

# *Kapitel 2: Elektromagnetische Wechselwirkung*

# PETRA: Positron Elektron Tandem Ringanlage

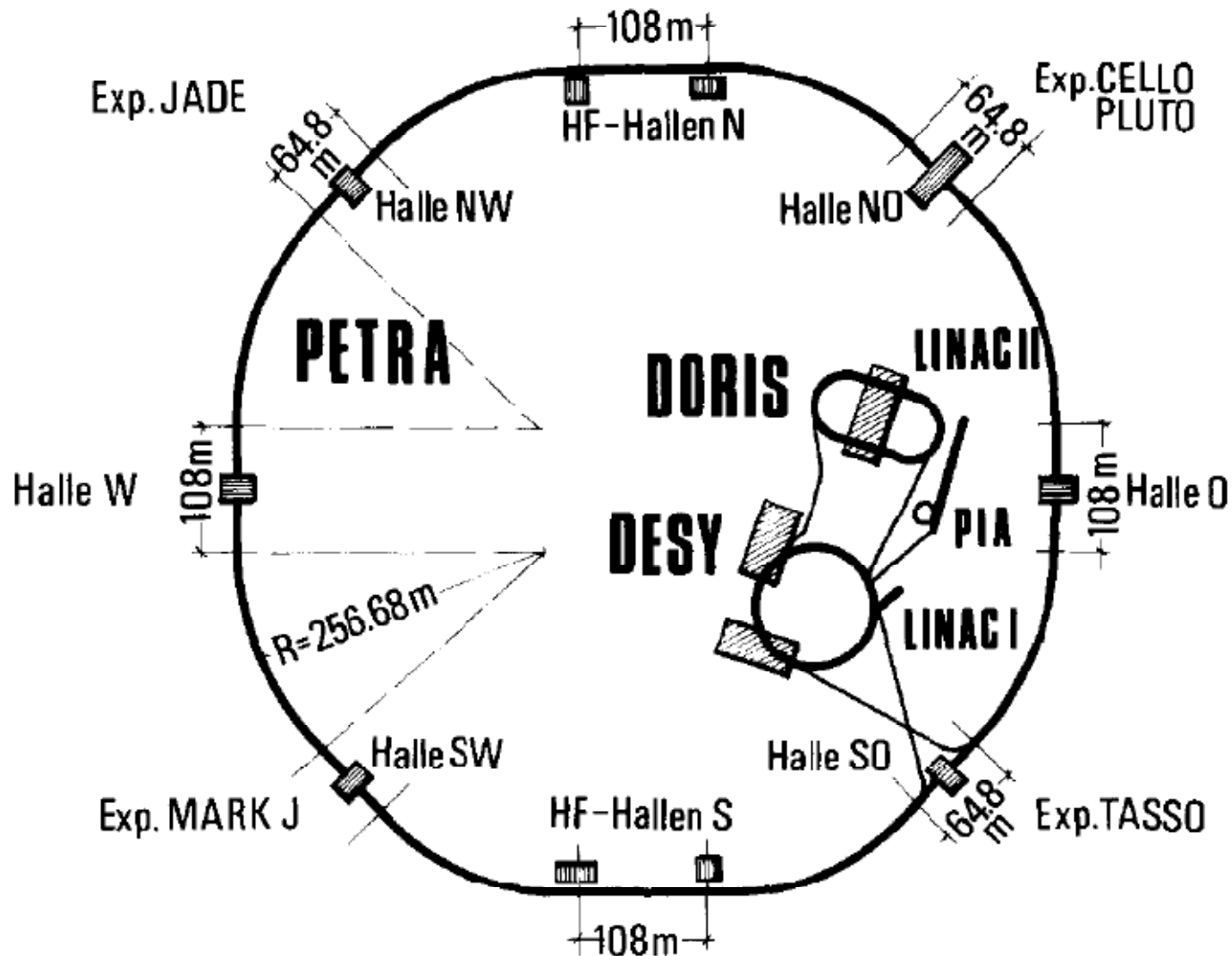


Fig. 1.1a. PETRA (Positron-Electron Tandem Ring Accelerator).

