Possible Processes for Mass Calibration
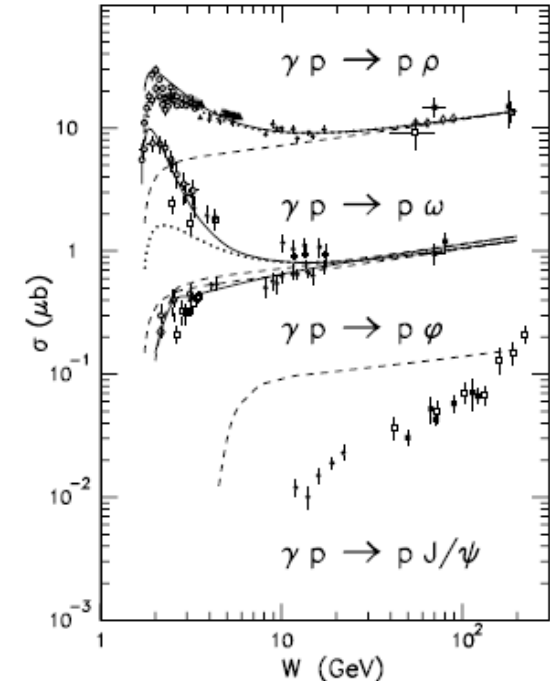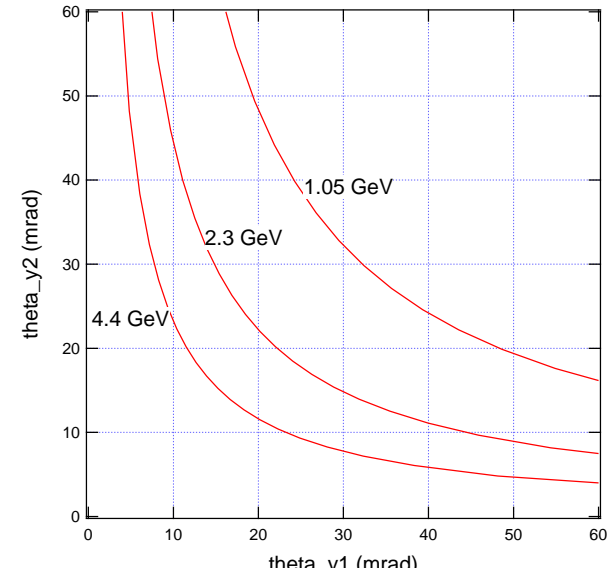
- Only single Moller electron can be detected at E > 2.5 GeV.

- Photo-production of vector meson could be used.

  - e- + W $\rightarrow$ e- + γ* + W $\rightarrow$ e- + V^0 + W

- Possible processes:

  - $\rho^0 \rightarrow \pi+\pi-$ (largest σ but not useful)
  - $\omega^0 \rightarrow \pi+\pi-$
    $\rightarrow$ e+e-
  - $\phi^0 \rightarrow$ K+K-
 $\rightarrow$ KsKl , Ks $\rightarrow \pi+\pi-$

