Status of Exotic Meson Searches

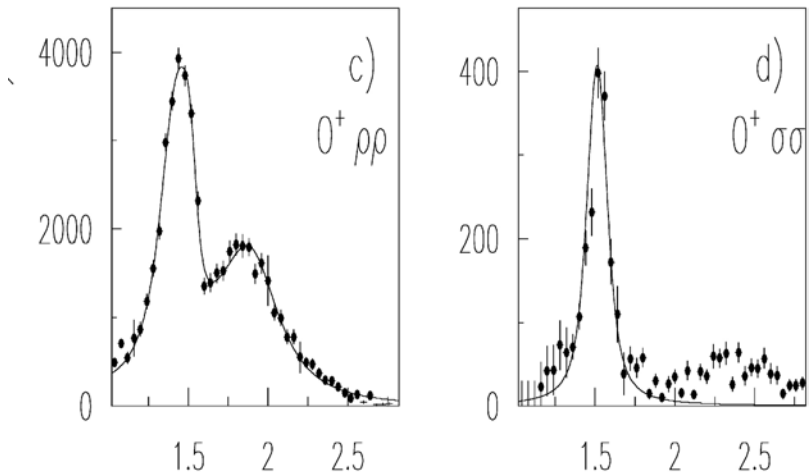
- Spin exotics and glueballs essential to our understanding of QCD.
- Limit comments to new results or new experiments.
  - WA102, Crystal Barrel, E852, CLAS, GlueX, Compass

Lattice QCD mass predictions

- Scalar glueball at about 1.6 GeV.
  - Tensor at 2.3 GeV.
- Hybrid spin-exotics start at about 1.9 GeV ($J^{pc}=1^{-+}$).
    - Reviewed by McNeile, hep-lat/0207001 (2002)

Glueball searches - 4π decay

- CERN WA102 (central production)
- $pp \rightarrow 4\pi\ pp$ PWA
  - $f_0(1370)$; $\rho\rho$ dominant
  - $f_0(1500)$; $\rho\rho$ and $\sigma\sigma$
  - $f_0(2000)$; $\rho\rho$ dominant
    - Barberis et al., PL B471,
    - 440 (2000)



$M_{4\pi}$

Glueball searches - 4π decay

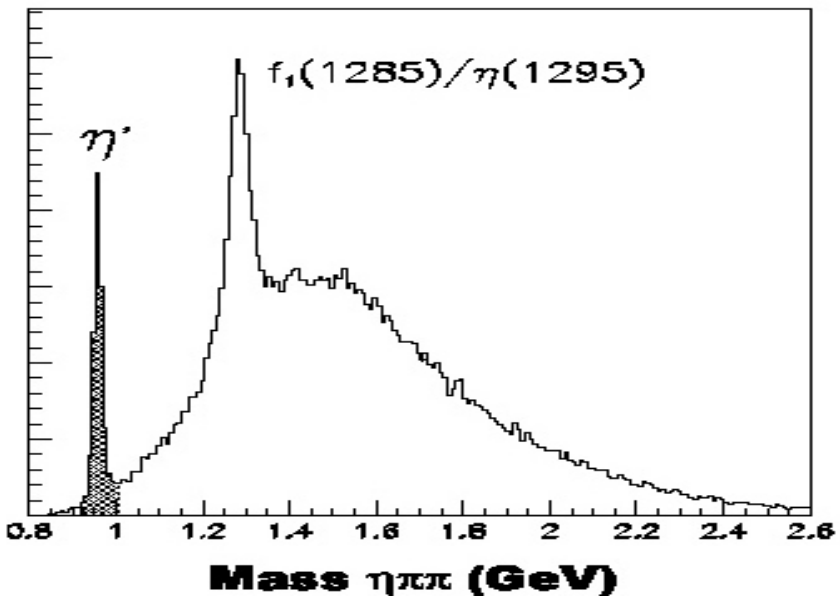
- CRYSTAL BARREL
- $\bar{p}n \rightarrow X\pi \rightarrow 5\pi$
- important disagreement with WA102
  - Abele, et al., Eur. Phys. J. C21, 261 (2001).