# PETRA

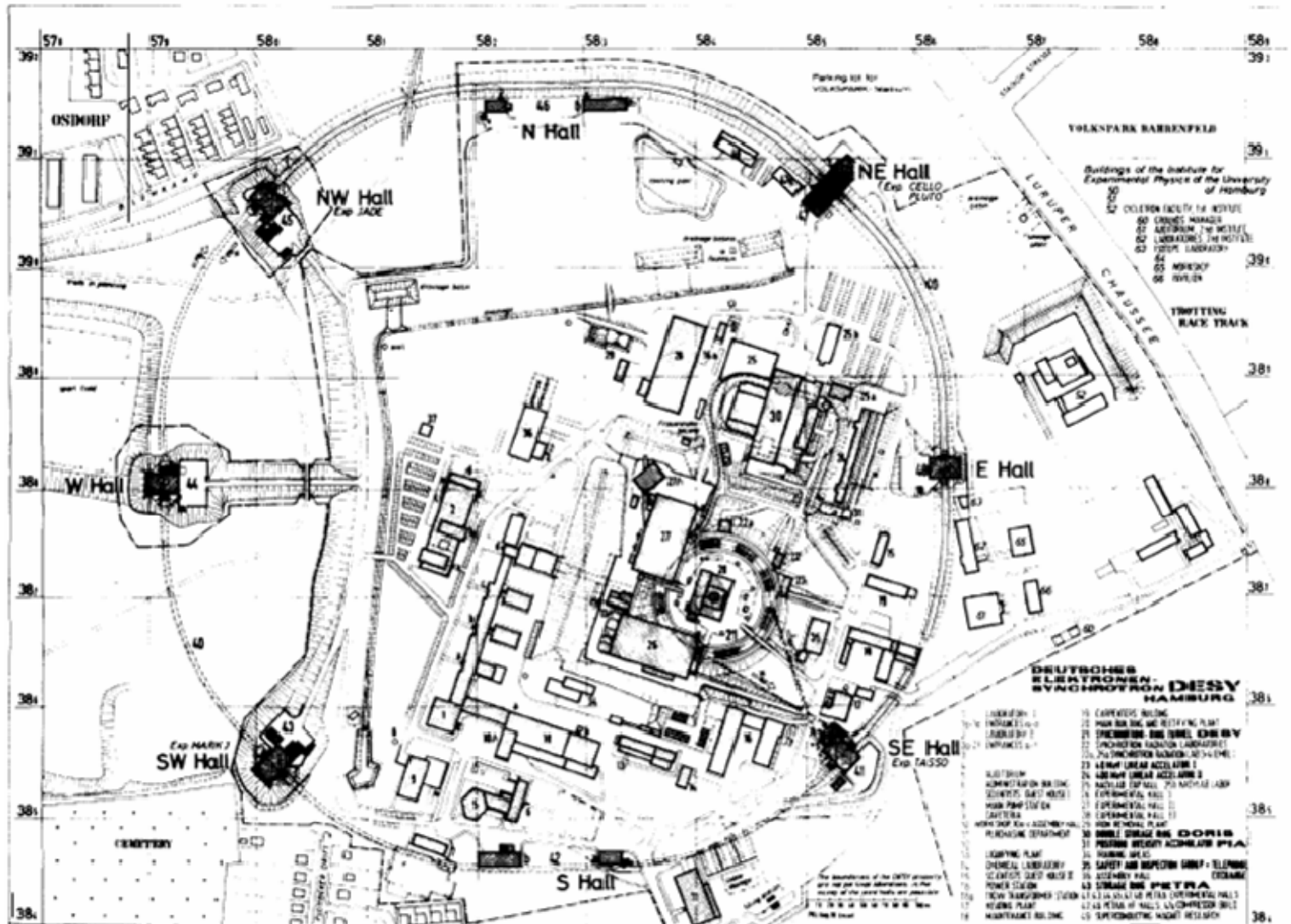


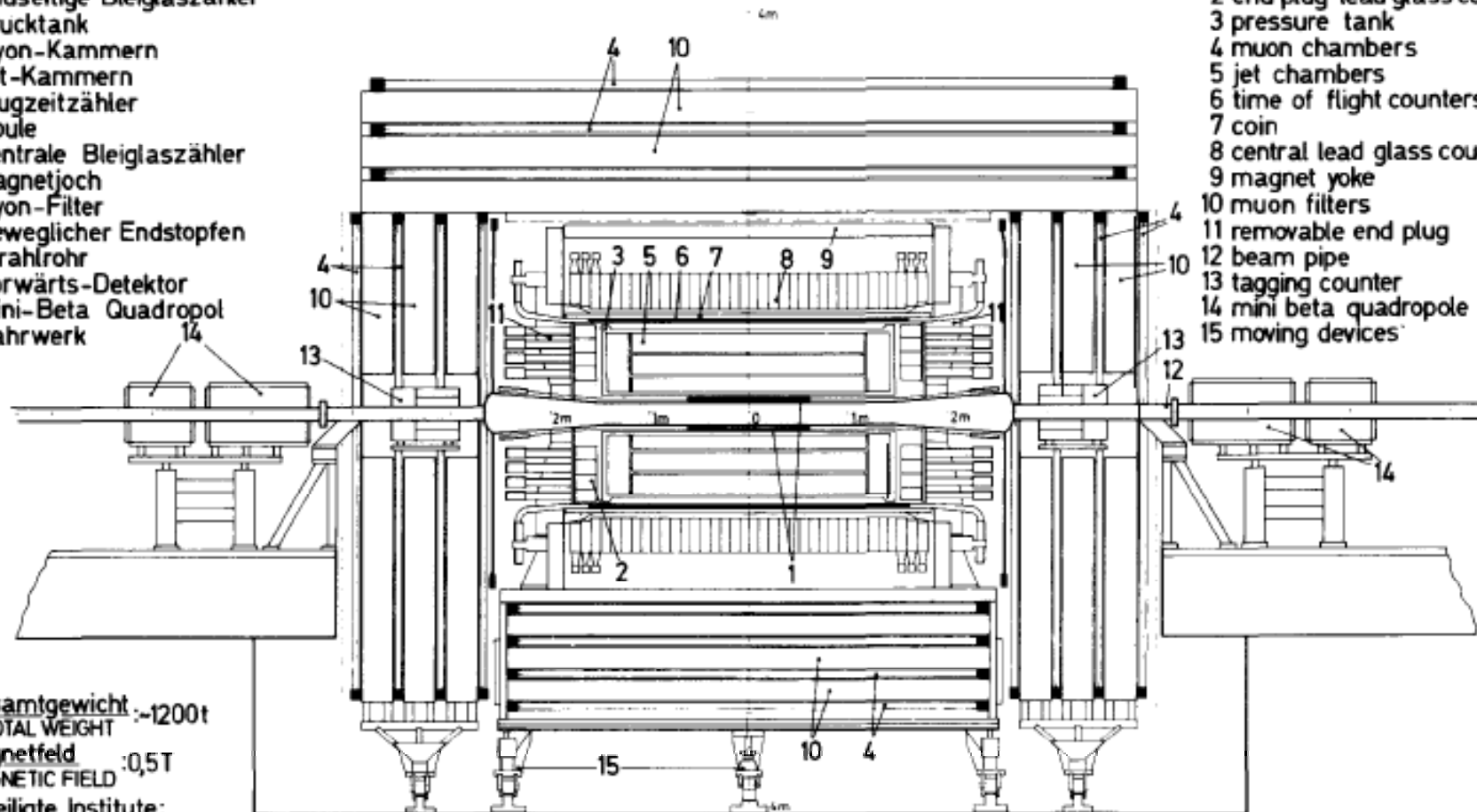
Fig. 1.1b. PETRA (Positron-Electron Tandem Ring Accelerator) and its surroundings.

# Der Jade Detektor an PETRA

## MAGNETDETEKTOR **JADE** MAGNET DETECTOR

- 1 Strahlrohrzähler
- 2 Endseitige Bleiglaszähler
- 3 Drucktank
- 4 Myon-Kammern
- 5 Jet-Kammern
- 6 Flugzeitzähler
- 7 Spule
- 8 Zentrale Bleiglaszähler
- 9 Magnetjoch
- 10 Myon-Filter
- 11 Beweglicher Endstopfen
- 12 Strahlrohr
- 13 Vorwärts-Detektor
- 14 Mini-Beta Quadropol
- 15 Fahrwerk

- 1 beampipe counters
- 2 end plug lead glass counters
- 3 pressure tank
- 4 muon chambers
- 5 jet chambers
- 6 time of flight counters
- 7 coil
- 8 central lead glass counters
- 9 magnet yoke
- 10 muon filters
- 11 removable end plug
- 12 beam pipe
- 13 tagging counter
- 14 mini beta quadropole
- 15 moving devices



Gesamtgewicht :-1200t  
TOTAL WEIGHT

Magnetfeld :0,5T  
MAGNETIC FIELD

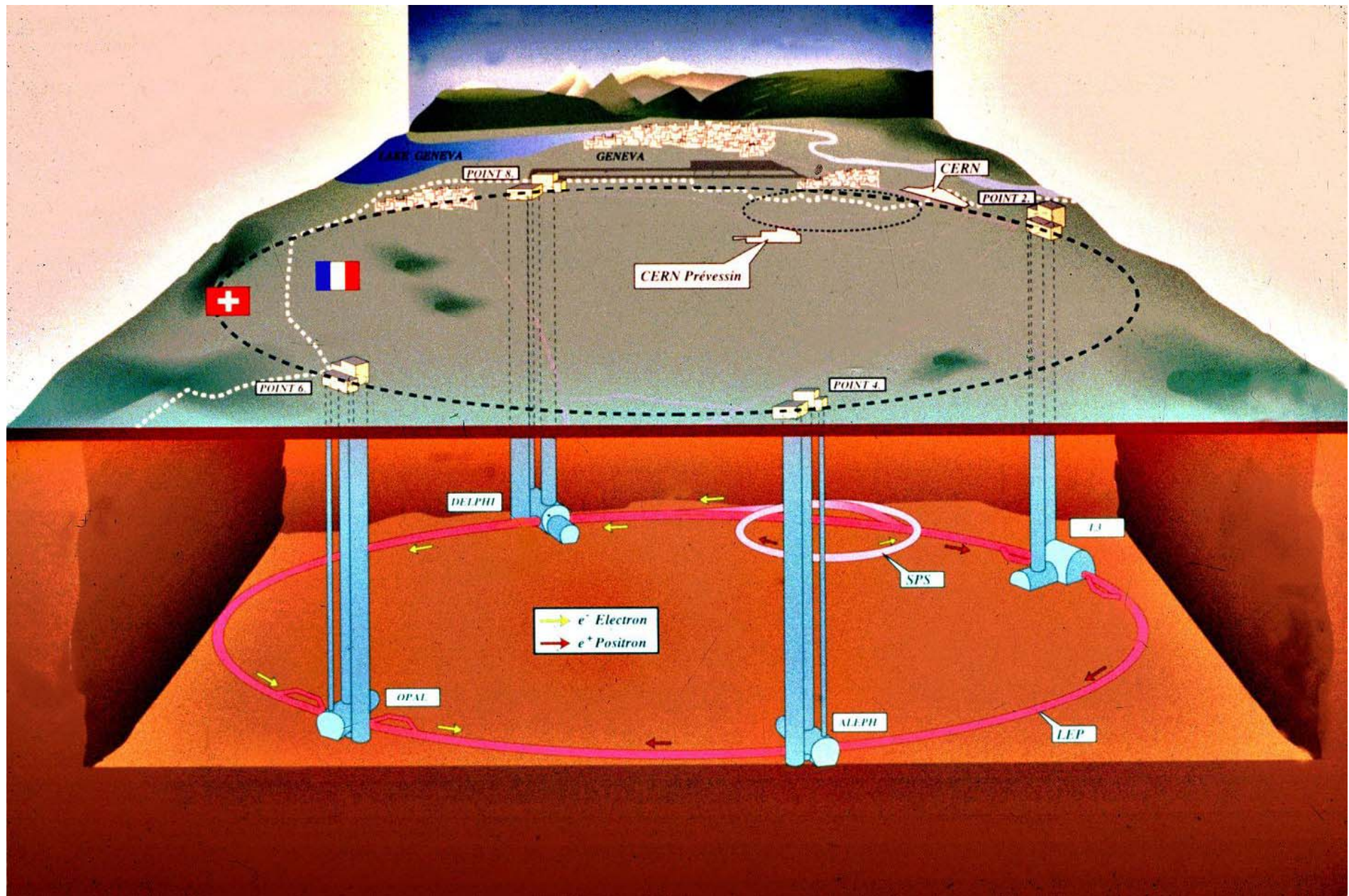
Beteiligte Institute:  
PARTICIPANTS

DESY, Hamburg, Heidelberg,  
Lancaster, Manchester,  
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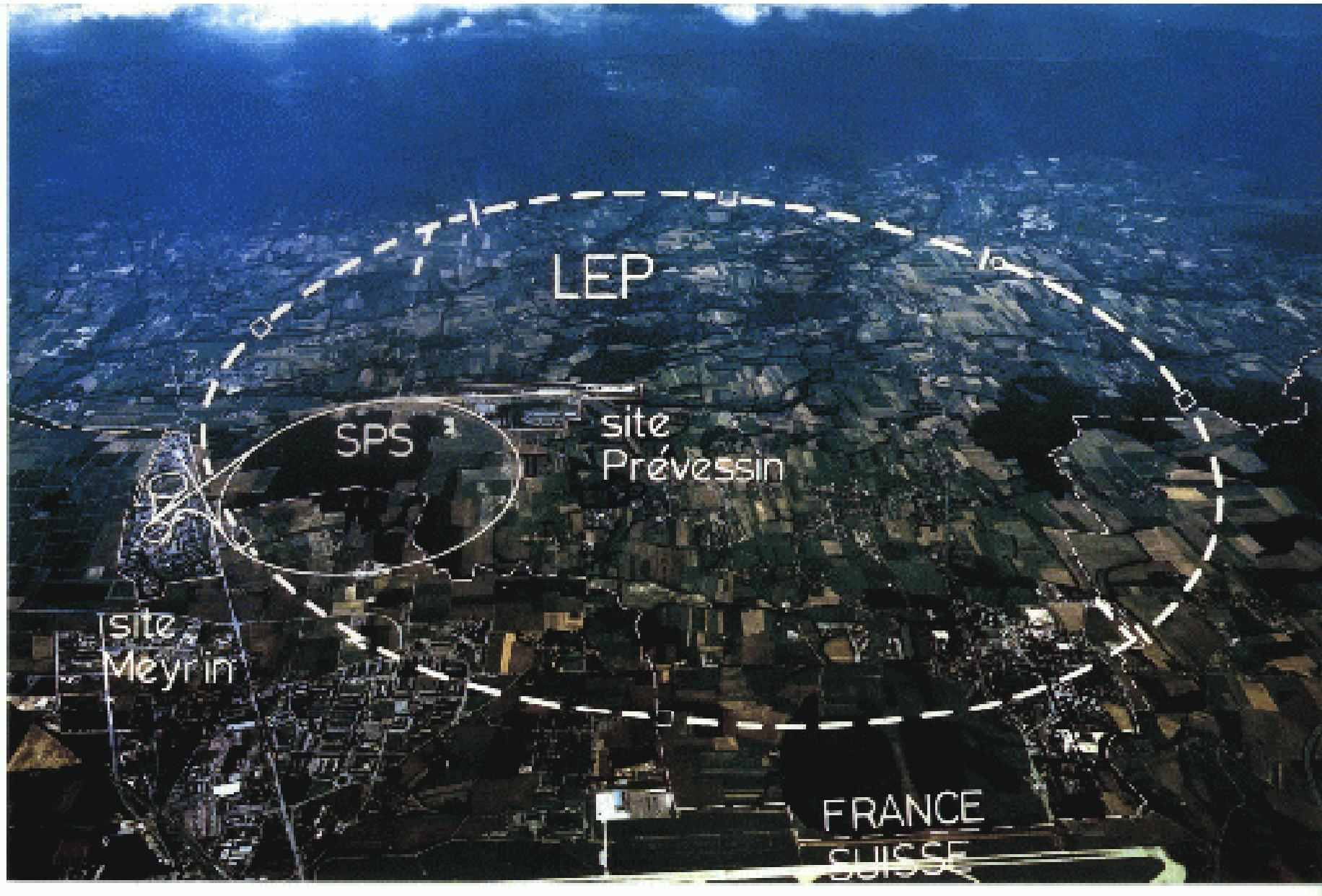
35152

