

Inclusive dilepton production in $2.2 \text{ GeV } p+p$

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pp at 2.2 GeV (Jan 2004 run)

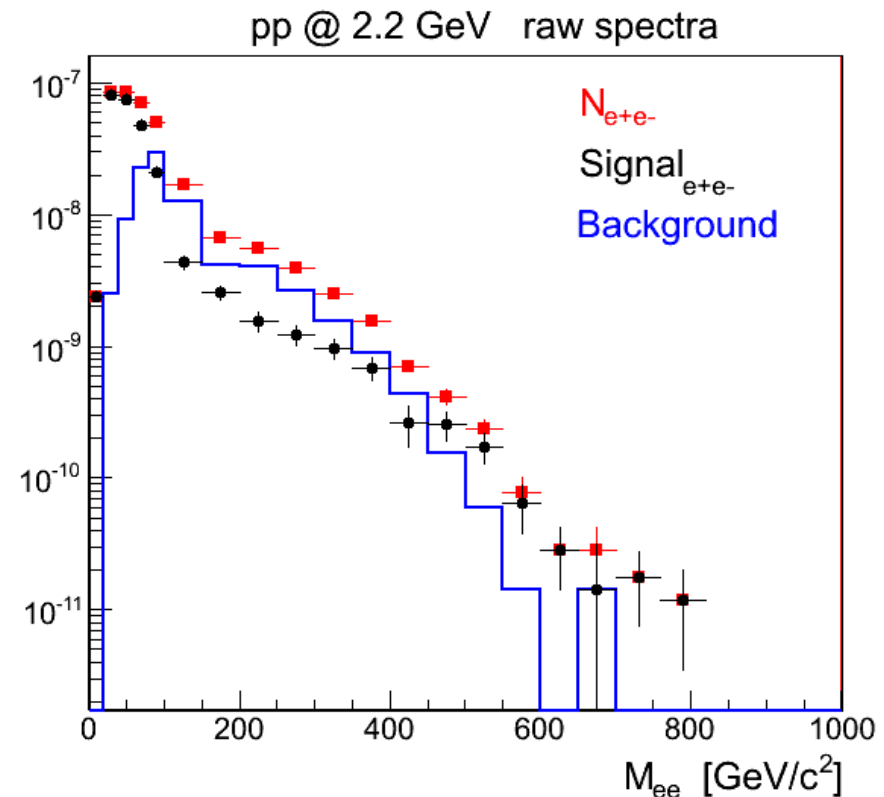
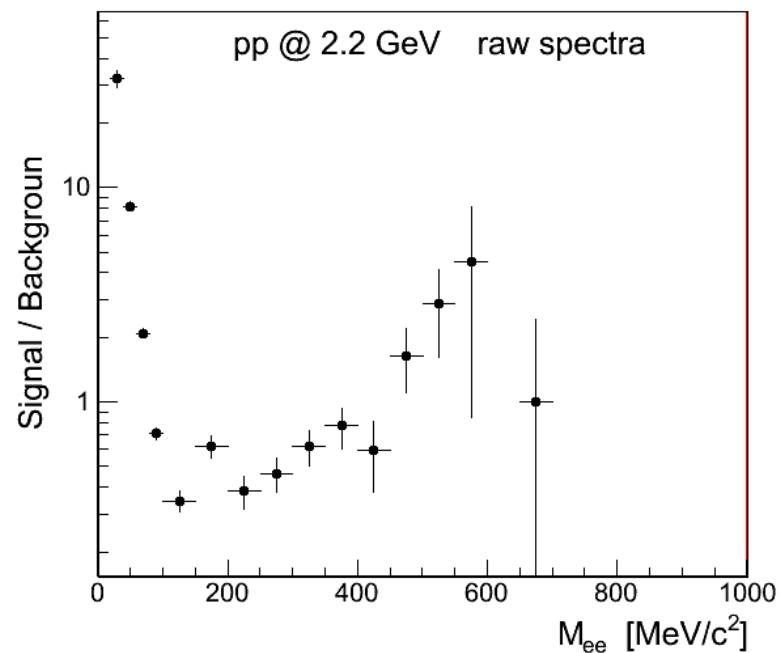
Normalization