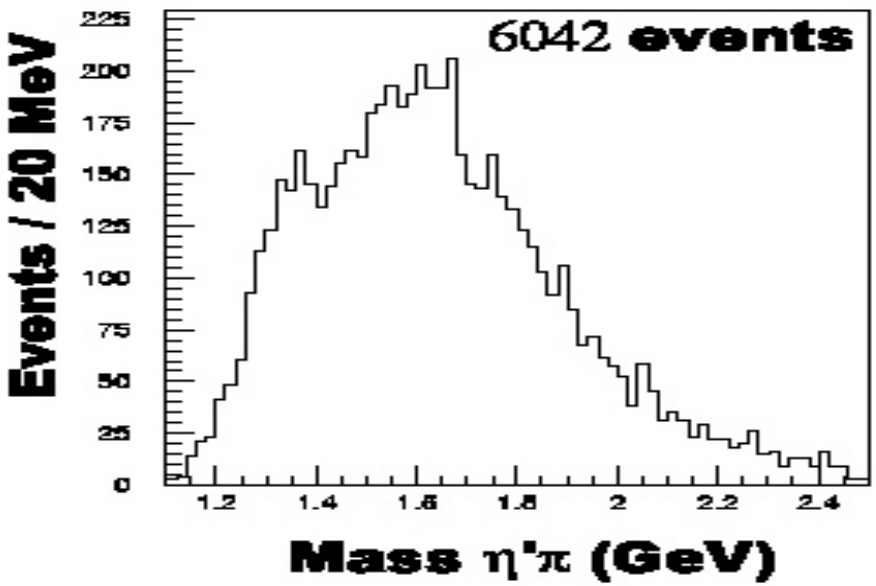
	Γ_{tot}	$\sigma\sigma$ $\pi\pi$	$\rho\rho$ $\eta\eta$	$\pi(1300)\pi$ $\eta\eta'$	$a_1\pi$ $K\bar{K}$
$f_0(1370)$	275 ± 55	120.5 ± 45.2 21.7 ± 9.9	62.2 ± 28.8 0.41 ± 0.27	41.6 ± 22.0	14.1 ± 7.2 (7.9 ± 2.7) to (21.2 ± 7.2)
$f_0(1500)$	130 ± 30	18.6 ± 12.5 44.1 ± 15.3	8.9 ± 8.2 3.4 ± 1.2	35.5 ± 29.2 2.9 ± 1.0	8.6 ± 6.6 8.1 ± 2.8

- Future: ρπ, η'π

Hybrid searches

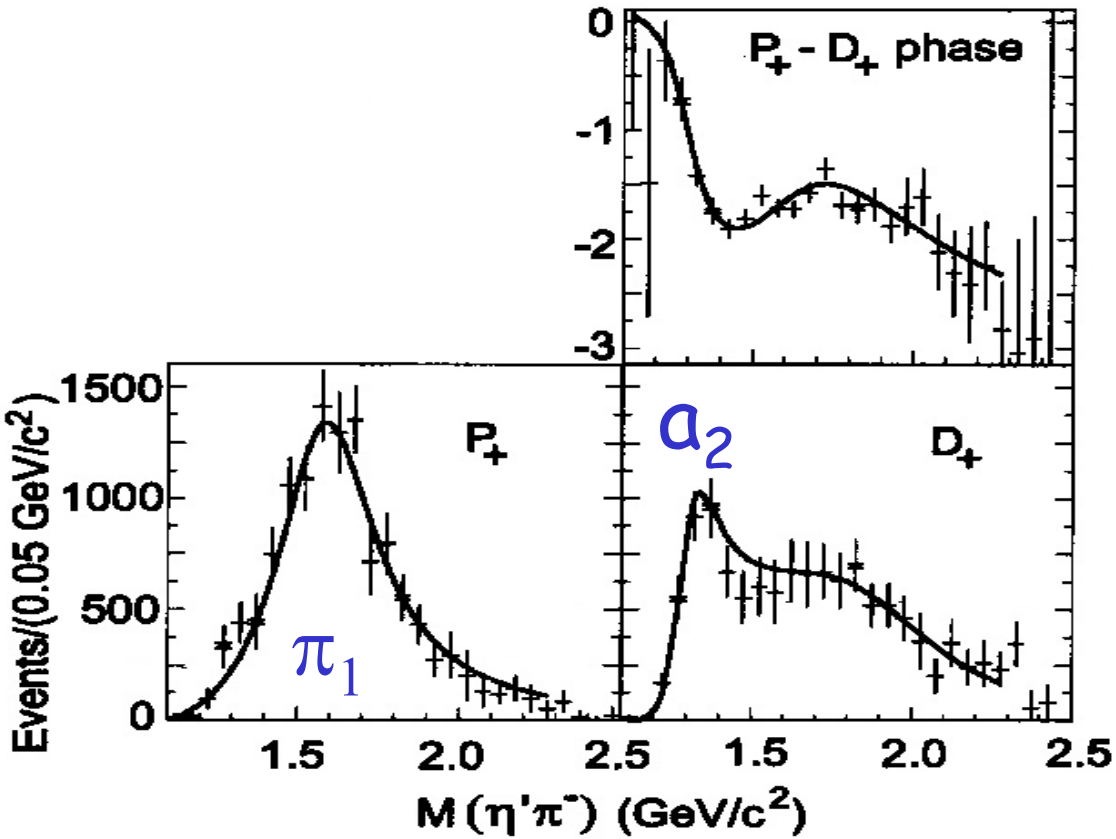
- BNL E852
- $\pi^- p \rightarrow Mp$
  - previous: $\pi_1(1400) \rightarrow \eta\pi$, $\pi_1(1600) \rightarrow \rho\pi$
  - recent: $\pi_1(1600) \rightarrow \eta'\pi^-$
    - Ivanov, et al., PRL 86, 3977 (2001)