Fig. 1.10. Cross section through the JADE detector.

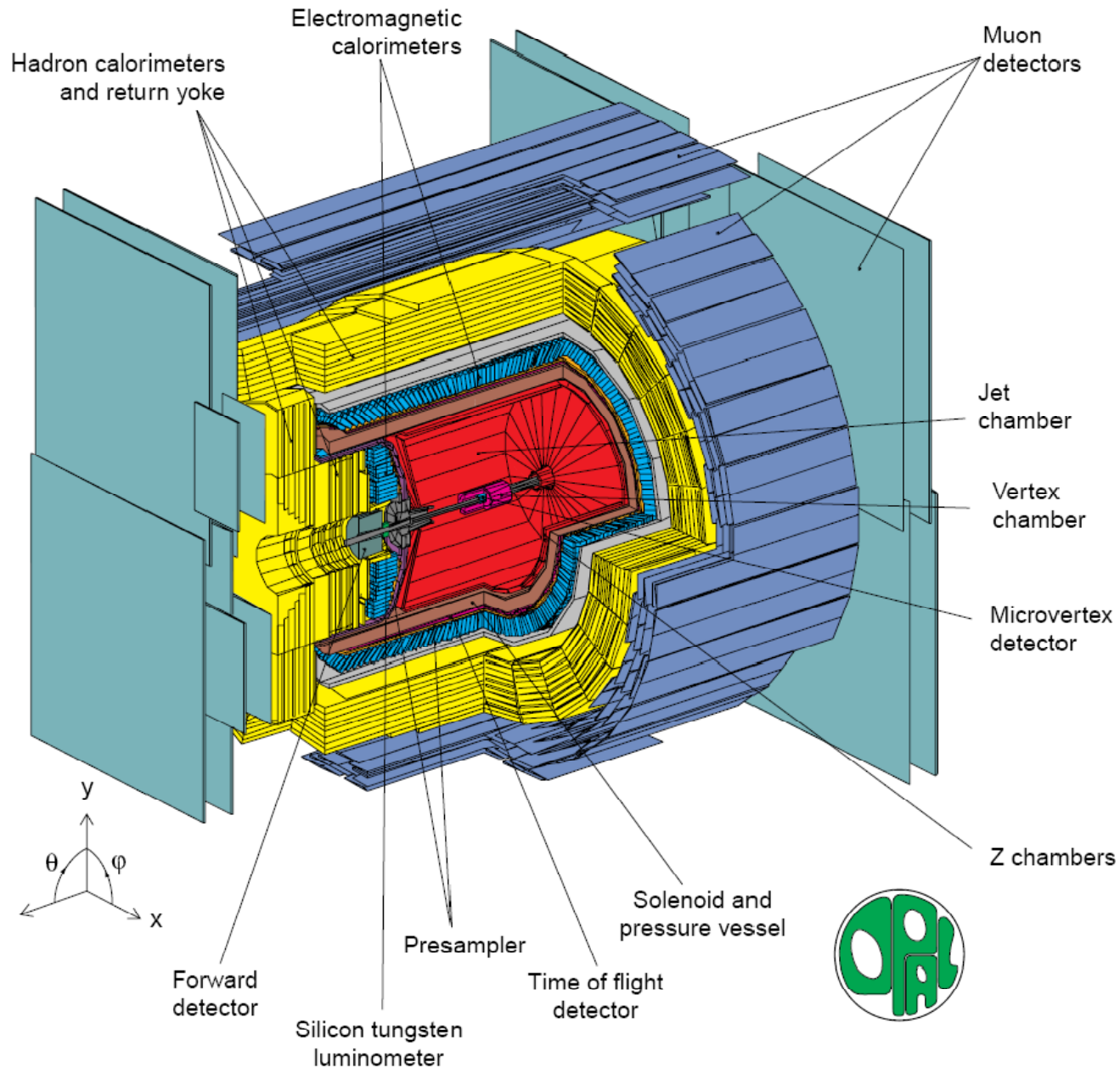
# Large Electron Positron Collider LEP



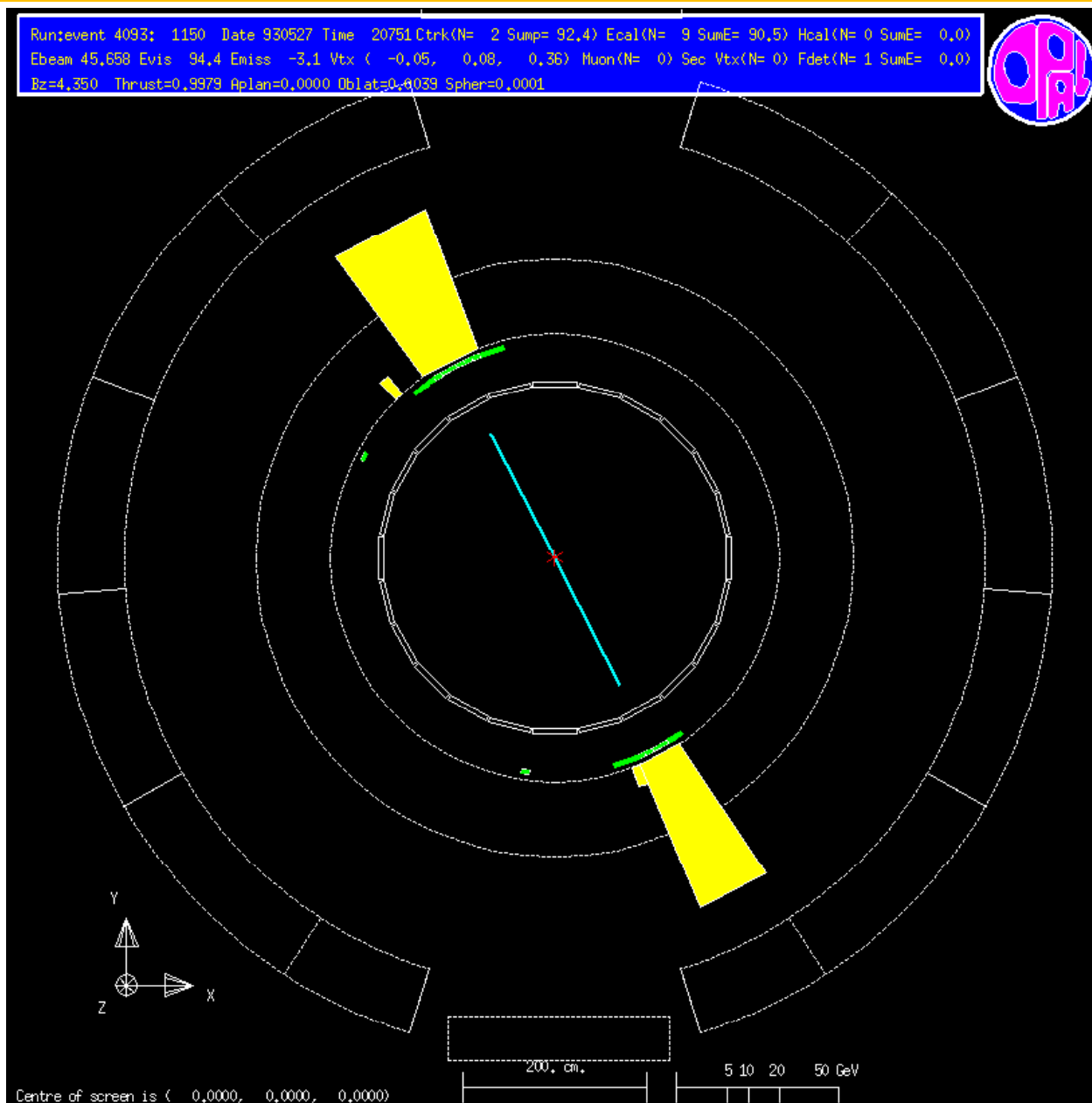
# Large Electron Positron Collider LEP



# Der OPAL Detektor an LEP

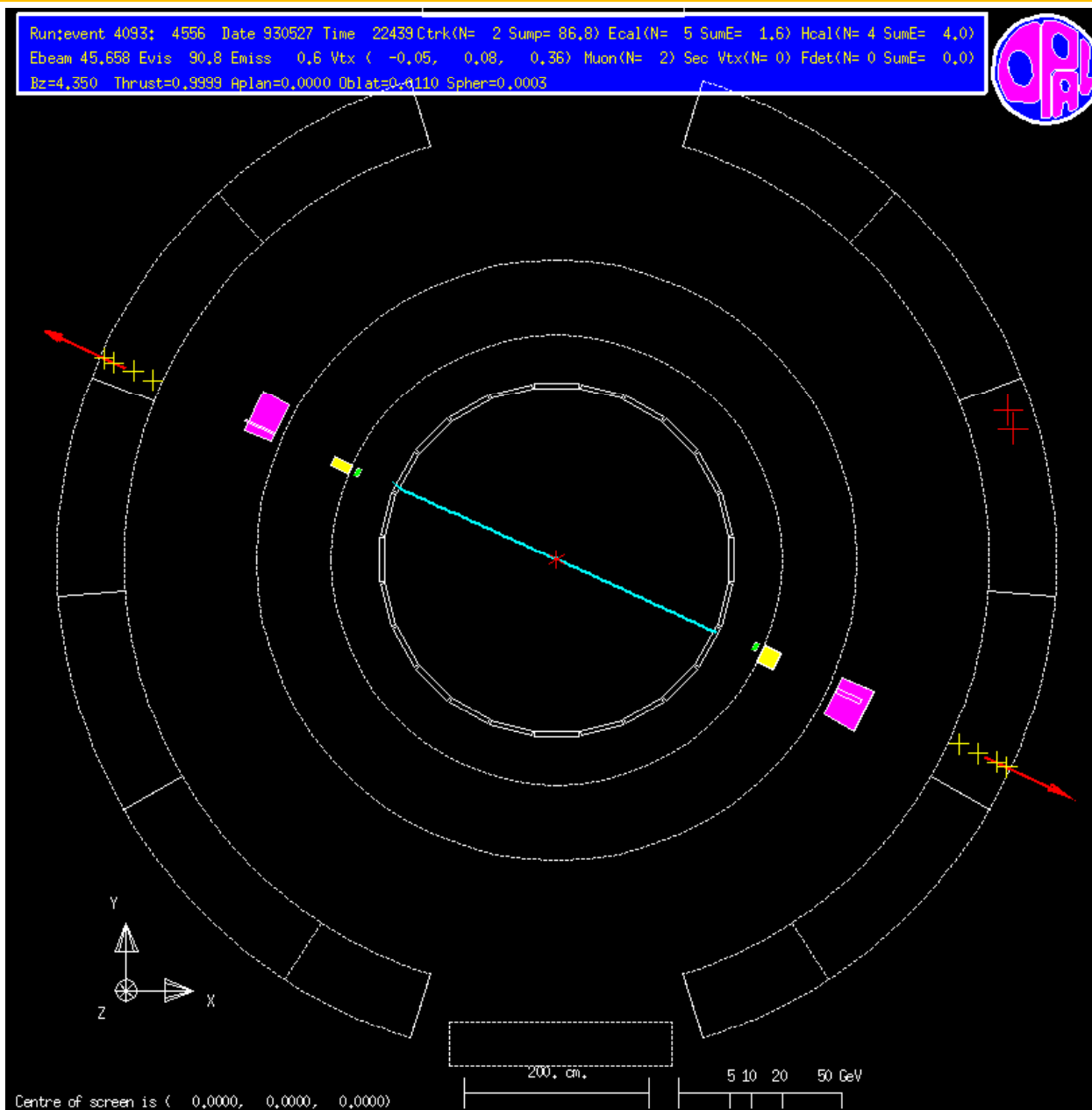


$$e^+e^- \rightarrow e^+e^-$$



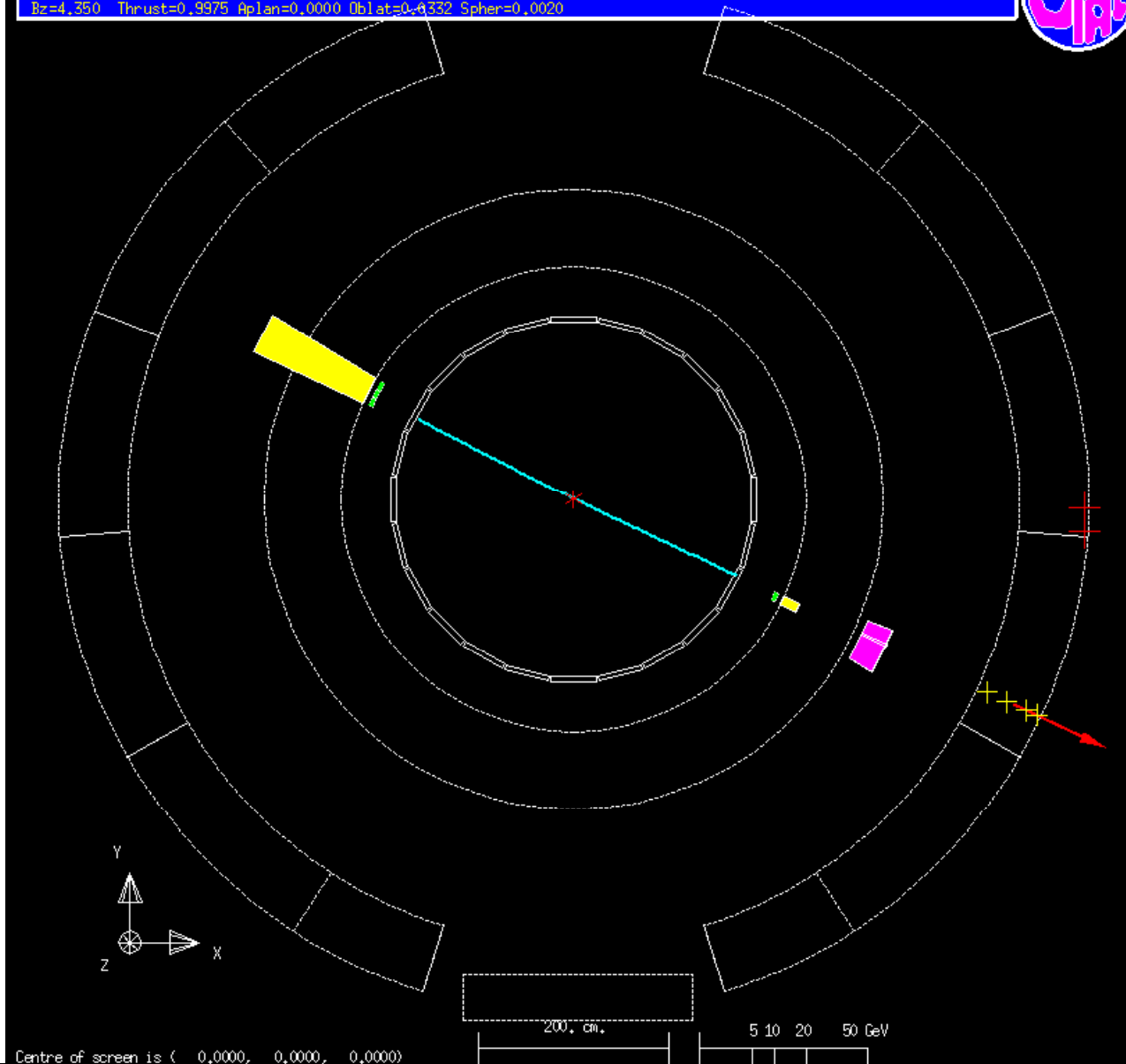


$$e^+e^- \rightarrow \mu^+\mu^-$$



