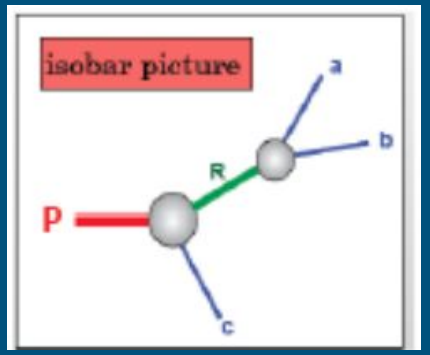
$$\Xi_c^0 \rightarrow \Lambda^0 K^- \pi^+$$

Resonance Substructure

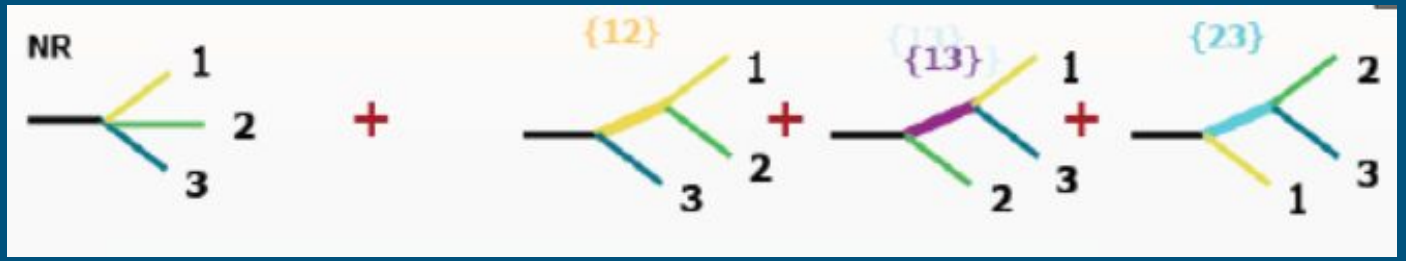
Anil Panta , Dr. Bennett

Isobar model:

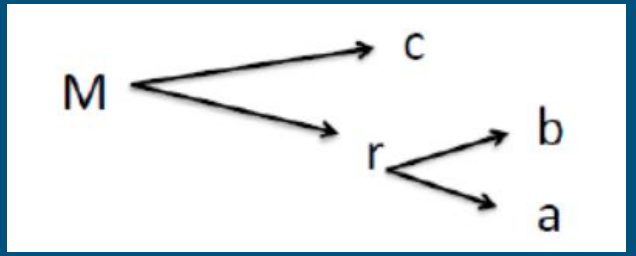


- Three body decay goes through intermediate resonance.

- Total 3 -body decay amplitude = Coherent sum of 2-body resonant ,
  Non -resonant decay



Possible Intermediate Resonance



1. $\Xi_c^0 \rightarrow \Lambda^0 \; K^{*0}$ $\qquad K^*(892)^0 \rightarrow K^- \pi^+$
2. $\Xi_c^0 \rightarrow \Xi(1690)^- \pi^+$ $\qquad \Xi(1690)^- \rightarrow \Lambda^0 K^-$
3. $\Xi_c^0 \rightarrow \Sigma(1385)^+ \; K^-$ $\qquad \Sigma(1385)^+ \rightarrow \Lambda^0 \; ^- \pi^+$

Formalism:

1. Amplitude ------> $U^{M,\lambda_\Lambda}(x) = \langle \Lambda^0 K^- \pi^+ | H | \Xi_c \rangle$

$$U^{M,\lambda_\Lambda}(\vec{x}) = \sum_{jx,\lambda x} V_{jx,\lambda_X} A^{M,\lambda_\Lambda}_{jx,\lambda_X}(\vec{x}),$$

-> Coherent sum over Spin and helicity of intermediate state.
-> A gives the angular distribution of reaction
-> V gives the dynamical function(modeled as Breit-Wigner) and coupling with resonance.