$$N(\pi^0) = \frac{\sigma(\pi^0)}{\sigma_{elastic}} * N_{elastic}$$

$$\sigma_{elastic} = 17.8 mb$$

$$N_{elastic} = 3.6e + 09$$

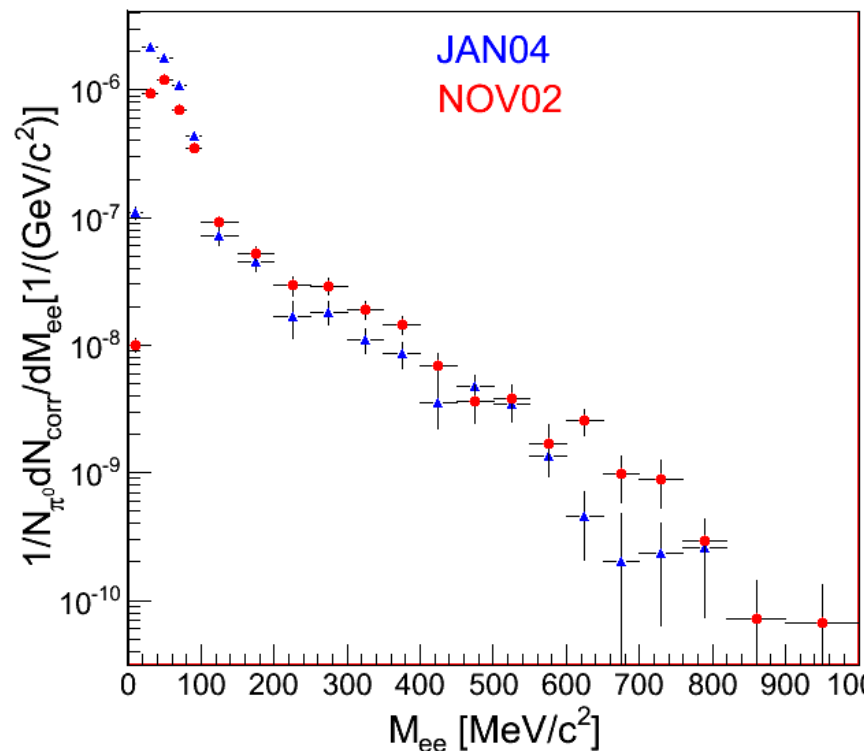
$$\sigma(\pi^0) = 11.6 \pm 0.8 mb \quad (\text{Landolt-Börnstein})$$