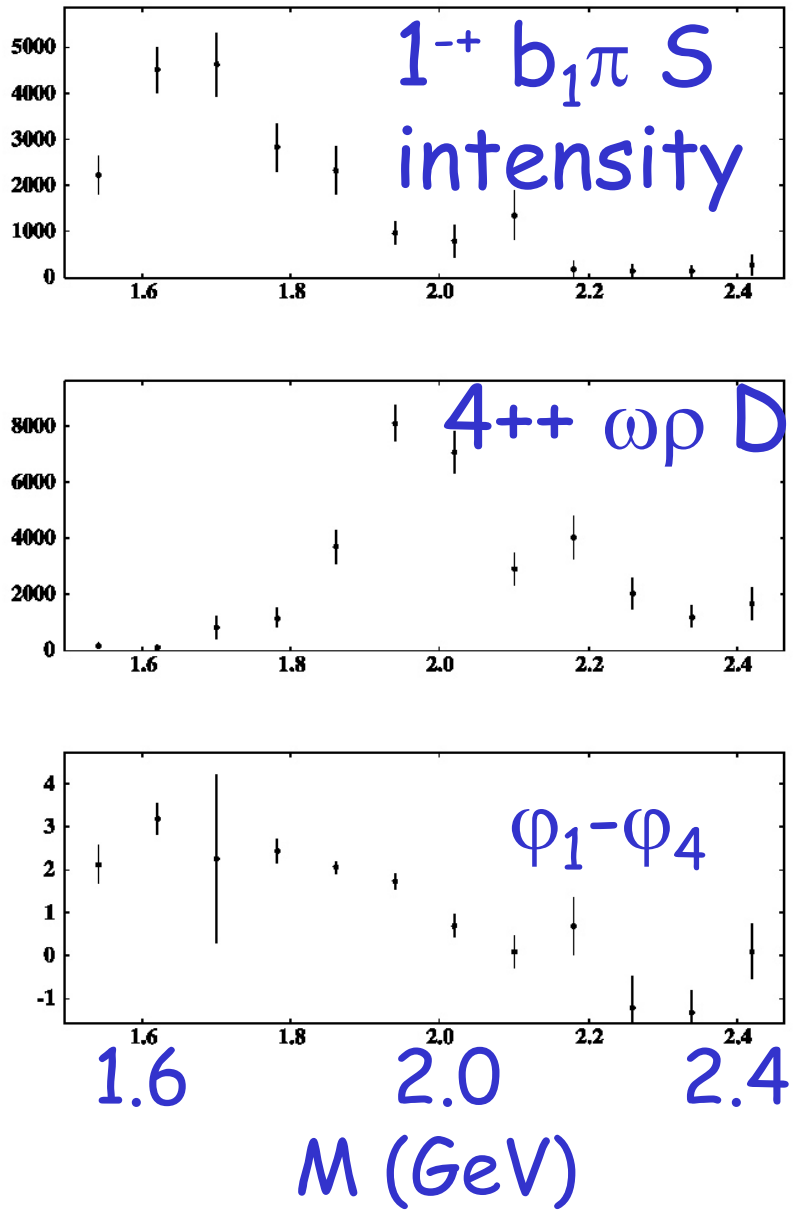
E852 partial wave fits

- $\pi_1(1600) \rightarrow \eta'\pi^-$ dominant!
- M=1.60 GeV, Γ=0.34 GeV
- Future:
  - $b_1\pi$
  - $f_1\pi$
  - K_1K
  - K^*K
  - $\omega\pi$



E852 - preliminary

- $\omega\pi^0\pi^-$ PWA
- large $b_1\pi$ width for π_1
  - hybrid meson?



New experiments

- Jefferson Lab. CLAS
- $\gamma p \rightarrow Mp$ with $M \rightarrow 3\pi$, $KK\pi$
  - tagged $E_\gamma \cong 5.2$ GeV

Motivation:

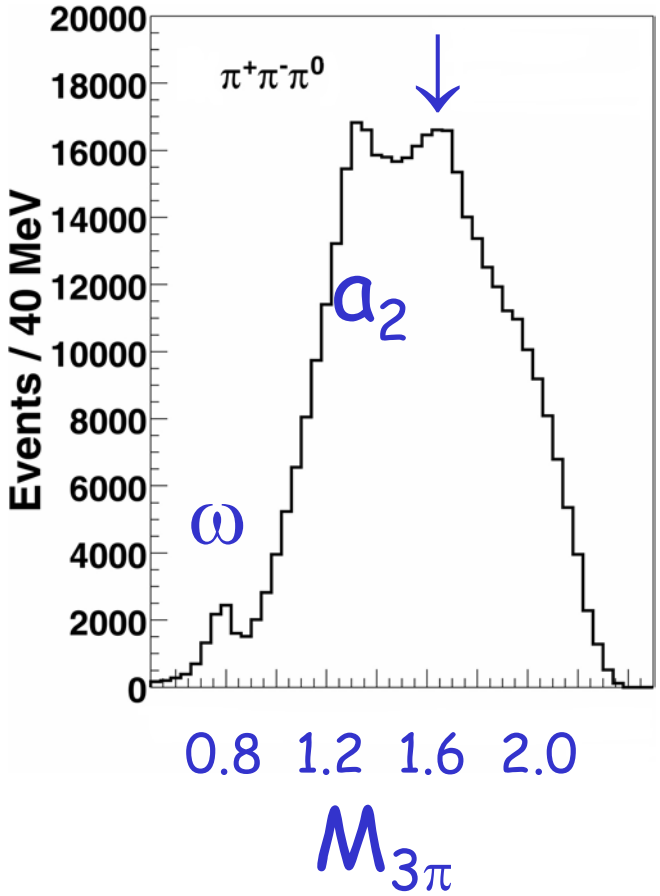
"vector meson" probe.

Good acceptance for few-body decays.