2. Intensity ------->

$$I(\vec{x}) = \sum_{M,\lambda_\Lambda} \left| \sum_{jx,\lambda x} V_{jx,\lambda_X} A^{M,\lambda_\Lambda}_{j_x,\lambda_X}(\vec{x}) \right|^2 .$$

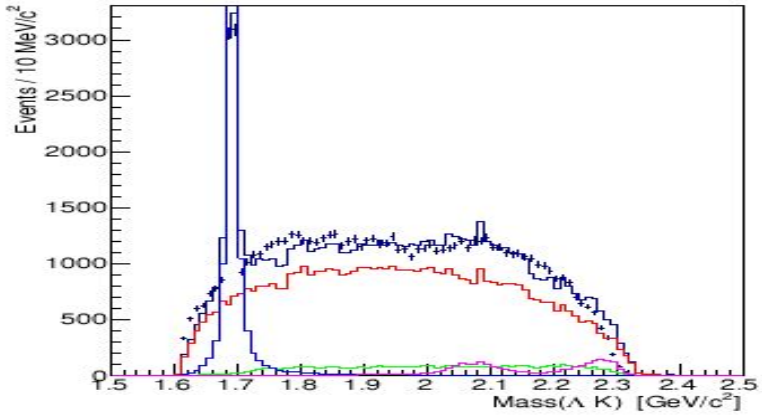
-> Incoherent sum is done over observables (Helicity of Xi_c & daughter Λ)

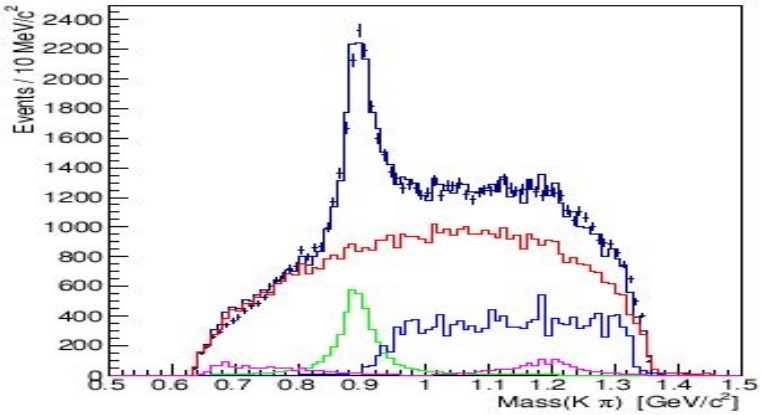
Yet to understand more about theory behind it. 🤔 ?

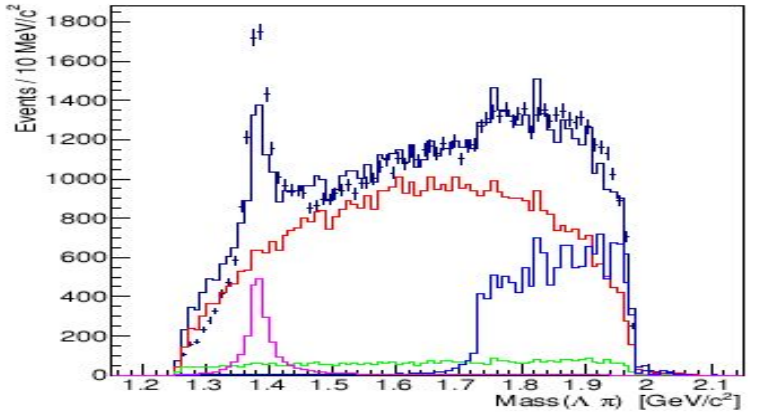
Amplitude Analysis using AmpTools

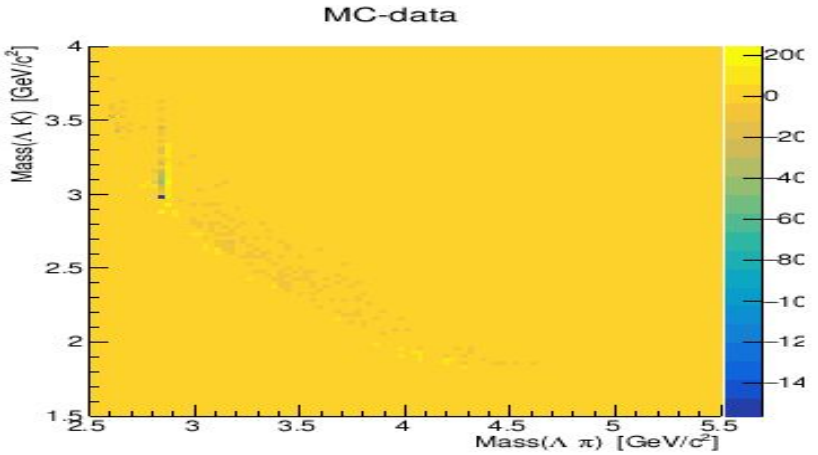
- Software design at Indiana University.
- Maximum likelihood fits to data having set of interfering amplitude.
- Very useful in looking at the resonance structure as fitting can be done separating the interfering amplitude

Parameter varied: (Kstar s=0)
W Sigma
W kst
W Xi(1690)