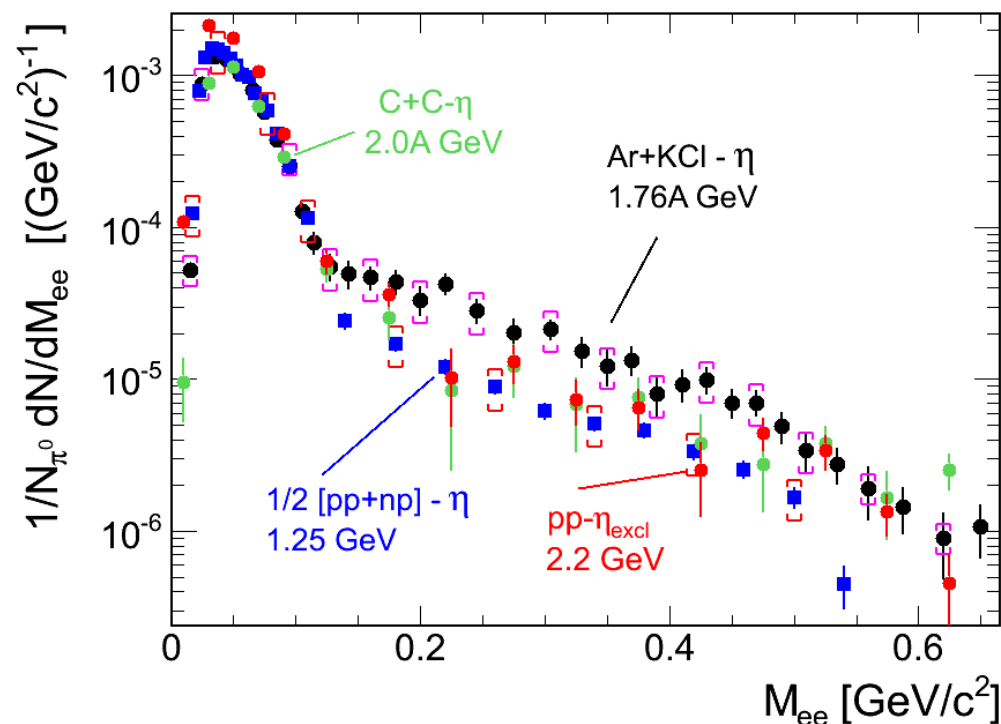
$M_{ee} < 150 MeV/c^2$: 16,933 pairs

$M_{ee} > 150 MeV/c^2$: 1,926 pairs

Comparison with 2.0 AGeV C+C

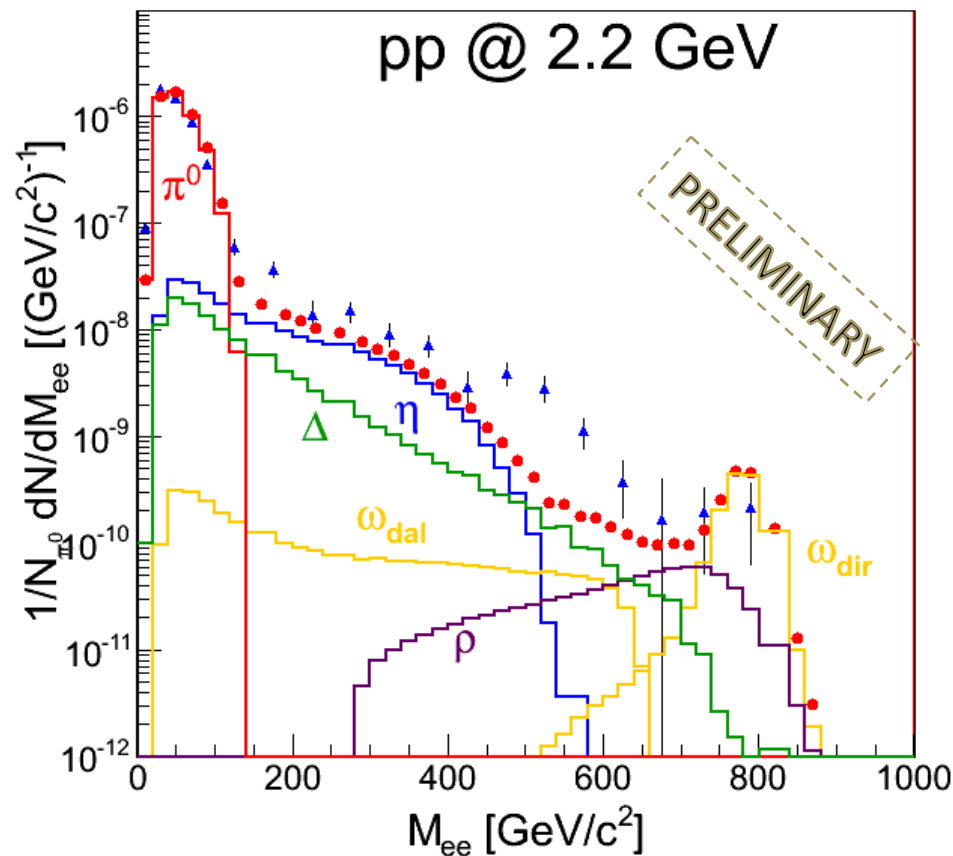


- Comparison of efficiency-corrected spectra
- 29% estimated systematic error for pp@2.2 GeV



▶▶▶ C+C $\approx$ p+p

Comparison with a PLUTO cocktail



PLUTO input:

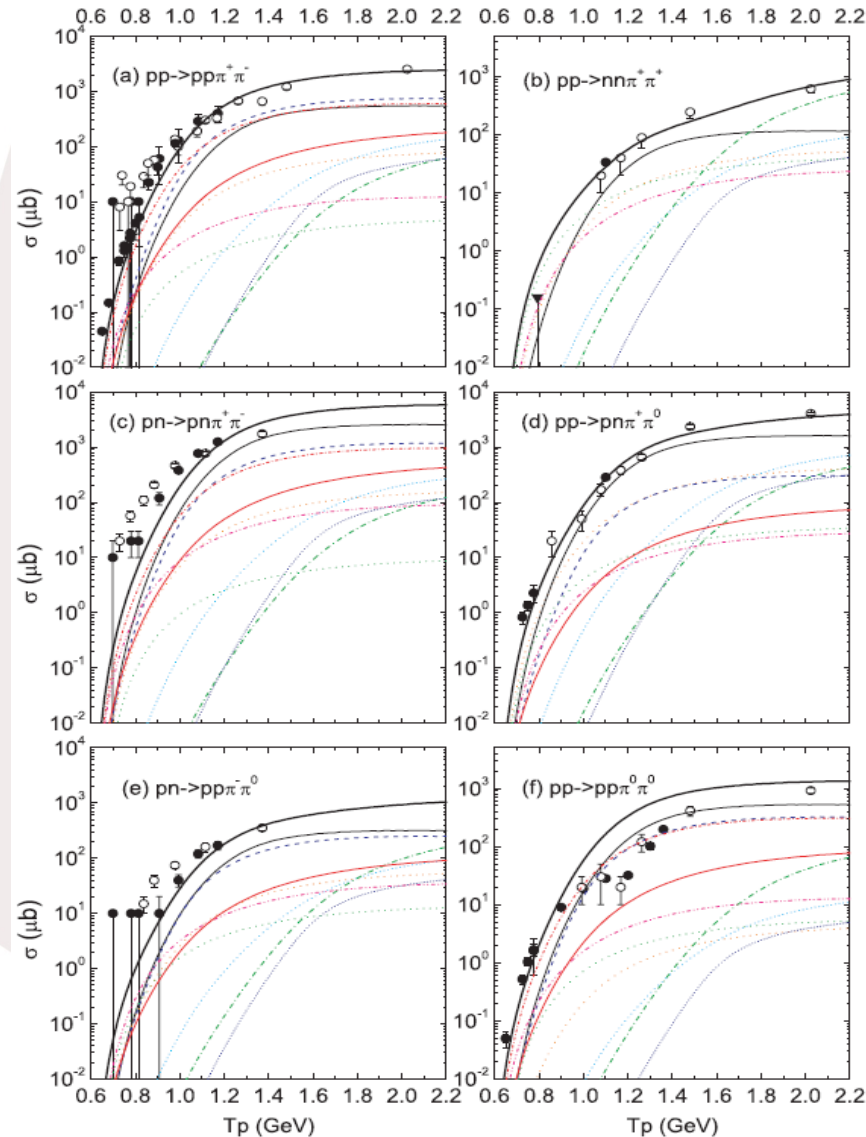
particle	cross section [mb]
π^0	14
Δ	10 (2 π model Cao et al.*)
η	0.13 (exclusive HADES)
ρ	0.0112
ω	0.0112 (COSY-TOF**)

but $\eta_{\text{inc}} > \eta_{\text{exc}} !$

* Estimates for the $\Delta^{0,+}$ cross sections are based on X. Cao et al., PRC 81 (2010) 065201