CLAS preliminary

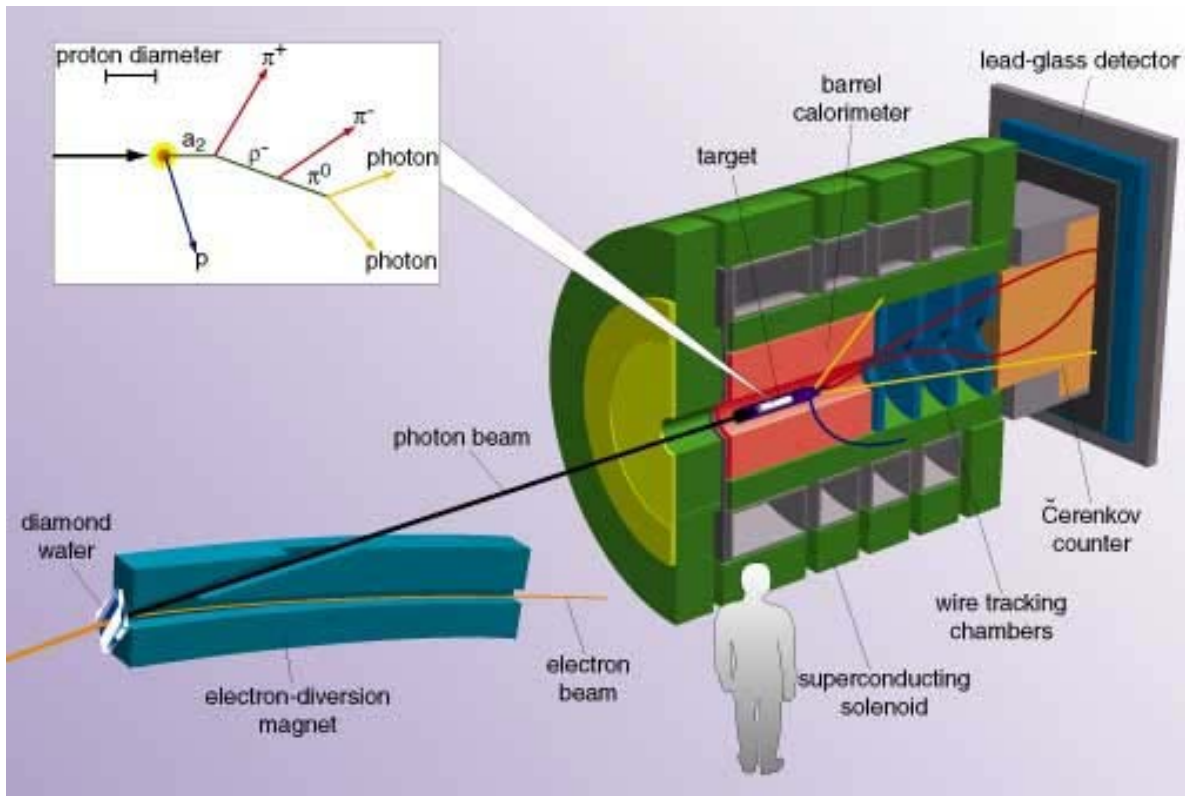
- Large production rates
- Search:
  - isovector 1^{-+}, 3^{-+}
  - isoscalar 2^{+-}, 4^{+-}
  - SLAC 1.8 GeV bump
    - Condo, et al., PRD 43,
    - 2787 (1991)

