15 th Working Group on Rad. Corrections and MC Generators for Low Energies

Monte Carlo generators for the study of the process $e^+e^- \to 2(\pi^+\pi^-\pi^0)$ with the CMD-3 detector

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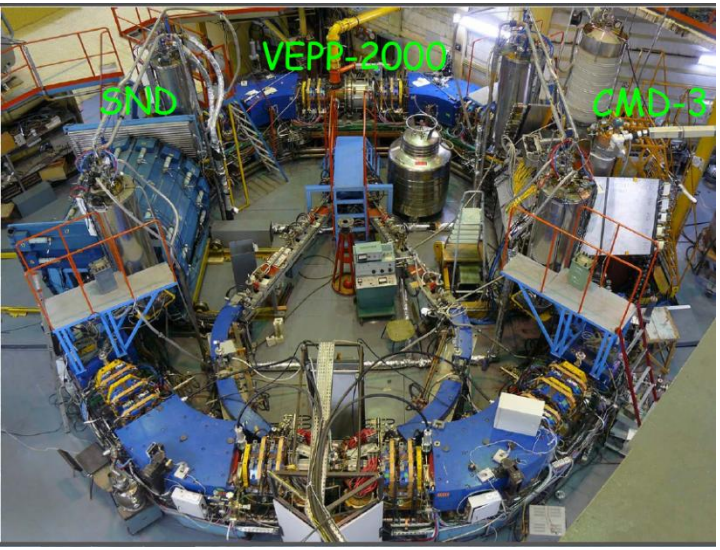
Outline

- ❑ Introduction
- ❑ Generators
- ❑ Mass distributions
- ❑ Angular distributions
- ❑ Plans