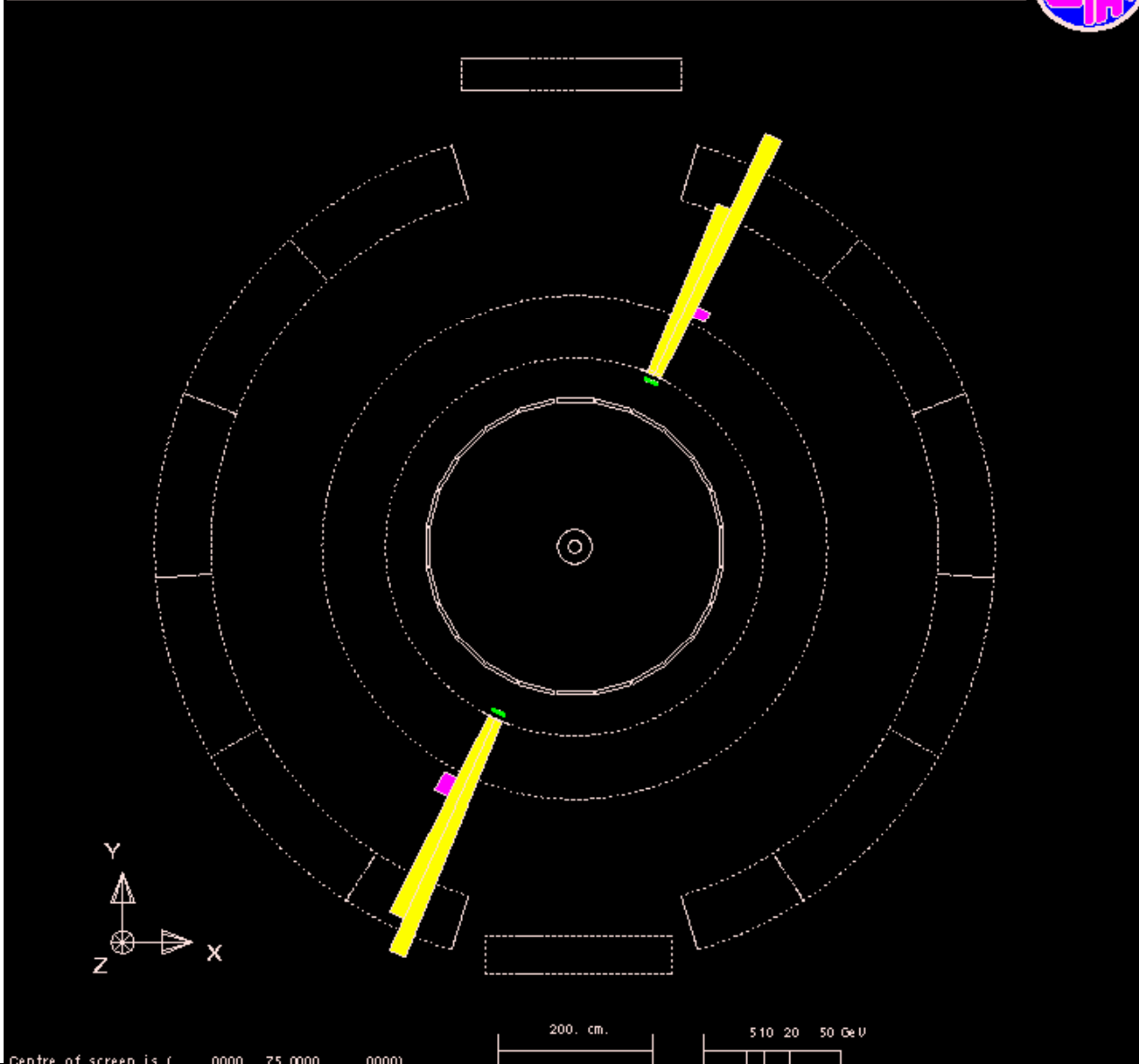
$$e^+e^- \rightarrow \tau^+\tau^-$$

Run: event 4177; 49573 Date 930611 Time 203852 Ctrk(N= 2 Sump= 50,6) Ecal(N= 4 SumE= 26,8) Hcal(N= 2 SumE= 1,3)  
Ebeam 45,661 Evis 52,1 Emiss 39,3 Vtx ( -0,03, 0,08, 0,45) Muon(N= 1) Sec Vtx(N= 0) Fdet(N= 0 SumE= 0,0)  
Bz=4,350 Thrust=0,9975 Aplan=0,0000 Oblat=0,4332 Spher=0,0020