400k events



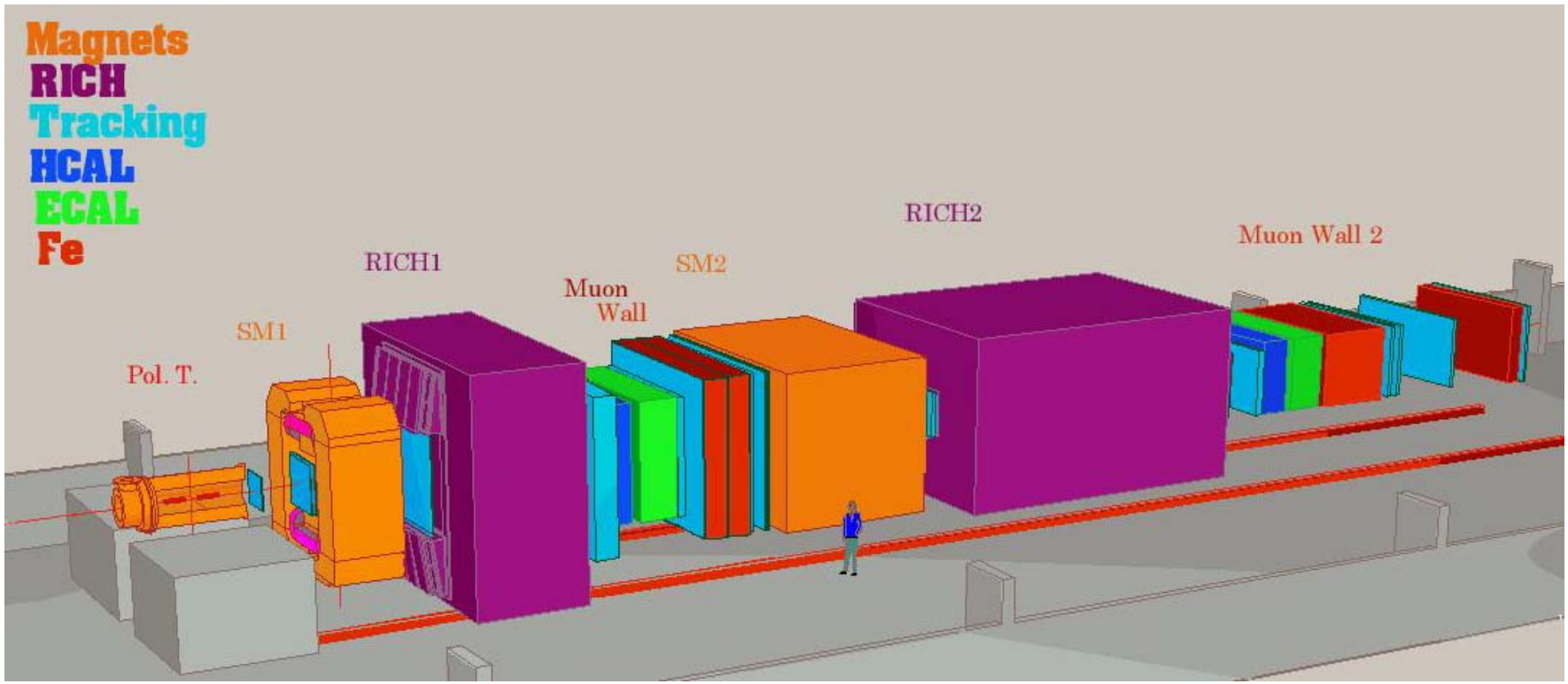
JLAB GlueX proposal

- New facility - big part of lab upgrade
  - polarized high-flux beam (E_γ = 9 GeV)
  - dedicated spectrometer



CERN COMPASS

- Broad program at SPS
- beam on target!

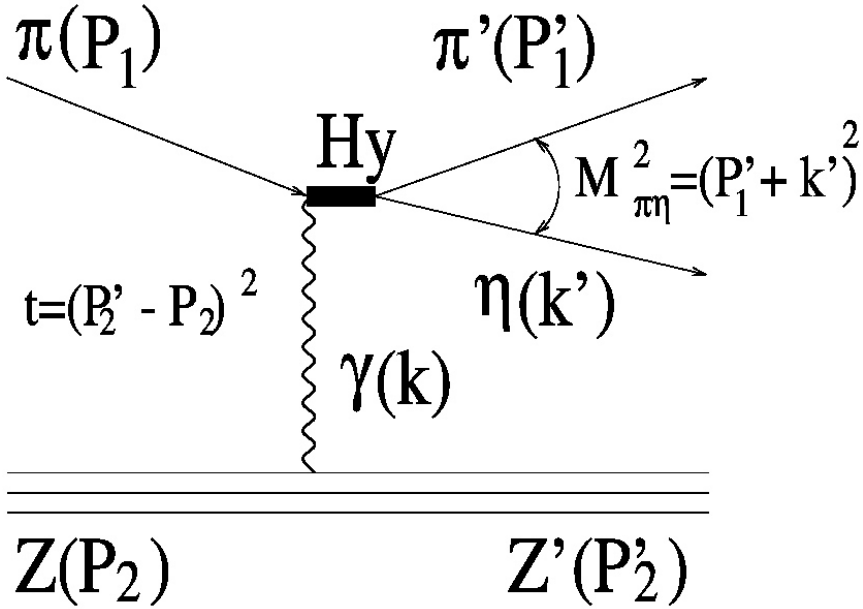


CERN COMPASS

- Meson program:
  - pp central production
  - $\pi\gamma$ Primakoff by πA interactions
  - πP diffraction
    - L. Schmitt, Proceedings of XXXVII Int. Winter Meeting on Nucl. Phys., Bornio, 1999

COMPASS Primakoff

- Expect 10^6 measured π_1 decays.
  - Moinester and Chung, hep-ex/0003008 (2000)



Summary of glueballs and exotics

- WA102, Crystal Barrel, E852 and earlier exps. have written a few chapters of a long story.
- By the next ICHEP meeting we can expect even bigger gains.
- We need the new experiments to fill in most of the book.