Introduction



VEPP-2000

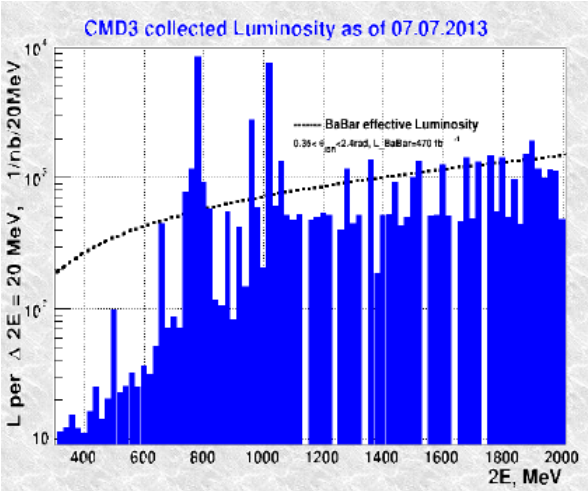
2E = 0.32 – 2.0 GeV

Round beams

$L = 2 \cdot 10^{31}\ cm^{-2} \cdot c^{-1}$ at 1.8 GeV

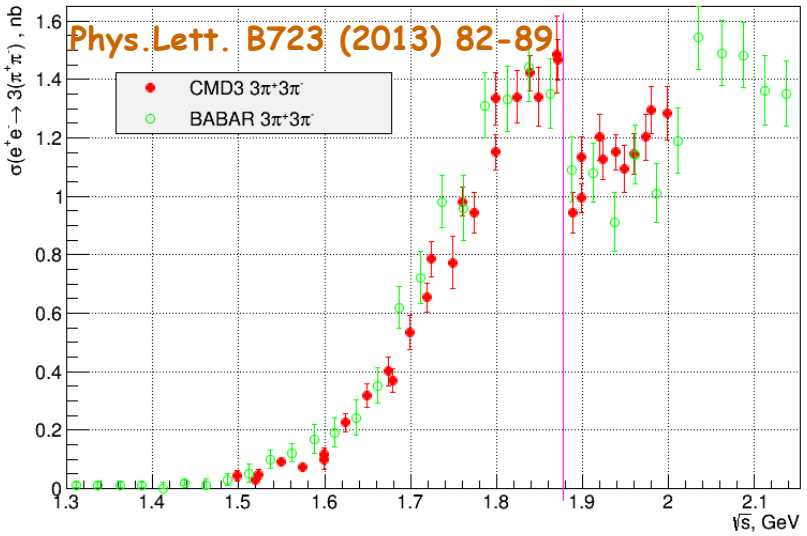
CMD-3

DC – drift chamber,
ZC – Z-chamber
SC solenoid, B = 1.3 T
LXe – LXe calorimeter (400 l)
TOF – Time of Flight system
CsI – CsI calorimeter (1152 cr)
BGO – BGO calorimeter (680 cr)
MU – muon range system



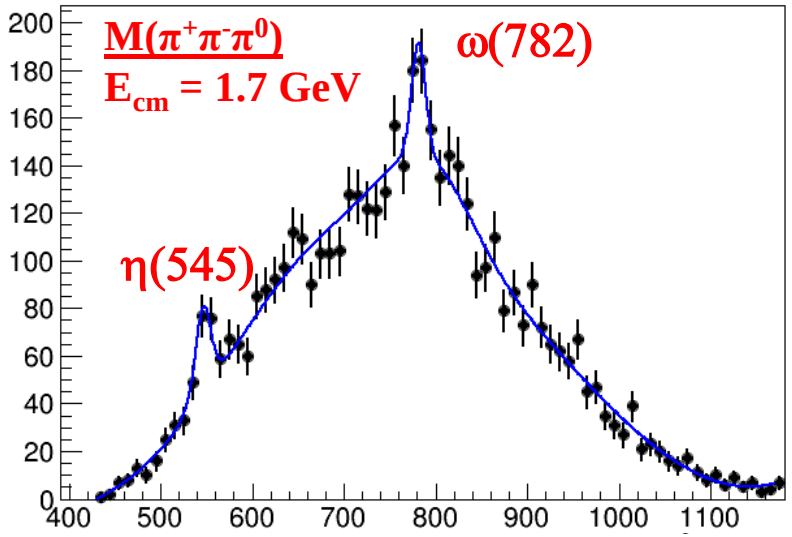
Collected L ~ 60 pb^{-1} per detector

8.3 pb^{-1}	ω - region
9.4 pb^{-1}	< 1 GeV (except ω)
8.4 pb^{-1}	φ - region
34.5 pb^{-1}	> 1.04 GeV