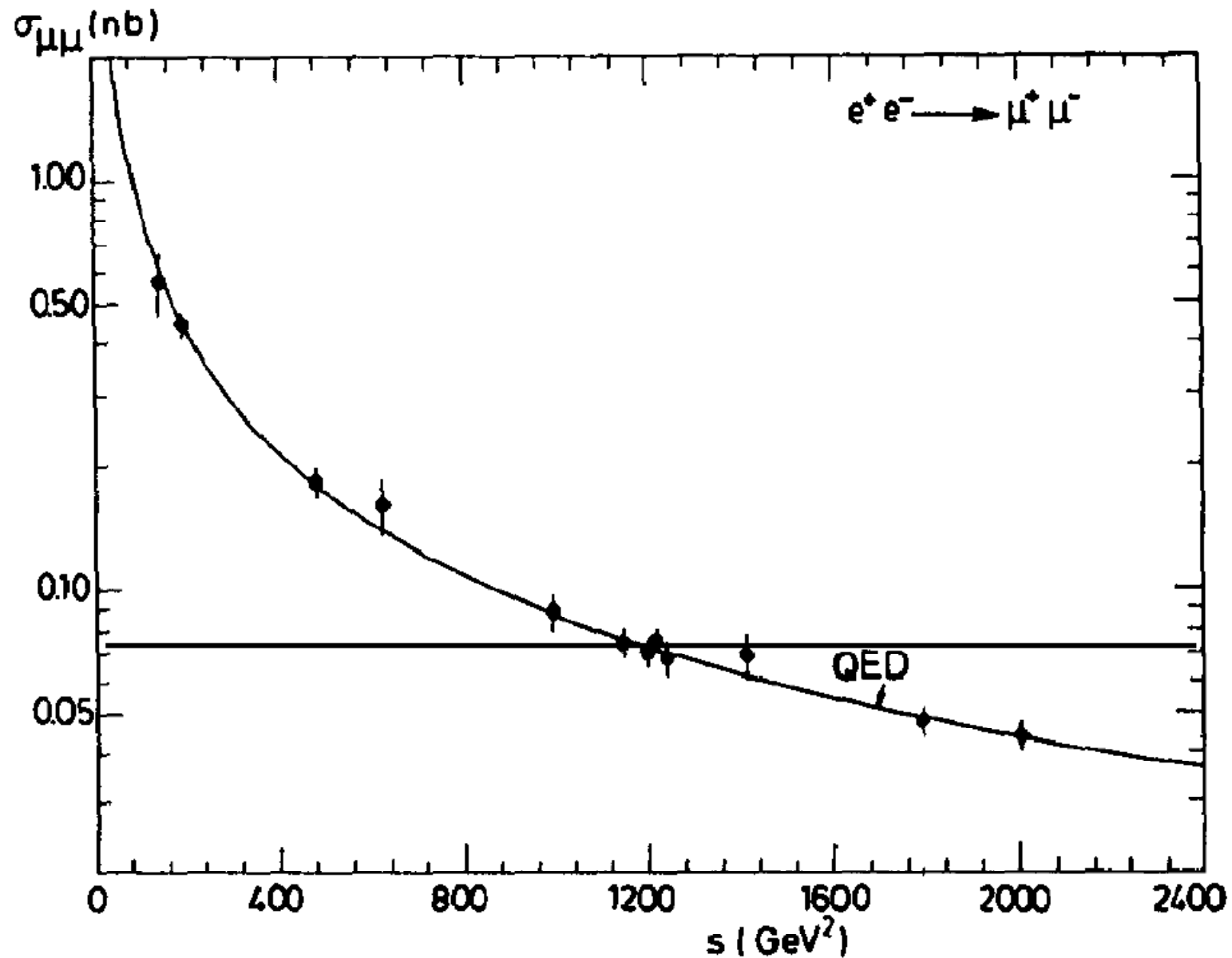


$$e^+e^- \rightarrow \gamma\gamma$$

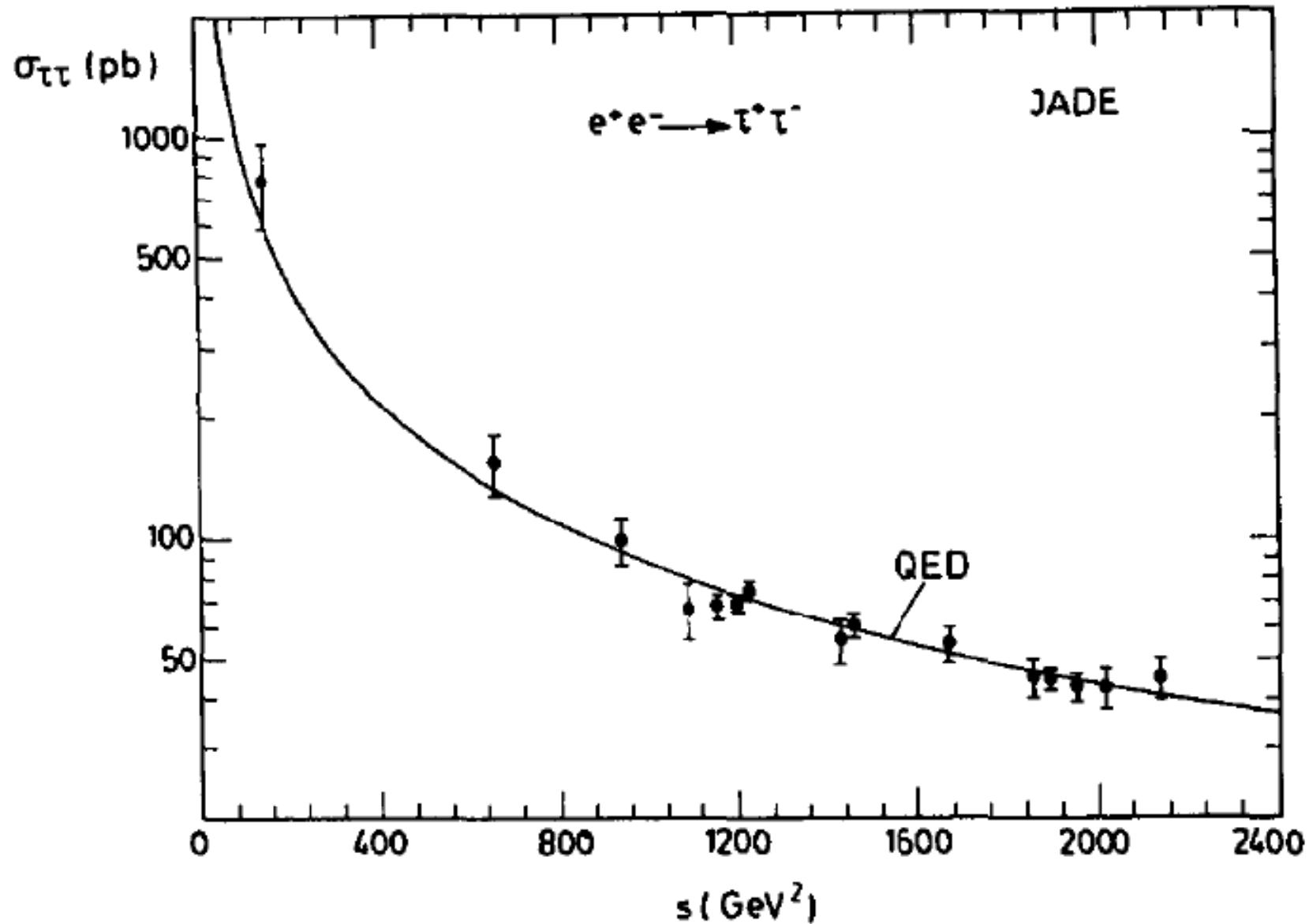
Run: event 7205: 903 Date 960709 Time 31619 Cirk(N= 0 Surp= .0) Ecal(N= 8 SumE=154.6) Hcal(N= 3 SumE= 1.6)  
Ebeam 80.500 Evis 155.2 Emiss 5.8 Vtx ( .00, .00, .00) Muon(N= 0) Sec Vtx(N= 0) Fdet(N= 0 SumE= .0)  
Bz=4.350 Bunchief 1/1 Thrust= .9997 Aplan= .0000 Cblat= .0029 Spher= .0000



