counts
Mass[K⁺K⁻] (GeV)


1300 MeV < Mass[K⁺K⁻π⁰] < 1310 MeV
Counts
Mass[K⁺K⁻] (GeV)

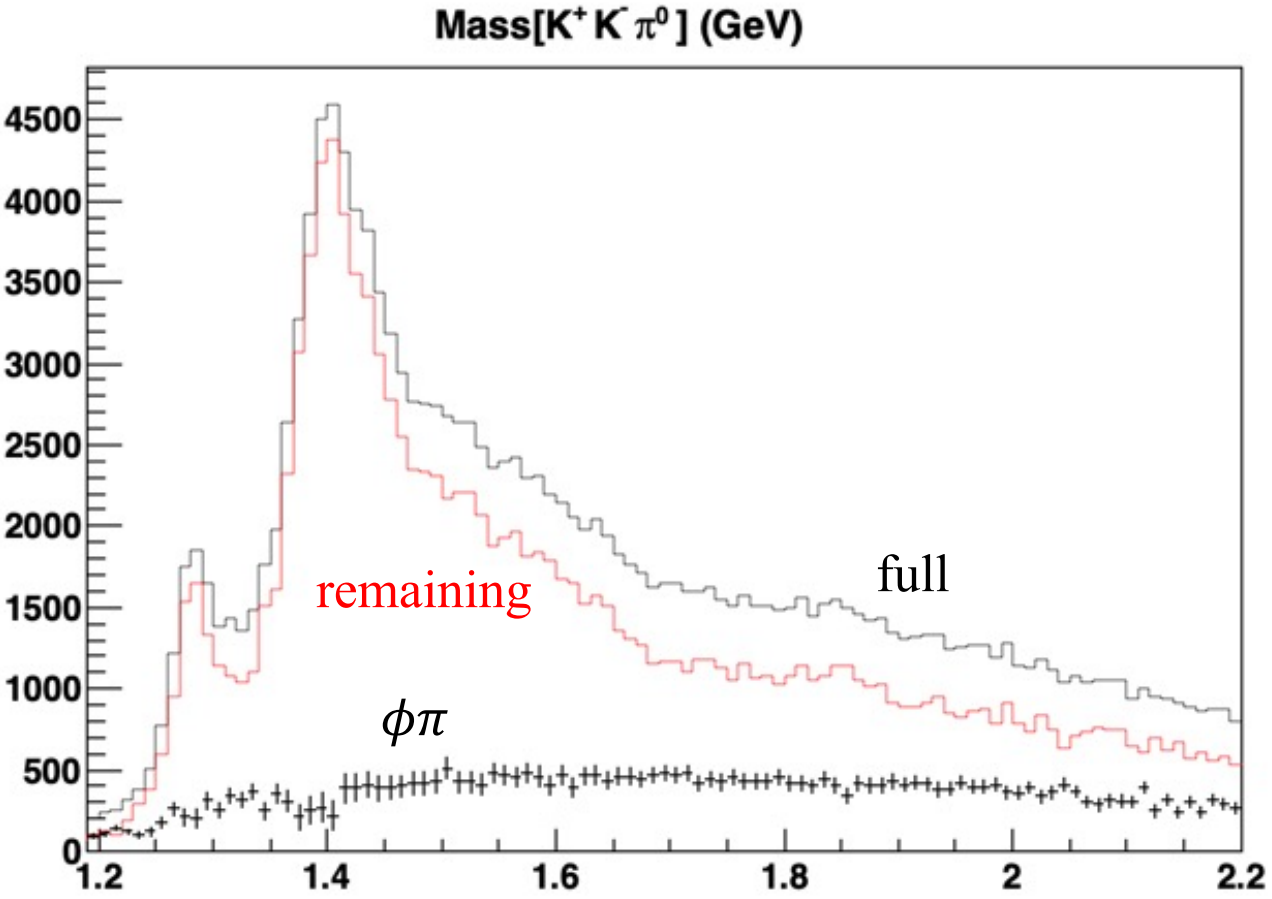

1390 MeV < Mass[K⁺K⁻π⁰] < 1400 MeV
Counts
Mass[K⁺K⁻] (GeV)


1400 MeV < Mass[K⁺K⁻π⁰] < 1410 MeV
Counts
Mass[K⁺K⁻] (GeV)


1410 MeV < Mass[K⁺K⁻π⁰] < 1420 MeV
Counts
Mass[K⁺K⁻] (GeV)


1420 MeV < Mass[K⁺K⁻π⁰] < 1430 MeV
Counts
Mass[K⁺K⁻] (GeV)

$\phi\ \pi^0$ contribution to mass($K^+\ K^-\ \pi^0$)