** The cross sections for ω and ρ are taken to be equal (COSY-TOF, PLB 522 (2001) 16-21)

2-pion production: resonance model



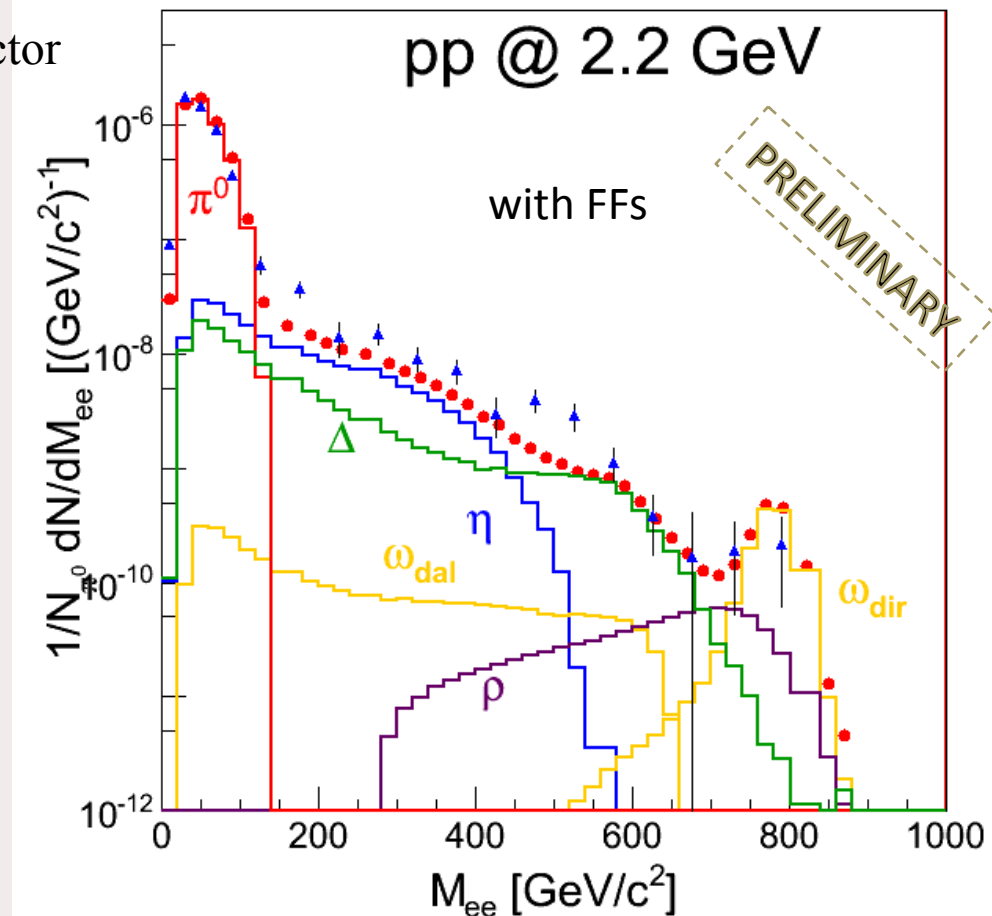
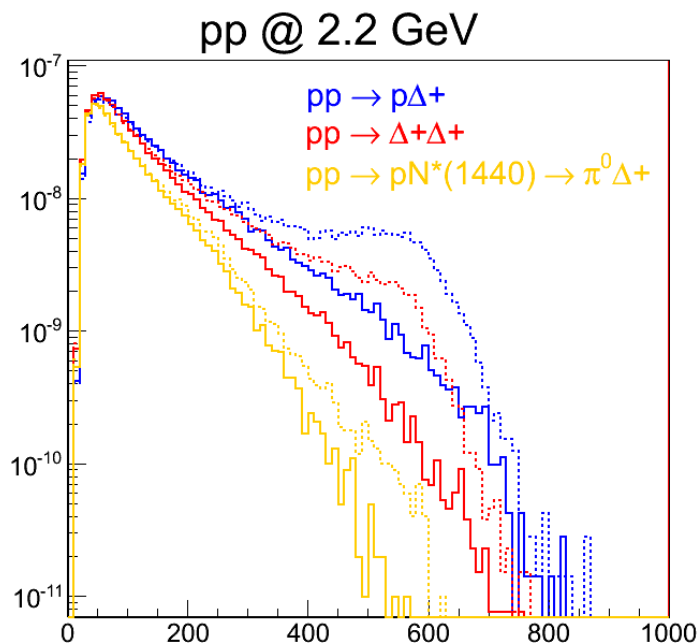
Cao et al., PRC 81 (2010)

Relevant are:

- $\Delta\Delta \rightarrow \pi\pi$
- $N^*(1440) \rightarrow \pi\Delta$

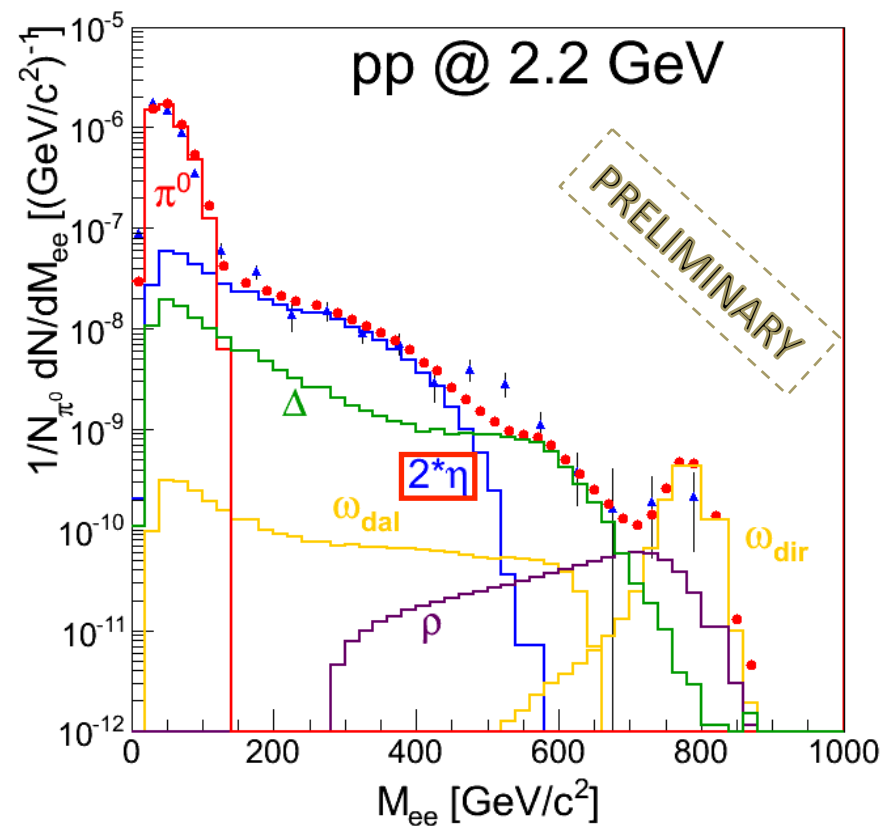
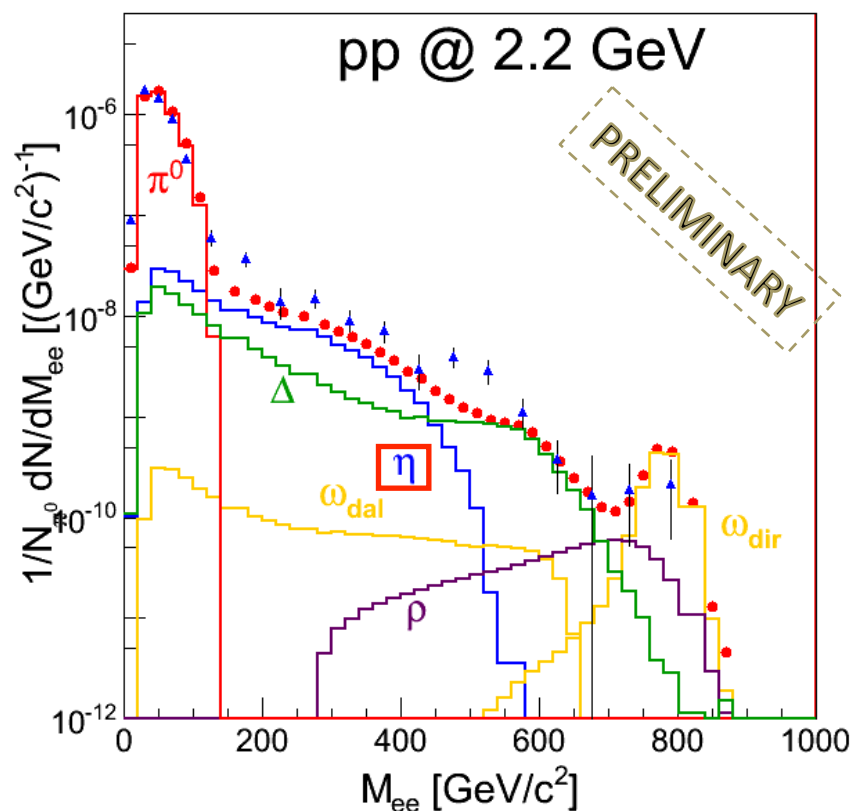
Vector dominance form factor in Δ

Influence of a Vector Dominance form factor on the Δ Dalitz invariant mass:

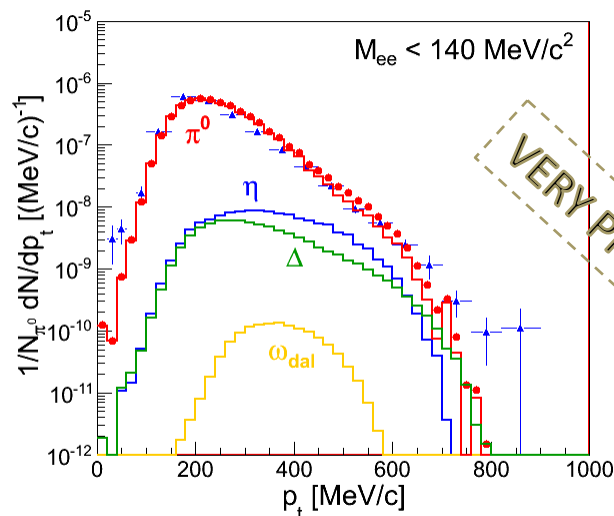


The η cross section included in PLUTO is too small, however!