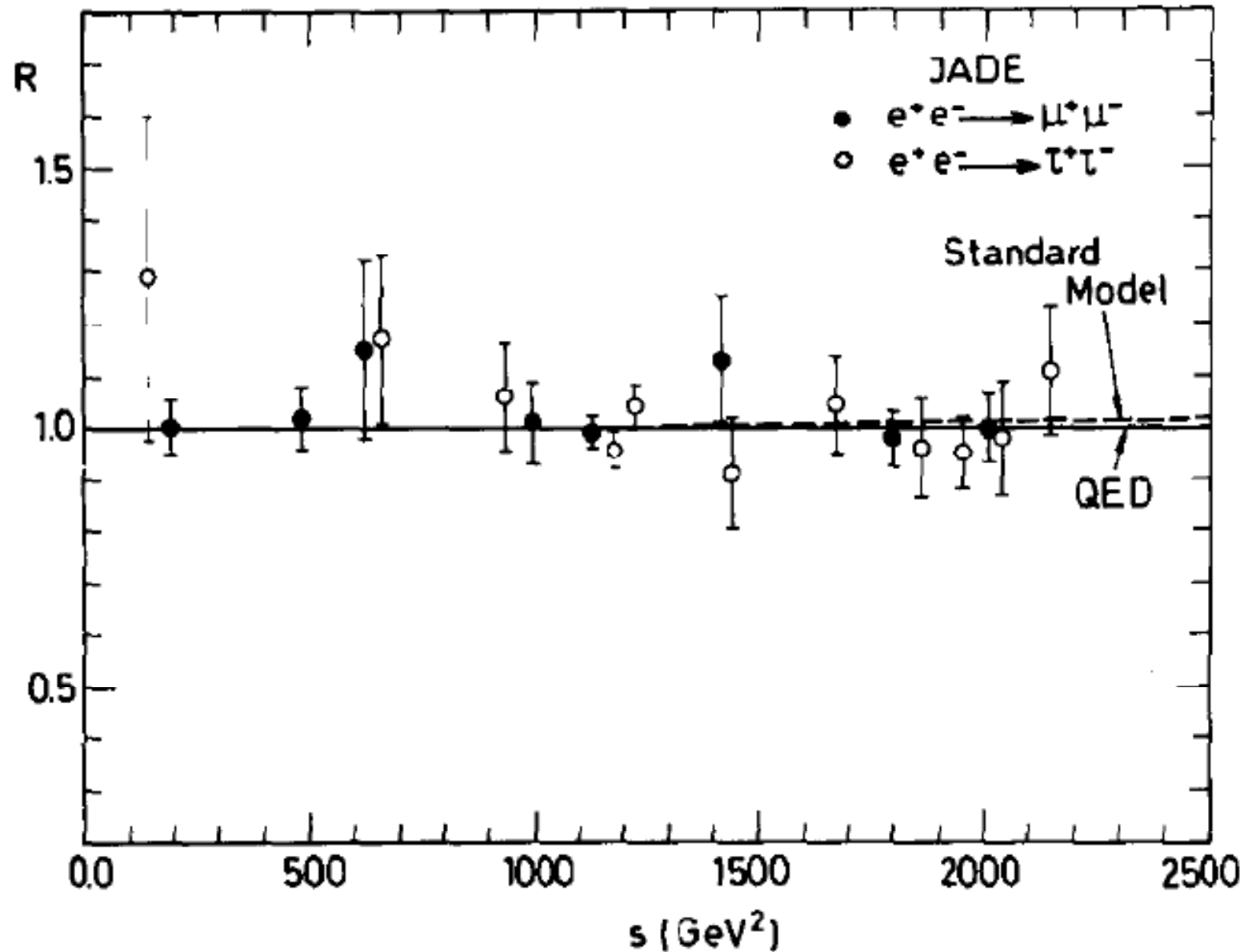
# PETRA: Totaler Wirkungsquerschnitt für $e^+e^- \rightarrow \mu^+\mu^-$