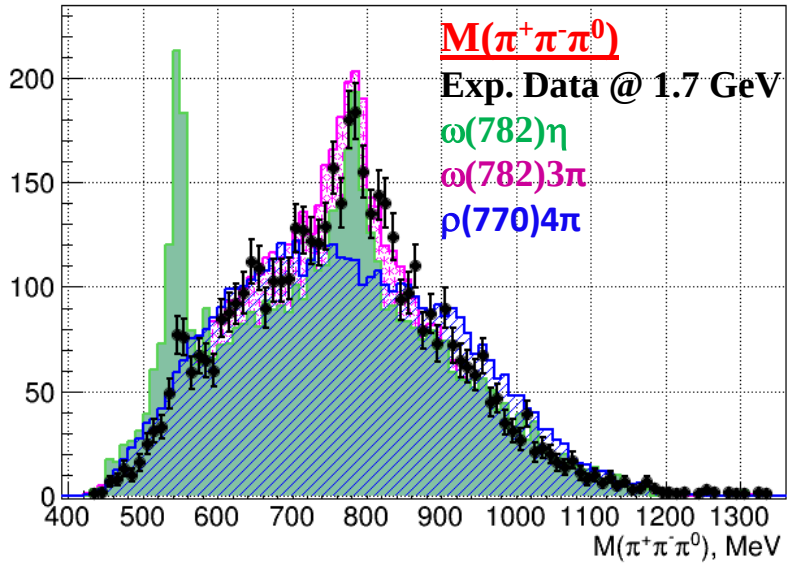
Generators

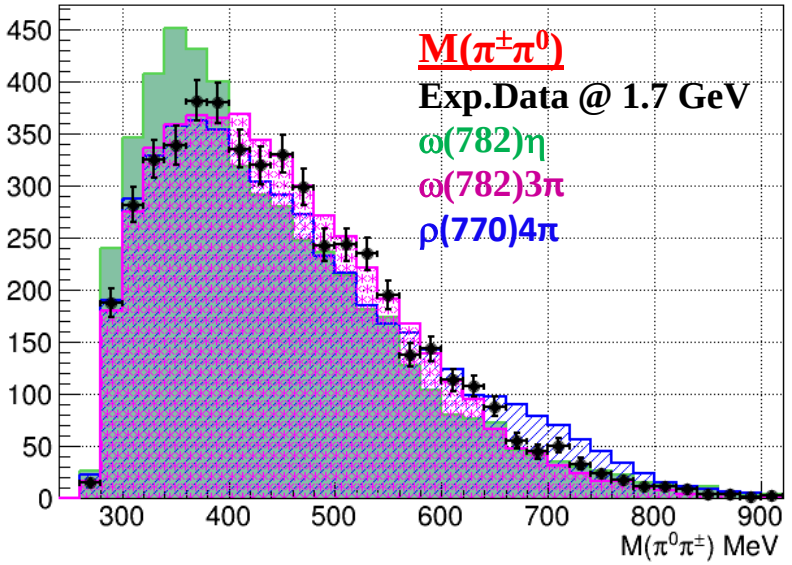
To calculate detection efficiency for $e^+e^- \to 2(\pi^+\pi^-\pi^0)$ we have to correctly describe angular correlations between particles



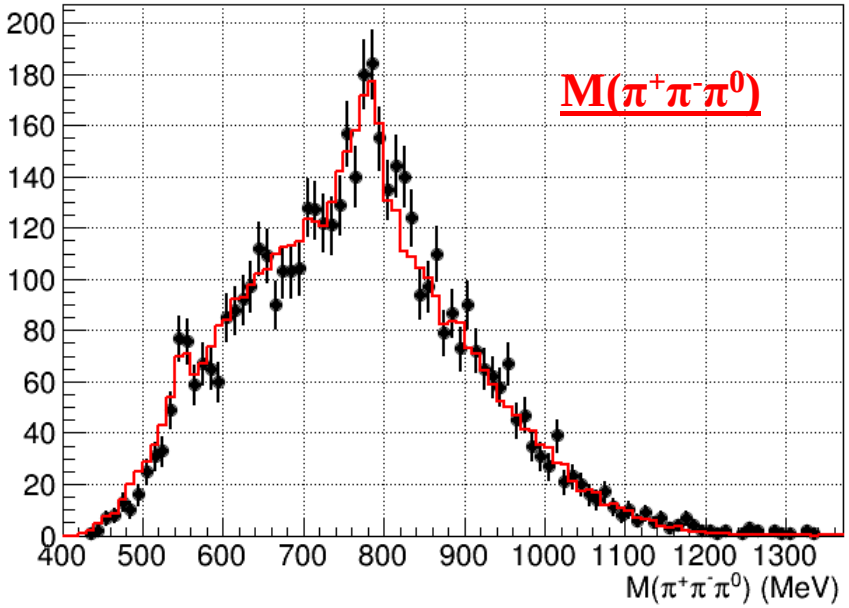
At least we need:

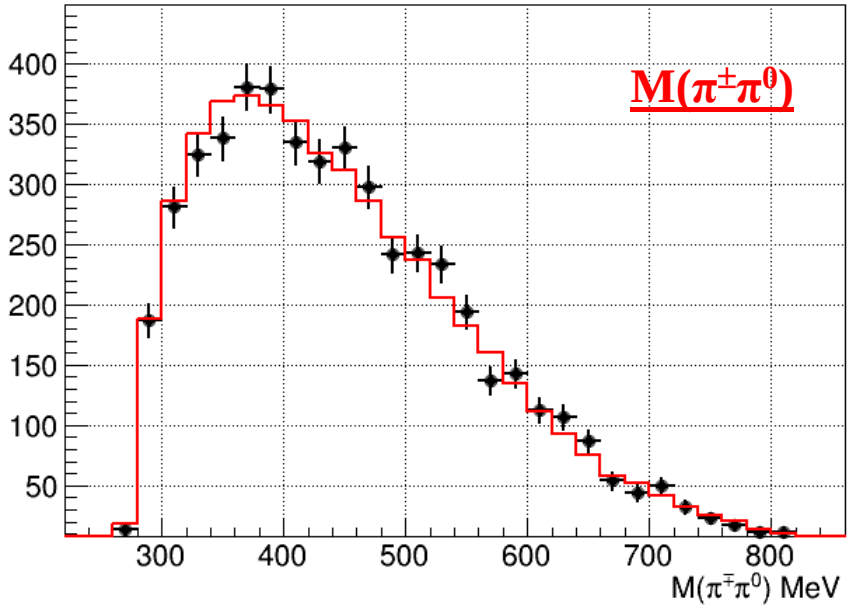
- $\omega(782)3\pi$
- $\omega(782)\eta$
- $\rho(770)4\pi$





Mass distributions





E = 1720 MeV

ω(782)3π – 61%

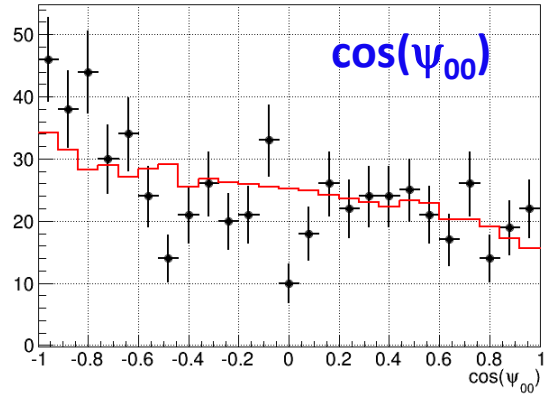
ρ(770)4π – 27%

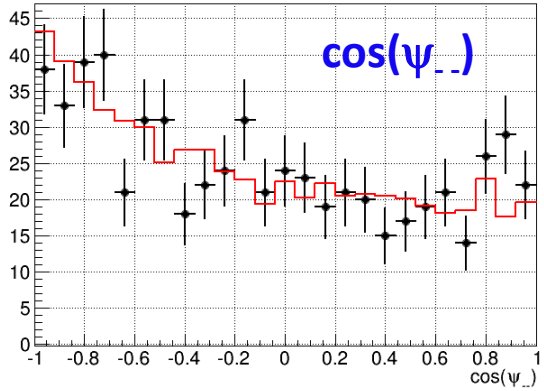
ω(782)η – 12%

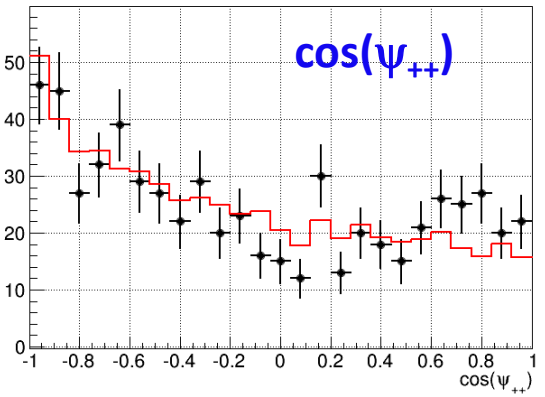
Angular distributions

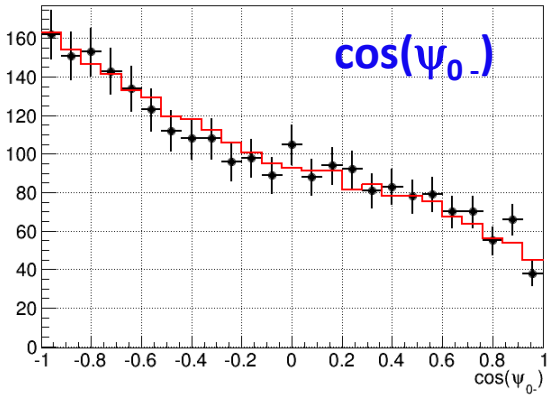
Points with errors – experimental data @ E_{cm} = 1720 МэВ