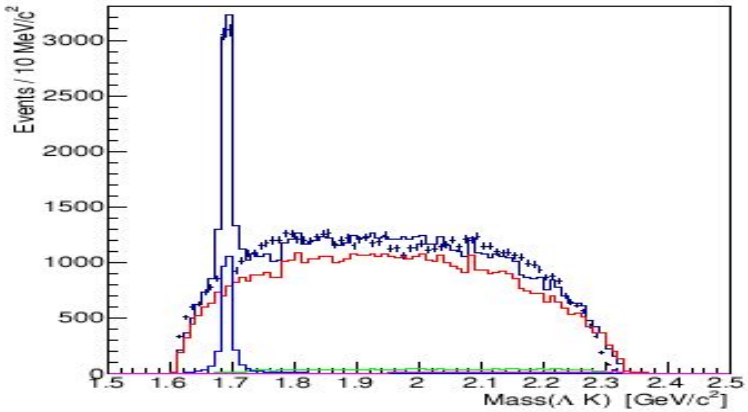


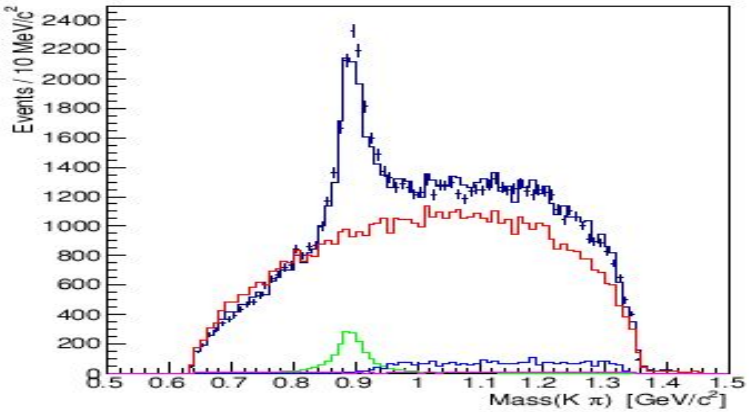


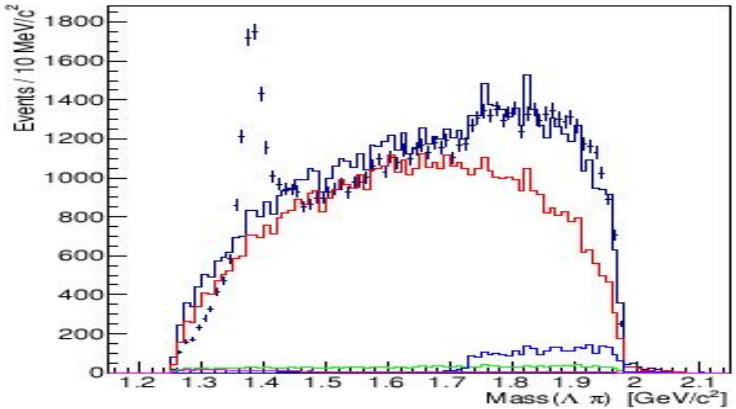


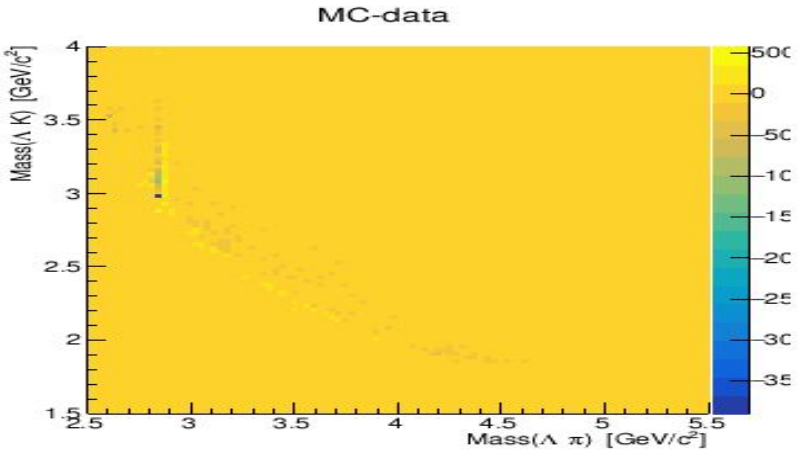


Parameter varied: (Kstar s=0)
M Sigma
W kst
W Xi(1690)