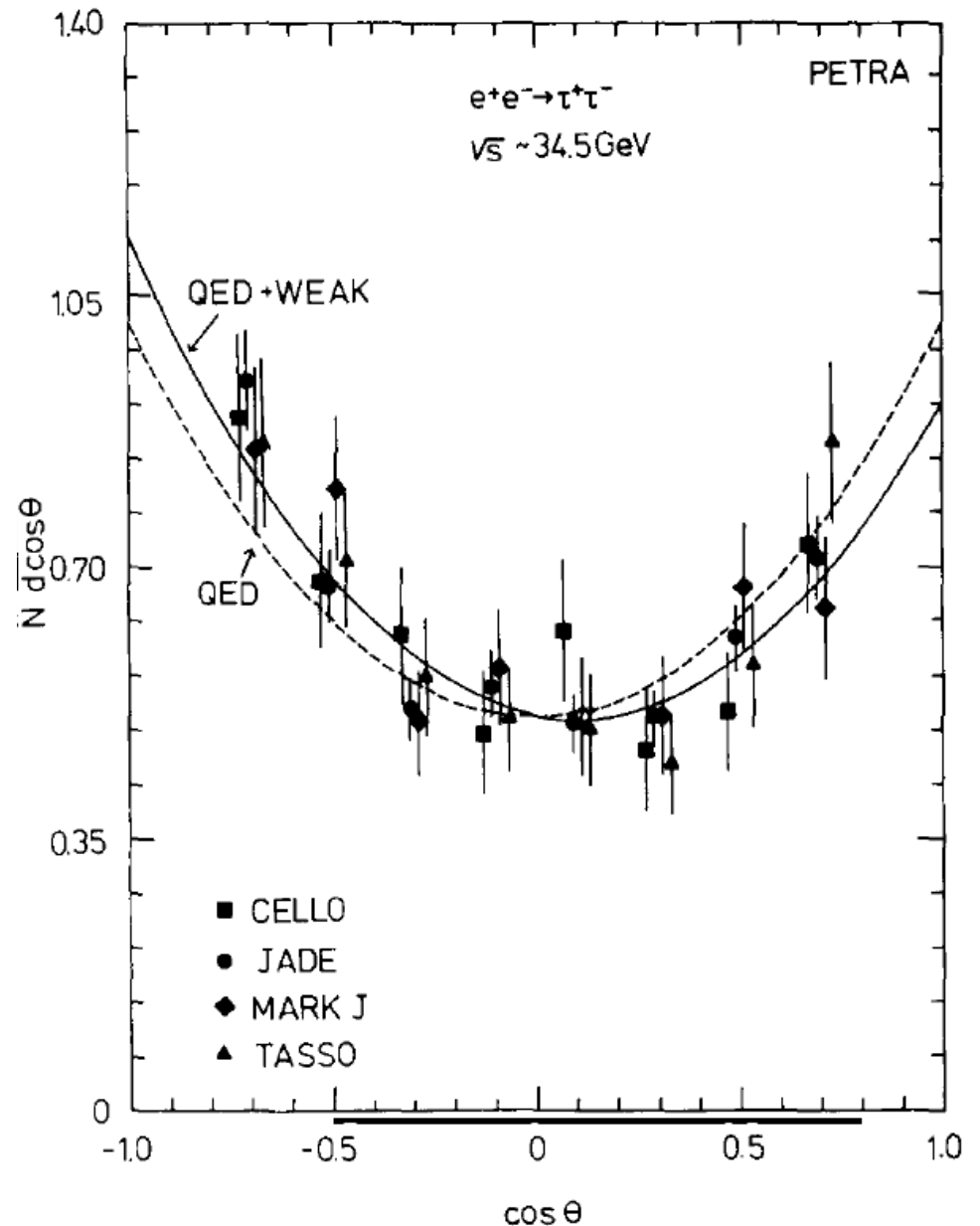
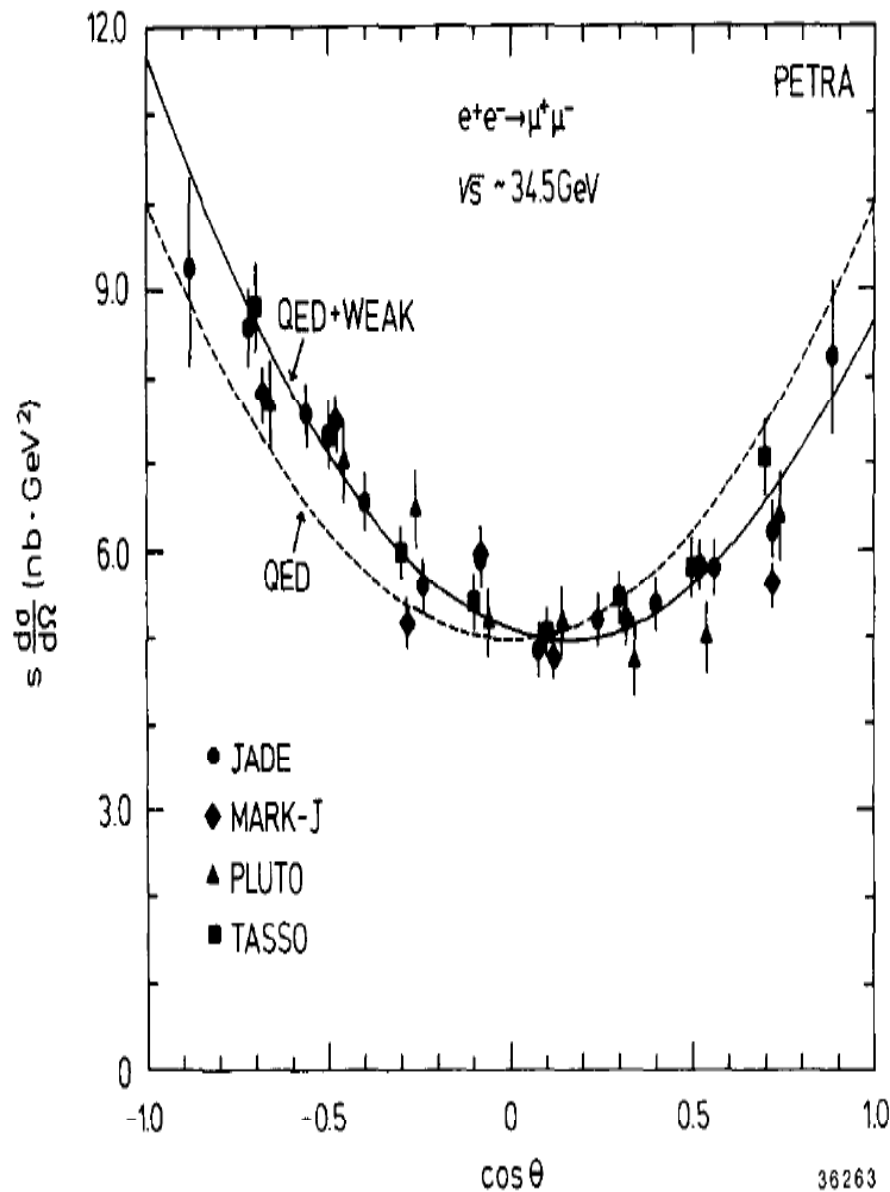
# Totaler Wirkungsquerschnitt für $e^+e^- \rightarrow \tau^+\tau^-$



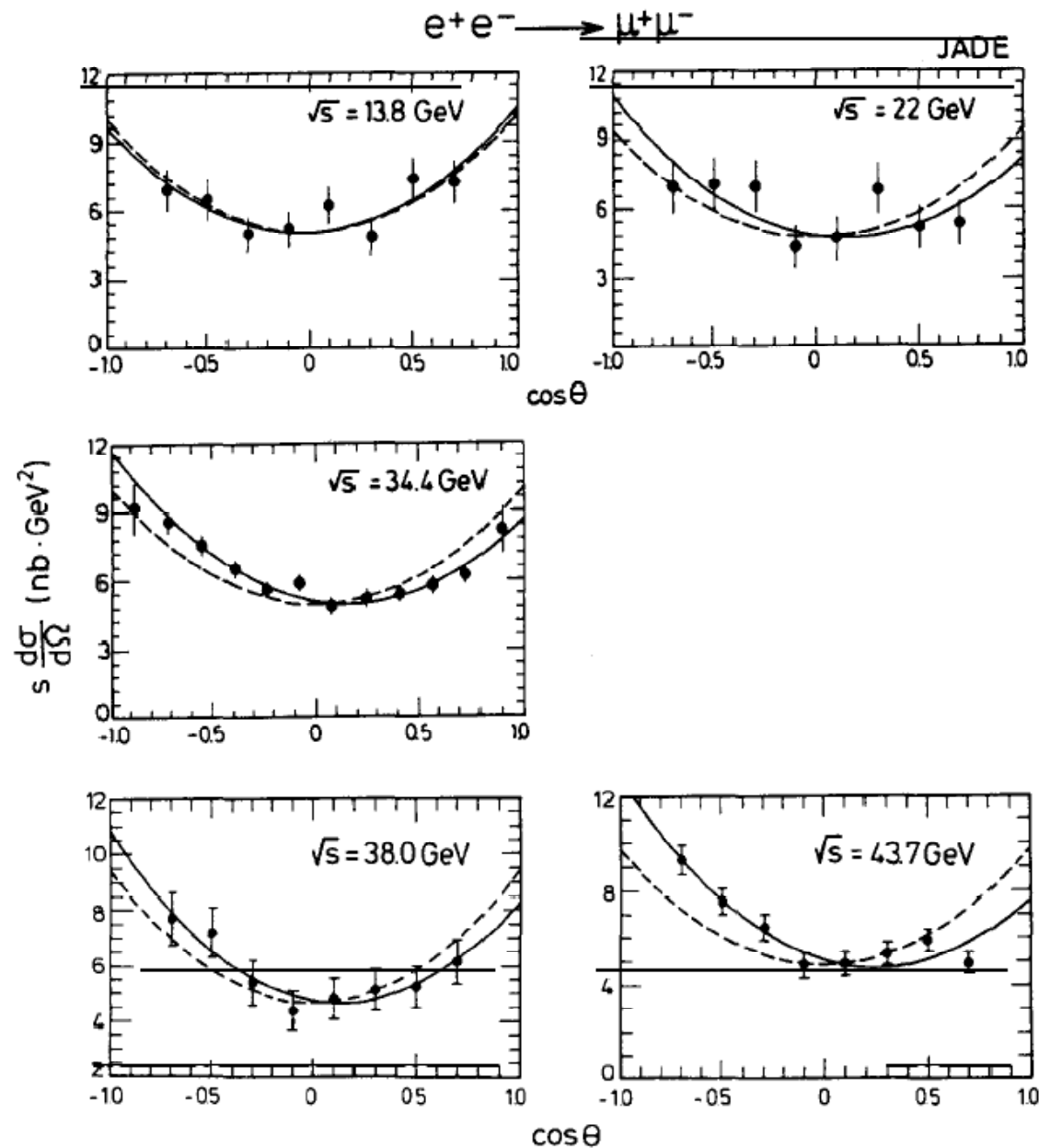
# Vergleich von tot. WQ mit QED-Vorhersage



