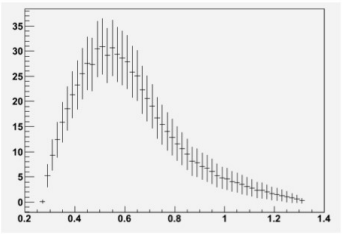
Process:

- $e^+e^- \to Z_c^{\pm}\pi^{\mp}, Z_c^{\pm} \to \pi^{\pm}\psi(2S)$
- $e^+e^- \to X\psi(2S), X \to \pi^+\pi^-$

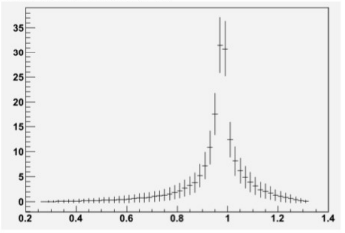
- **Three pipi S-wave components are used. σ_1, $f_0(980)$, σ_2**
- **The σ_1 : The bump at the lower threshold of m($\pi\pi$)**

$$f = \frac{G_\sigma}{M^2 - s - iM\Gamma_{tot}(s)},$$
$$\Gamma_{tot}(s) = g_1\frac{\rho_{\pi\pi}(s)}{\rho_{\pi\pi}(M^2)} + g_2\frac{\rho_{4\pi}(s)}{\rho_{4\pi}(M^2)},$$
$$g_1 = f(s)\frac{s - m_\pi^2/2}{M^2 - m_\pi^2/2}\exp[-(s - M^2)/a].$$



- **$f_0(980)$** is parameterized with flatte formula: fixed to BESII's measurement Phys.Lett. B607 (2005) 243-253

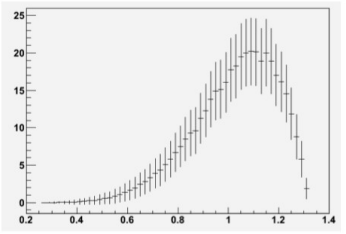
$$f = \frac{1}{M^2 - s - i(g_1\rho_{\pi\pi} + g_2\rho_{K\bar{K}})}.$$

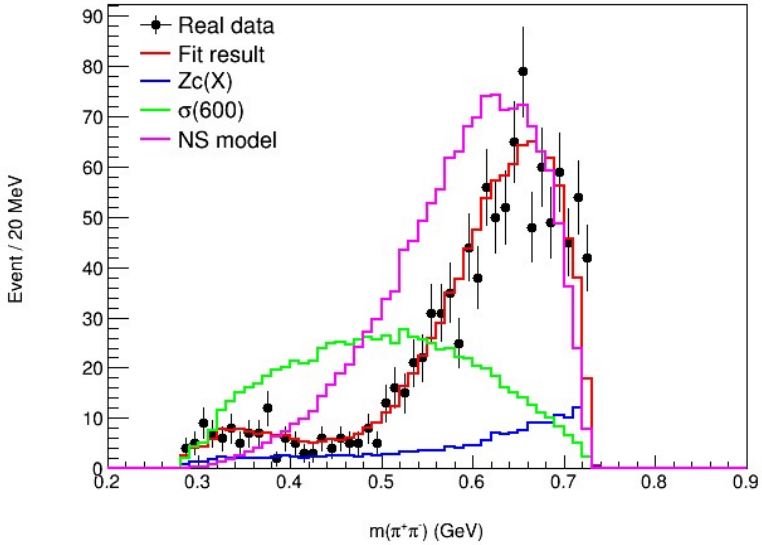


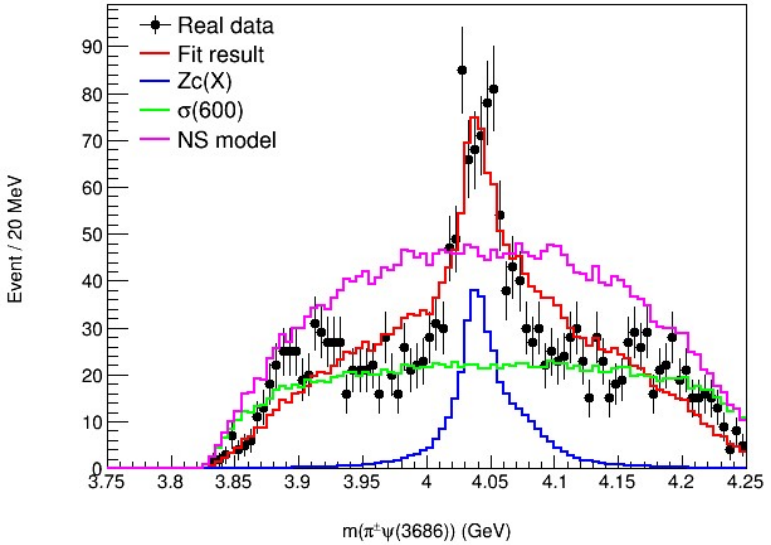
- **σ_2 : The bump at higher threshold of m($\pi\pi$)**