Vector meson detection with HPS

- Production cross sections are measured mostly with proton target.
  - No data with Tungsten target.
  - Fluka to generate some events at 4.4 GeV.
    - Fluka has data driven model.
    - Virtual photon generator by Degtiarenko (JLab)
- The Q-value is large for ρ^0 and K_s^0 decays.
  - Detector acceptance is low.
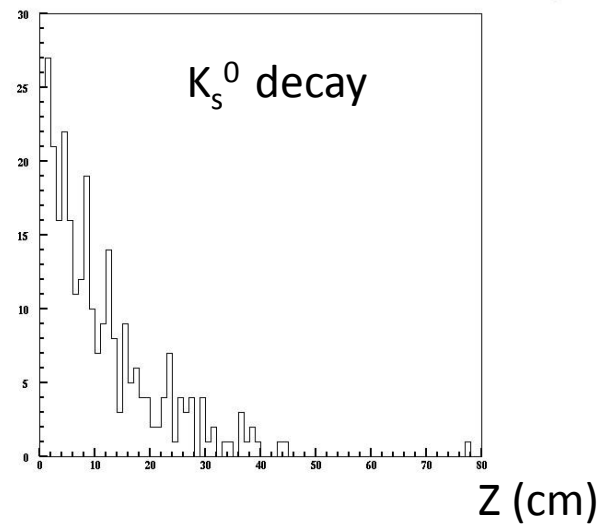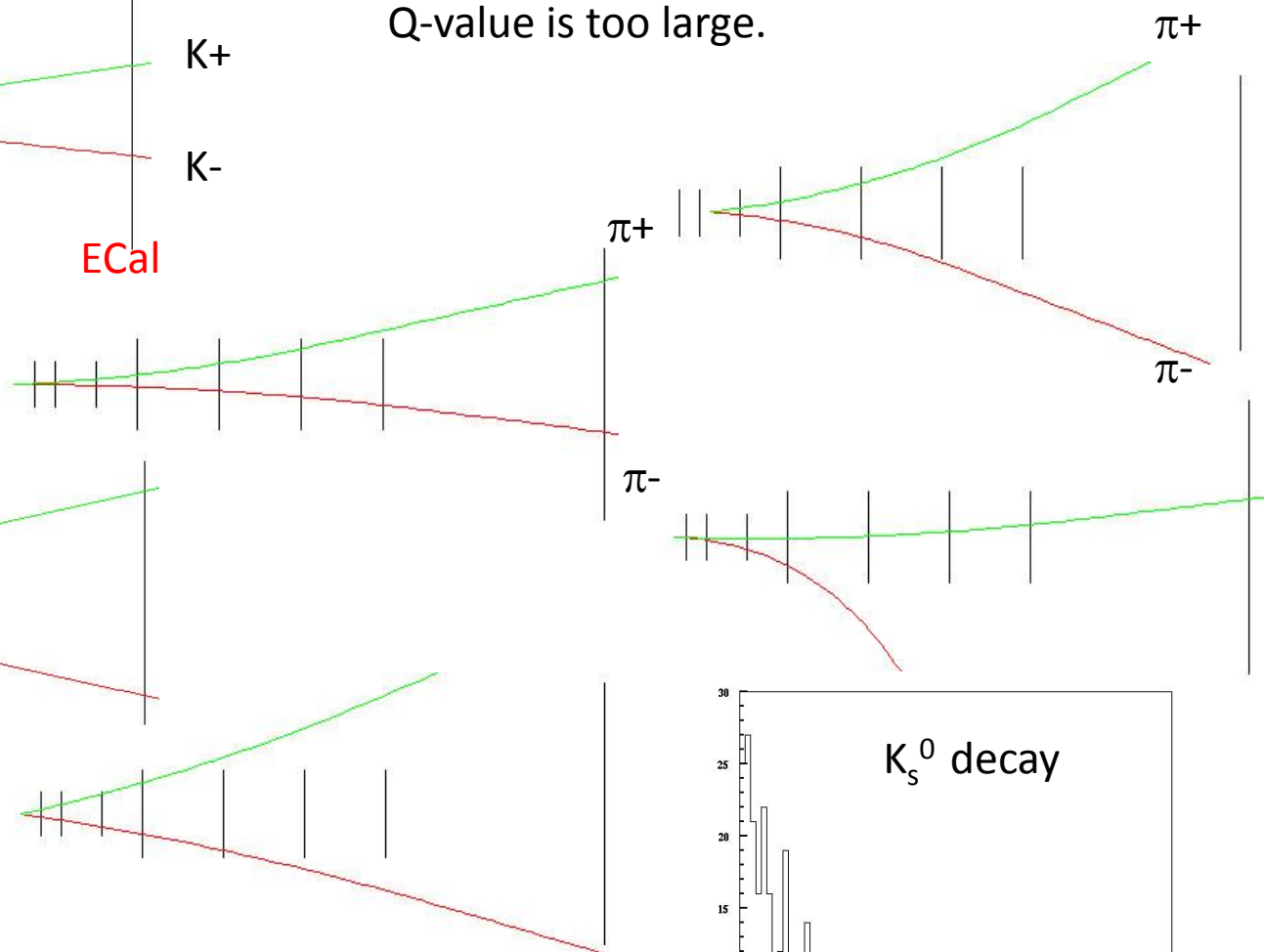- Trigger efficiency for π+ / K+ is low.
  - Positron trigger is important.

$\phi^0 \rightarrow$ K+/K- $\omega^0 \rightarrow \pi+/\pi-$ $K_s^0 \rightarrow \pi+/\pi-$

K+

K-

SVT

ECal
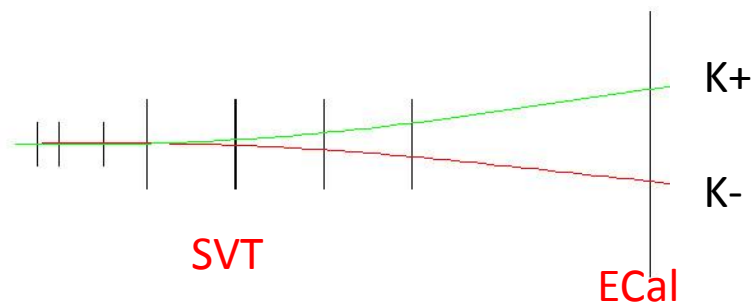
Q-value is too large.

π+

π+

π-

π+

π-

K_s^0 decay

Z (cm)

Rate estimates

	$\sigma(\gamma p) \cdot$ BR	σ(e-W) FLUKA	HPS Acceptance	Trigger Eff. HPS-MC	Rate @ 300 nA
ρ	20 μb	13 mb			
$\omega \rightarrow \pi+\pi-$	5μb $\cdot$ 1.5$\times 10^{-3}$	~2 mb	0.7 %	14%	0.3 Hz
$\omega \rightarrow e+e-$	5μb $\cdot$ 7$\times 10^{-5}$	~2 mb	0.7 %	100%	0.1
$\phi \rightarrow K+K-$	0.4μb $\cdot$ 0.49	0.13 mb	46 %	14%	420
$\phi \rightarrow KsKl$	0.4μb $\cdot$ 0.34	0.13 mb	1.2 %	14%	8