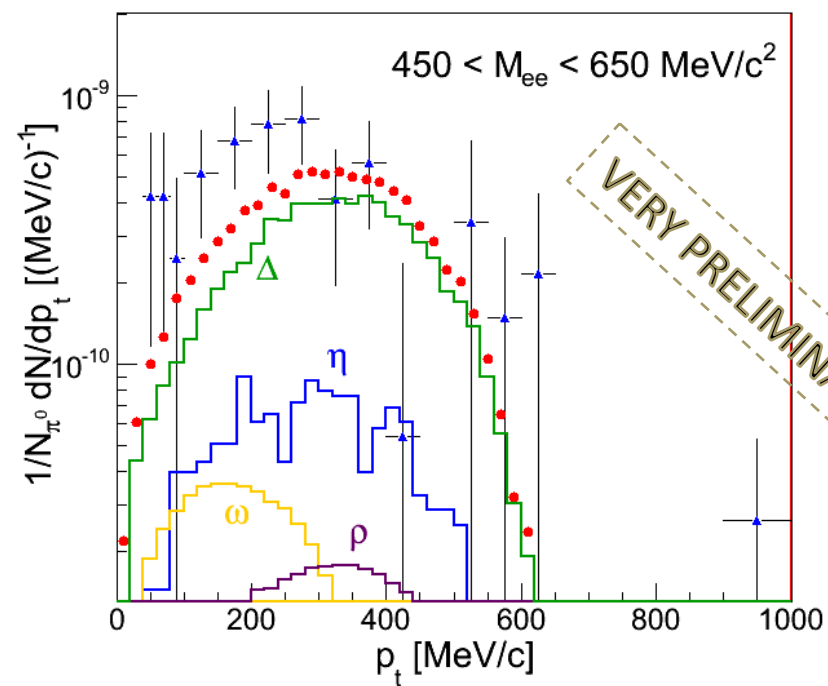
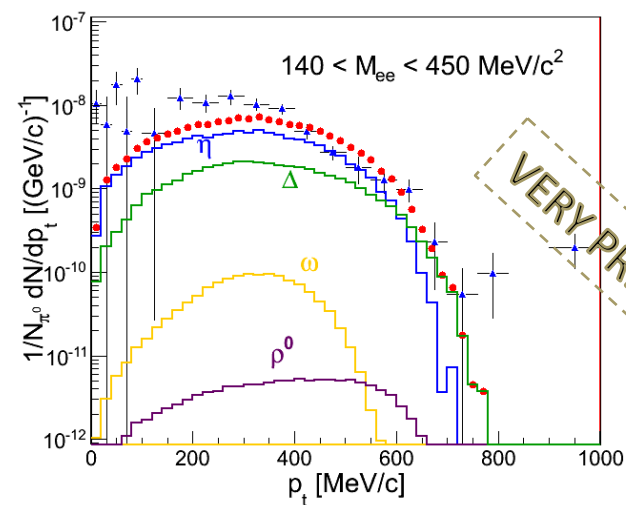
Influence of eta inclusive cross section:



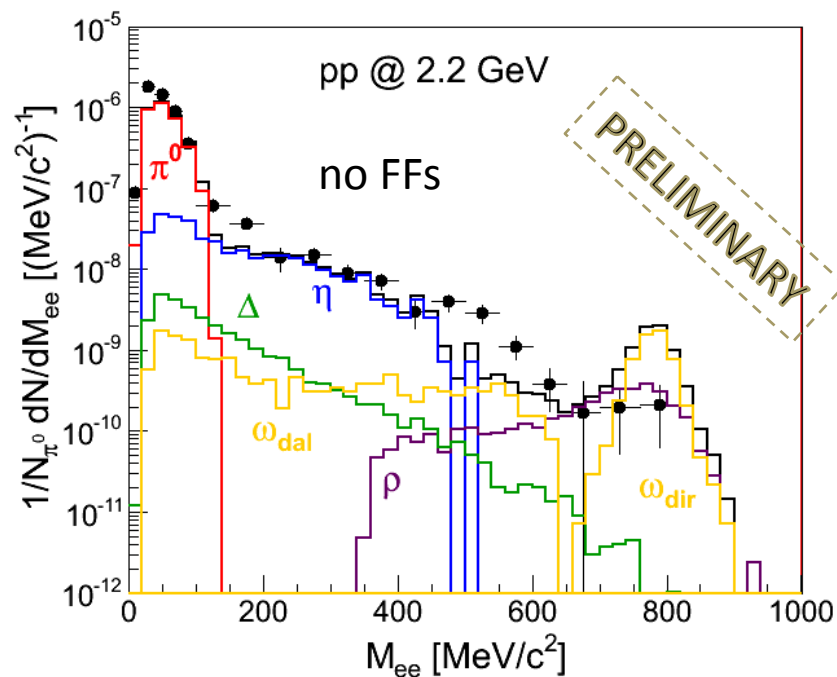
Comparison with PLUTO cocktail: p_t



with Δ form factor

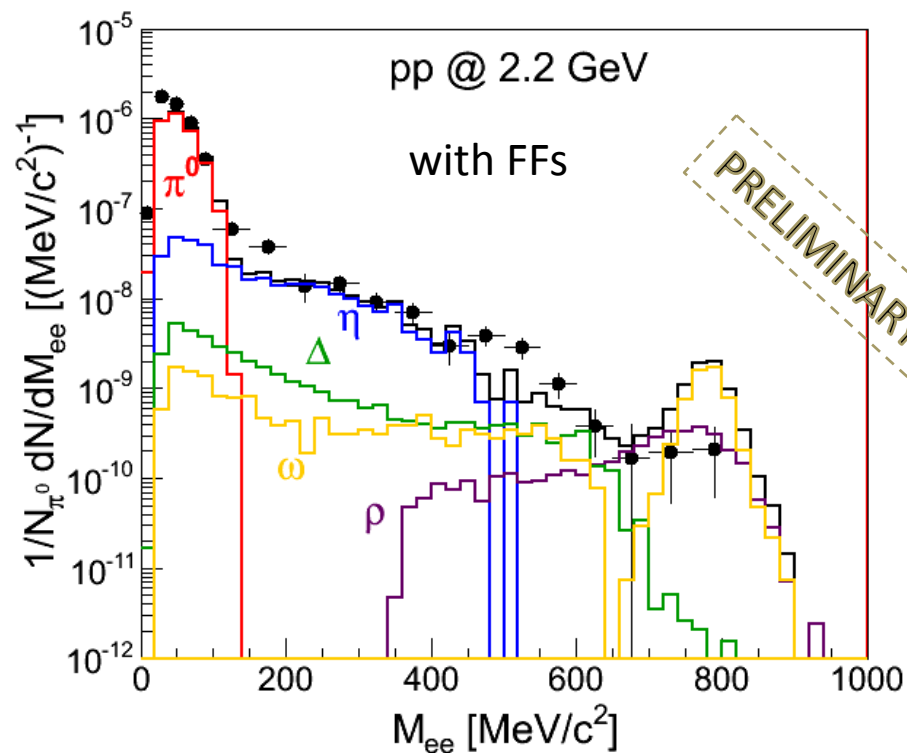


Comparison with PYTHIA



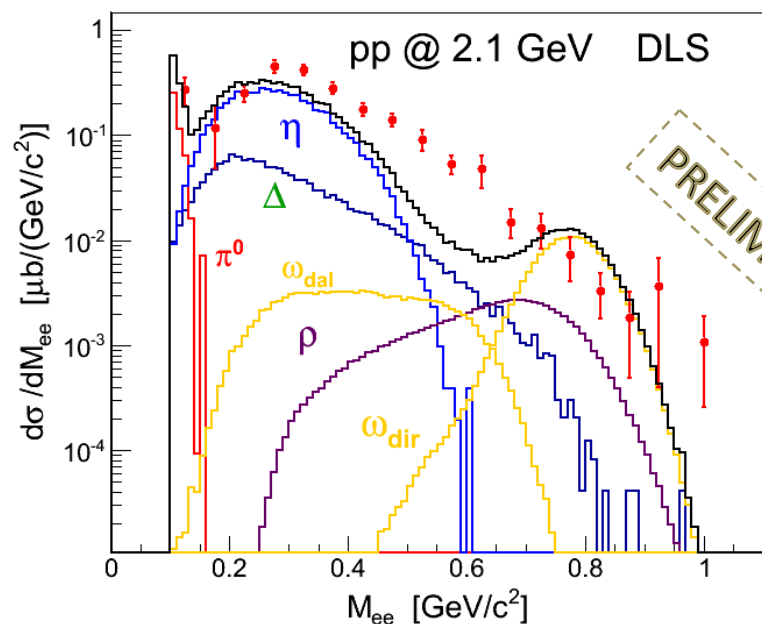
Pythia calculation provided by Anar Rustmov