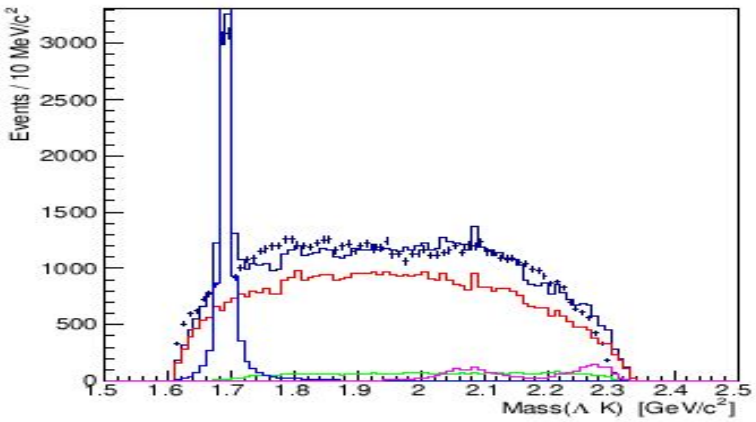


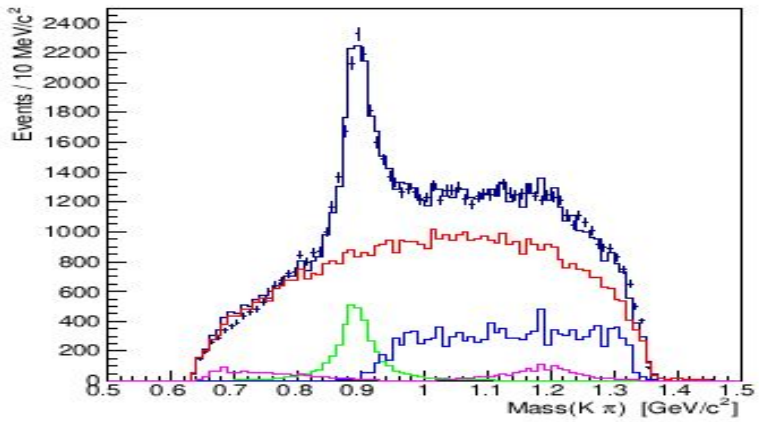
Parameter varied: (Kstar s=0)

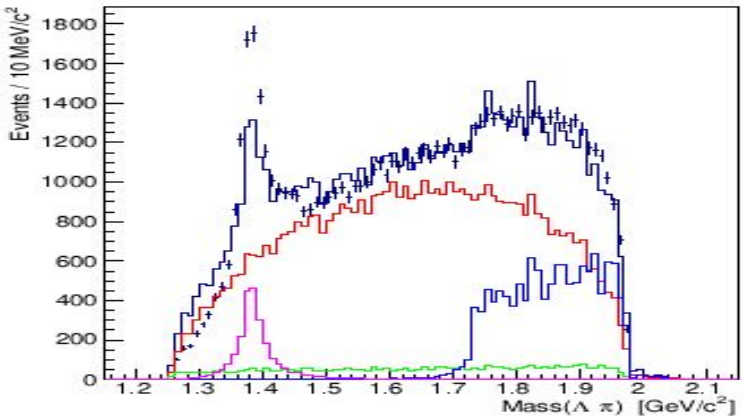
M Xi

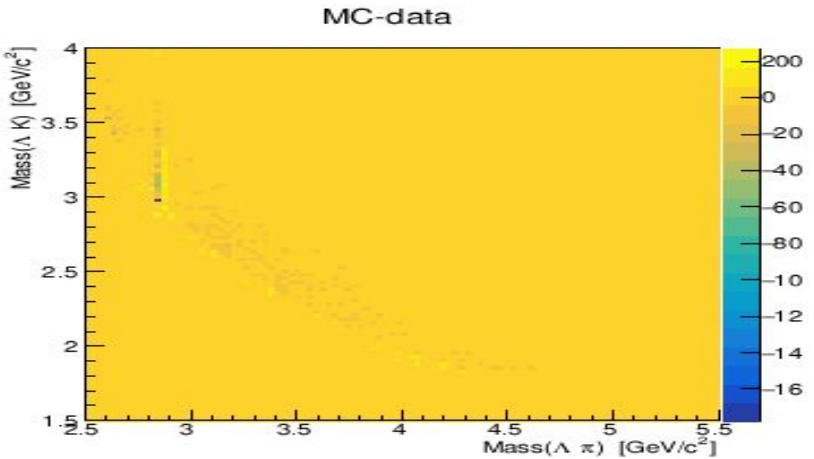
W Xi

W Kst









Fixed all parameter. Kst s=0 , Sigma s= 1/2