- No discernible peaks in $\phi\ \pi^0$
- Remaining distribution fitted on next slide

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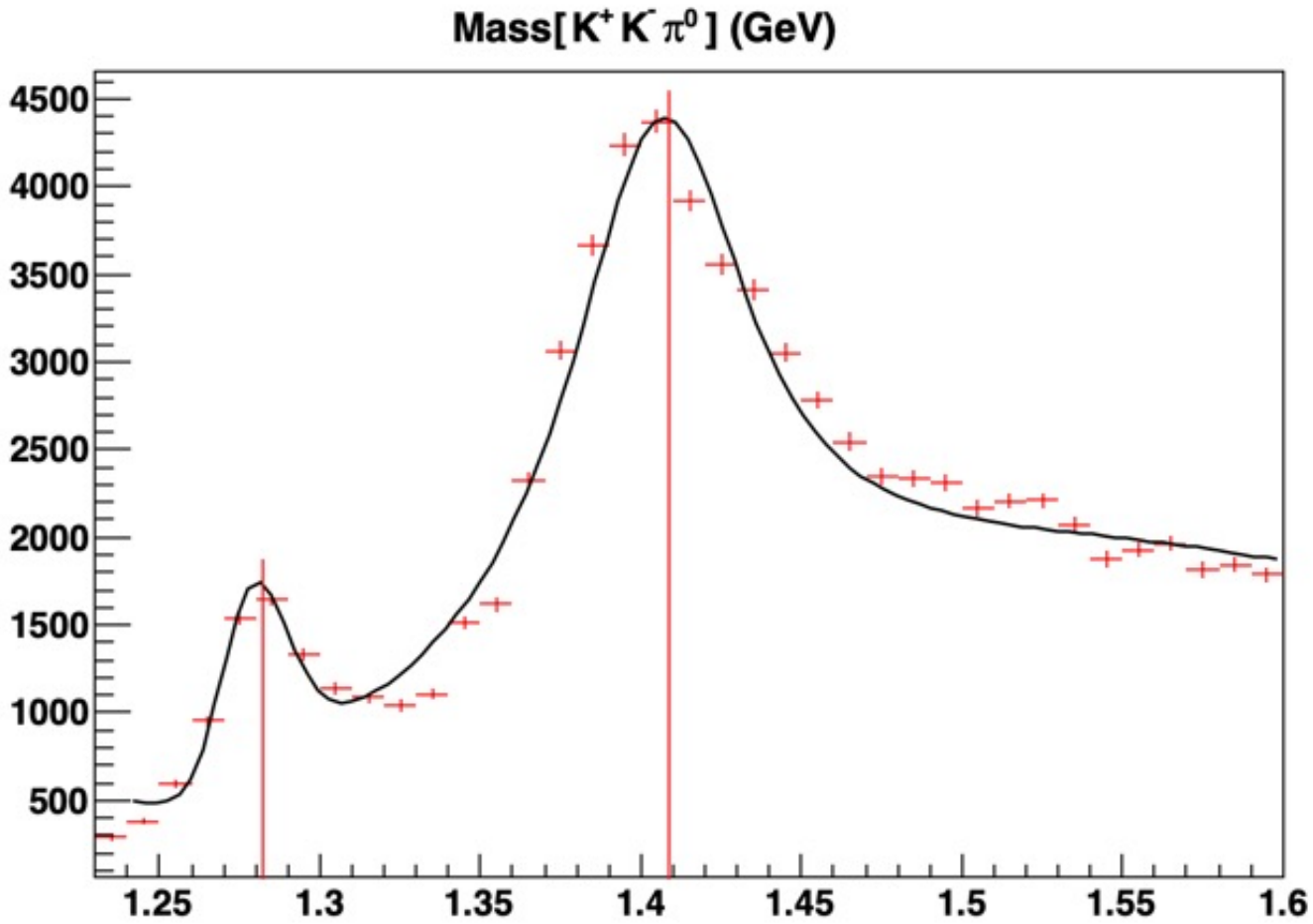

$f_1(1285)$ $\eta(1405)$

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Forward direction

- Perform a partial wave analysis of the K^*K final states

- Investigate K^*K final states in the study of possible hybrid mesons candidates