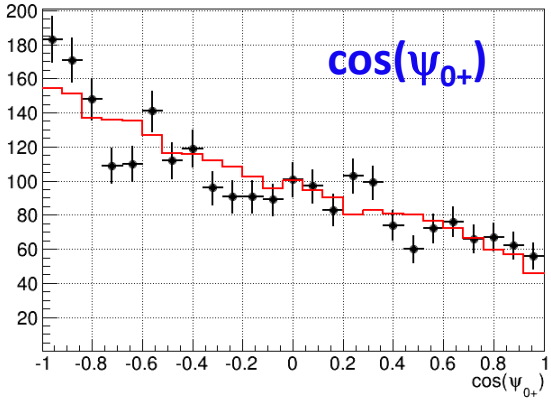
Histogram - model: 61% ω3π + 27% ρ4π+12 % ωη

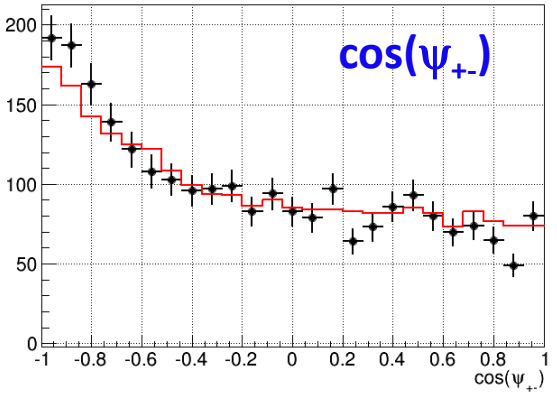




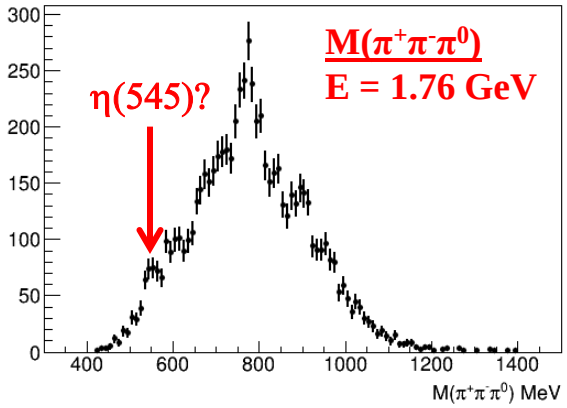


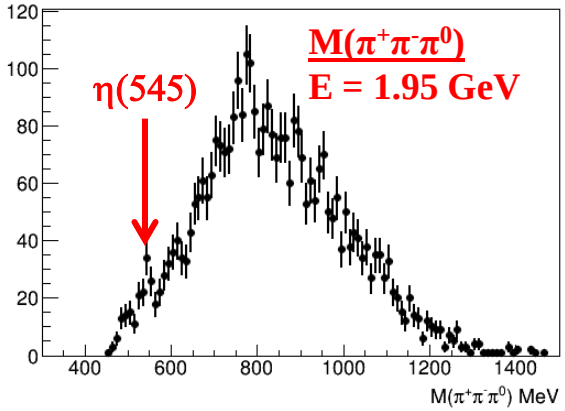




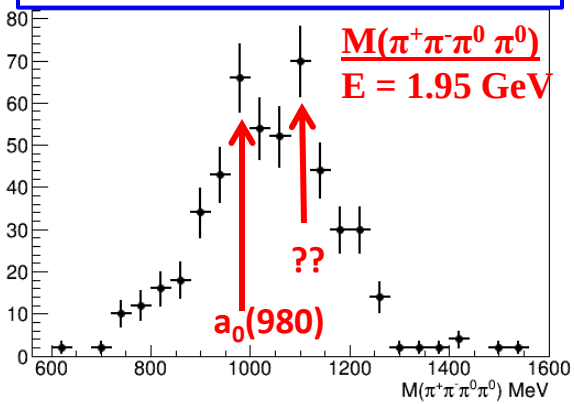


What else do we see ?