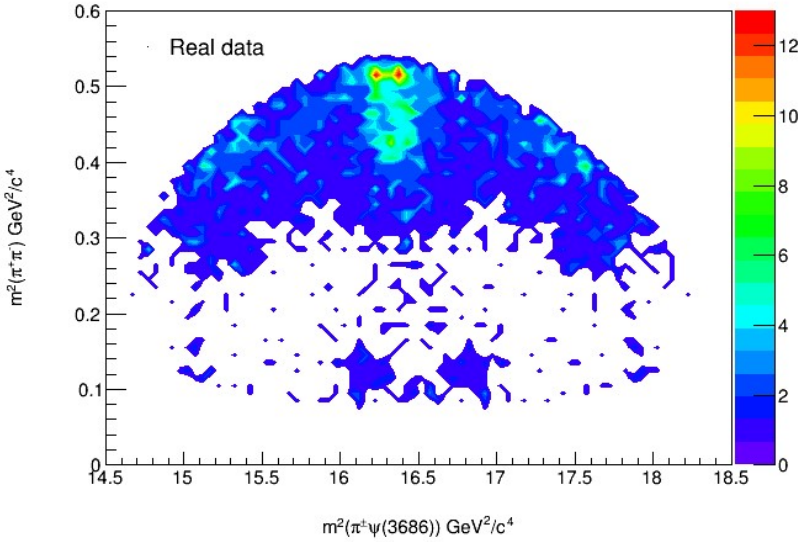
$$\frac{d\sigma}{dm_{\pi\pi}} \propto |\vec{q}| \sqrt{(q^2 - 4m_\pi^2)} \times q^4$$

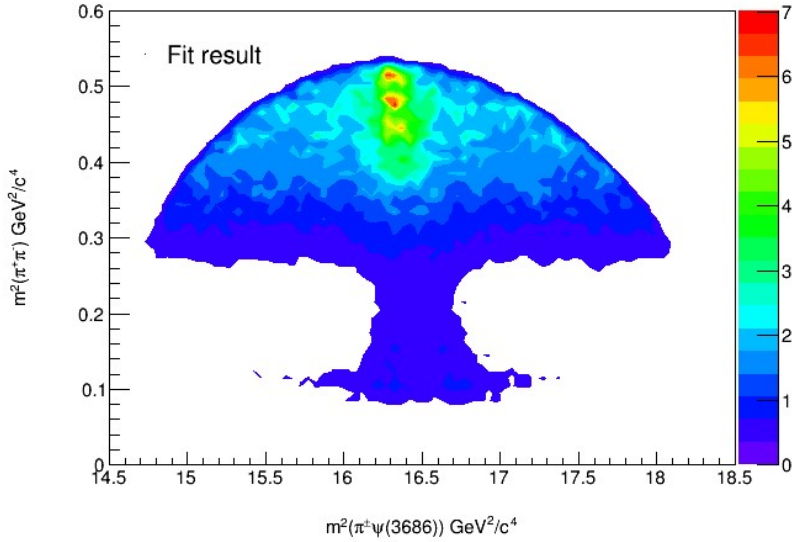
q is the four momentum of the dipion system
|q| is the magnitude of space part of q




Real data
Fit result
Zc(X)
σ(600)
NS model
Event / 20 MeV
m(π⁺π⁻) (GeV)


Real data
Fit result
Zc(X)
σ(600)
NS model
Event / 20 MeV
m(π±ψ(3686)) (GeV)


Real data
m²(π⁺π⁻) GeV²/c⁴
m²(π±ψ(3686)) GeV²/c⁴


Fit result
m²(π⁺π⁻) GeV²/c⁴
m²(π±ψ(3686)) GeV²/c⁴