No special tuning for pp@2.2 GeV performed

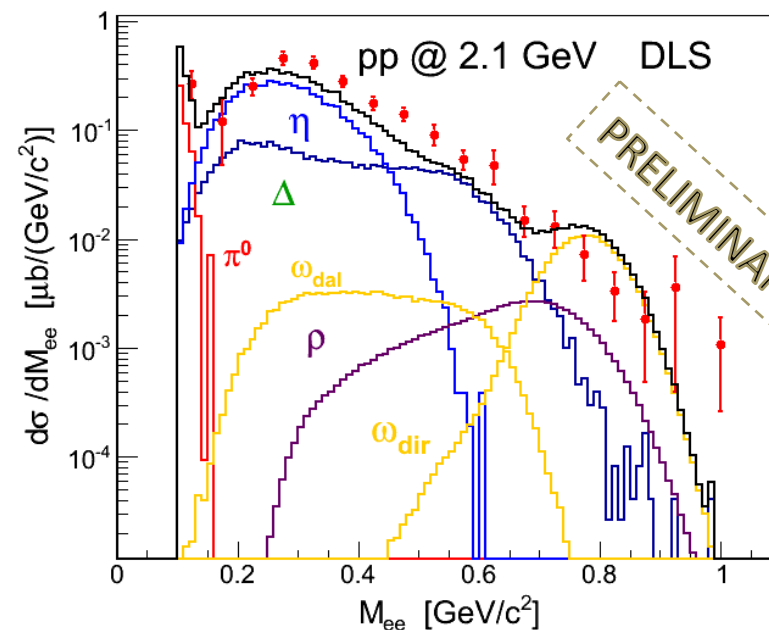


Looking closer to old DLS data

without Δ FF



with Δ FF



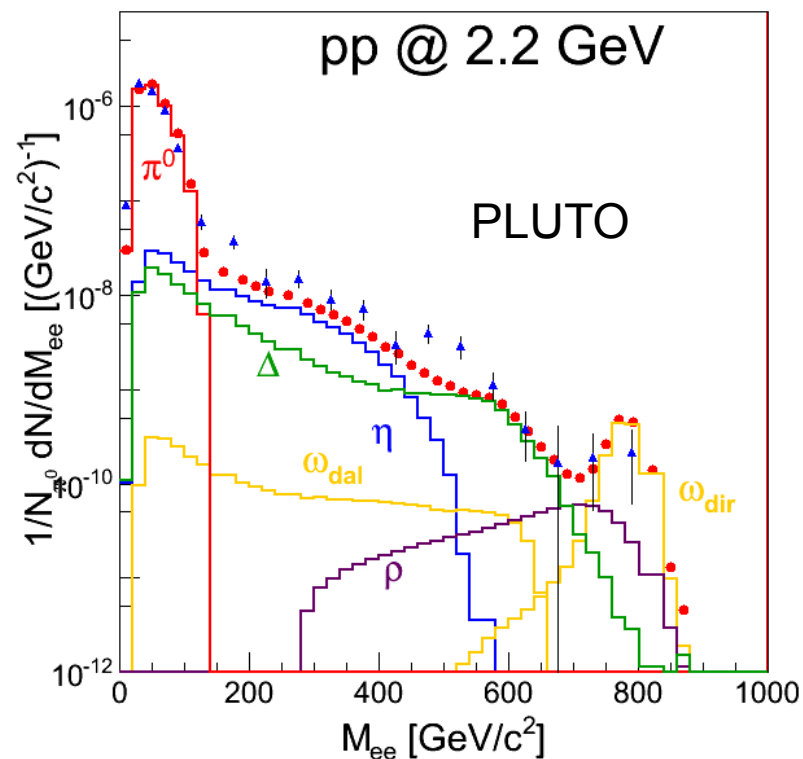
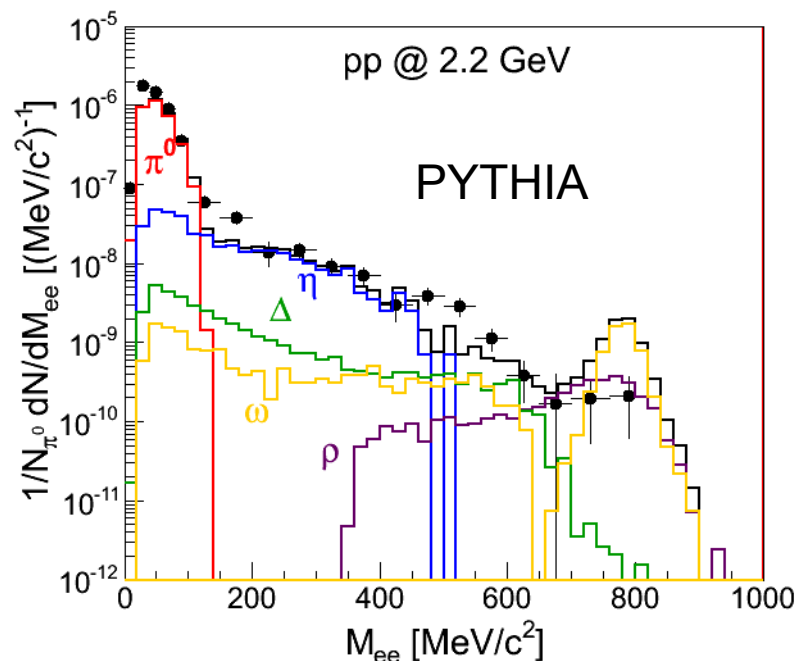
- 1) Dilepton yield excess at intermediate masses seems to be a feature of few-GeV p+p:

Seen in:

- HADES 2.2 and 3.5 GeV
- DLS 2.1 and 4.9 GeV

- 2) HADES 2.2 GeV and GeV DLS 2.1 GeV data are fairly well described by cocktail including a Δ VDM form factor

Comparison of PLUTO and PYTHIA with data



particle
 π^0
 Δ
 η
 ρ
 ω

PYTHIA
CS [mb]
17
4.05
0.484
0.126
0.100

PLUTO
CS [mb]
14
10
0.13
0.0112
0.0112