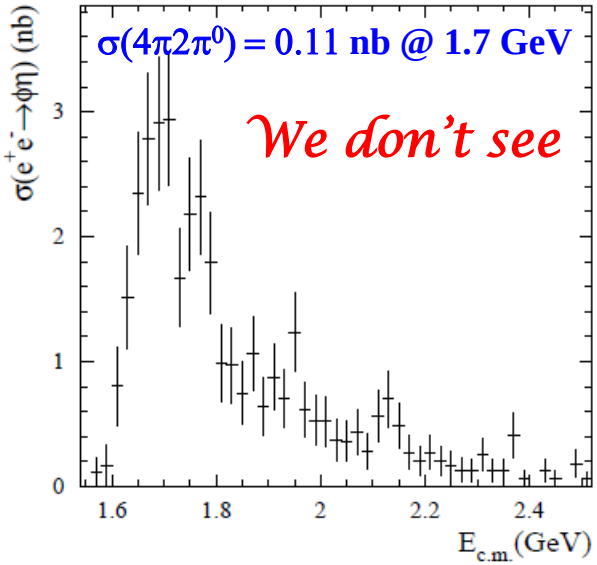


$e^+e^- \to a_0(980)\rho \to (\eta\pi)(\pi\pi)$

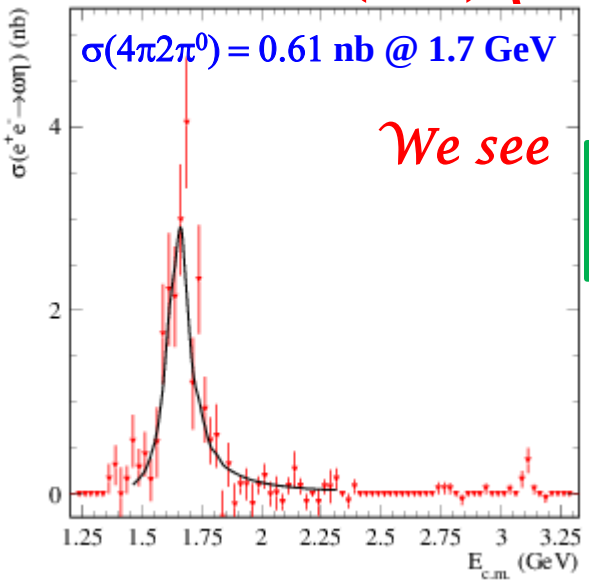


$0.7 < M(\pi^+\pi^-) < 0.9$ GeV

$e^+e^- \to \phi(1020)\eta$



$e^+e^- \to \omega(782)\eta$



We need more data near 2 GeV
We need generator $a_0(980)\rho$

Conclusion and plans

✓ **Three Monte Carlo Generators ($e^+e^- \to \omega 3\pi$, $\omega(782)\eta$, $\rho(770)4\pi$) have been created for study of the process $e^+e^- \to 2(\pi^+\pi^-\pi^0)$**

✓ **Dynamics of $e^+e^- \to 2(\pi^+\pi^-\pi^0)$ is satisfactorily described by these 3 contributions up to E_{cm} = 1.7 GeV.**

✓ **For desciption of the dynamics in E_{cm}= 1.7 – 2.0 GeV energy range new generators are needed (i.e. $e^+e^- \to \eta 3\pi$, a0(980)ρ, ...)**

✓ **Preliminary investigation demonstrates completely different mechanism of the $2(\pi^+\pi^-\pi^0)$ final state production versus $3(\pi^+\pi^-)$ final state.**

✓ **Approach for measurement of intermediate contribution cross sections has been developing**

Stay tuned! Thank You!