# Differentieller WQ für $e^+e^- \rightarrow \mu^+\mu^-$ und $\tau^+\tau^-$

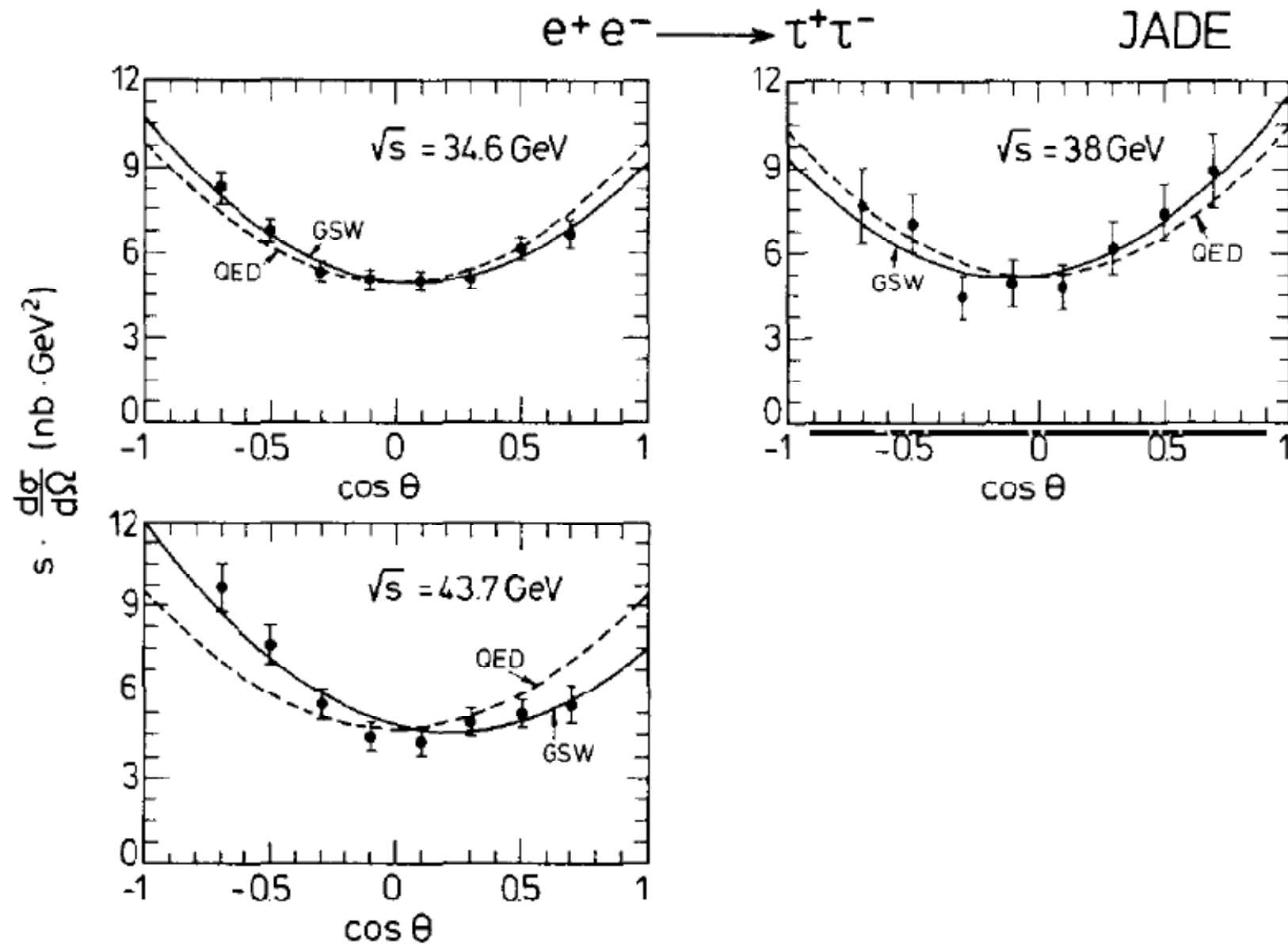


# Differentieller WG für $e^+e^- \rightarrow \mu^+\mu^-$

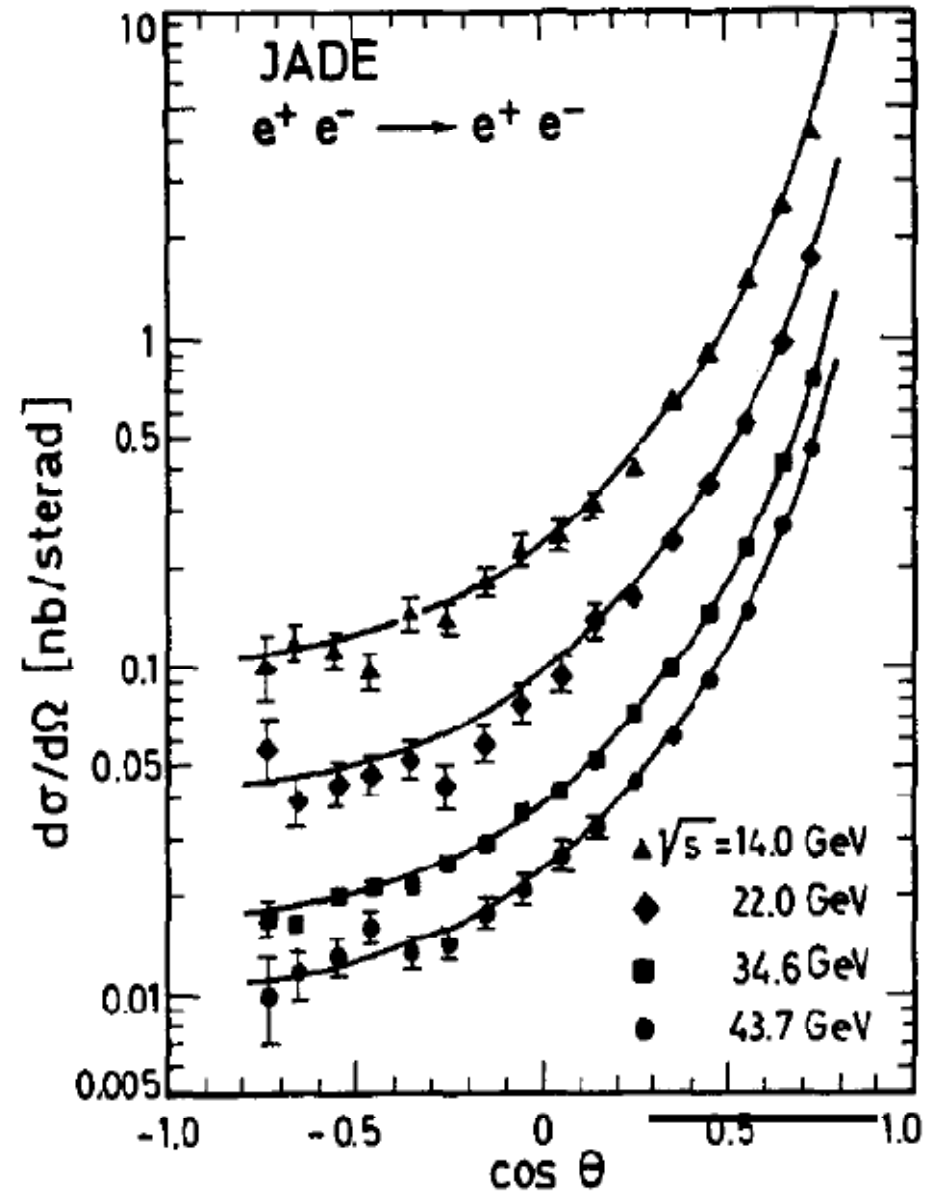
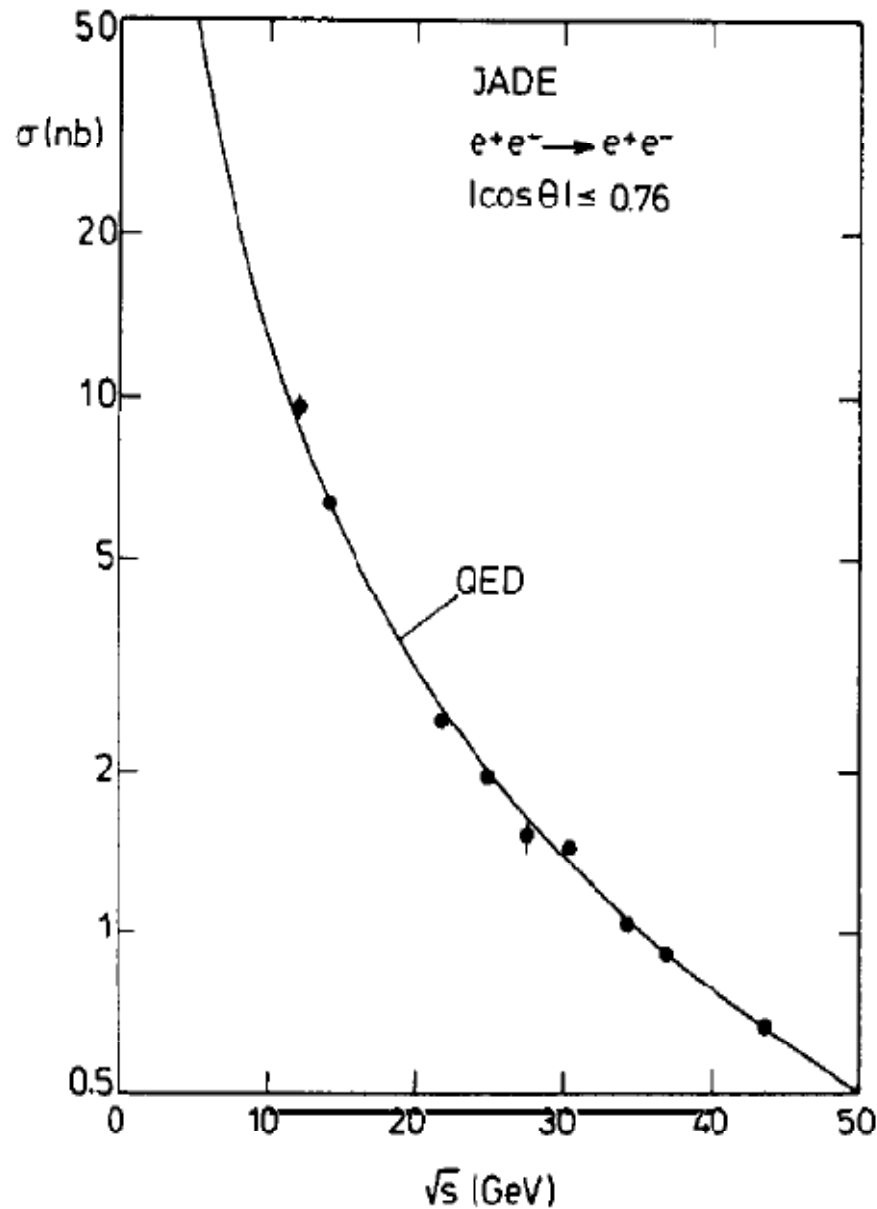




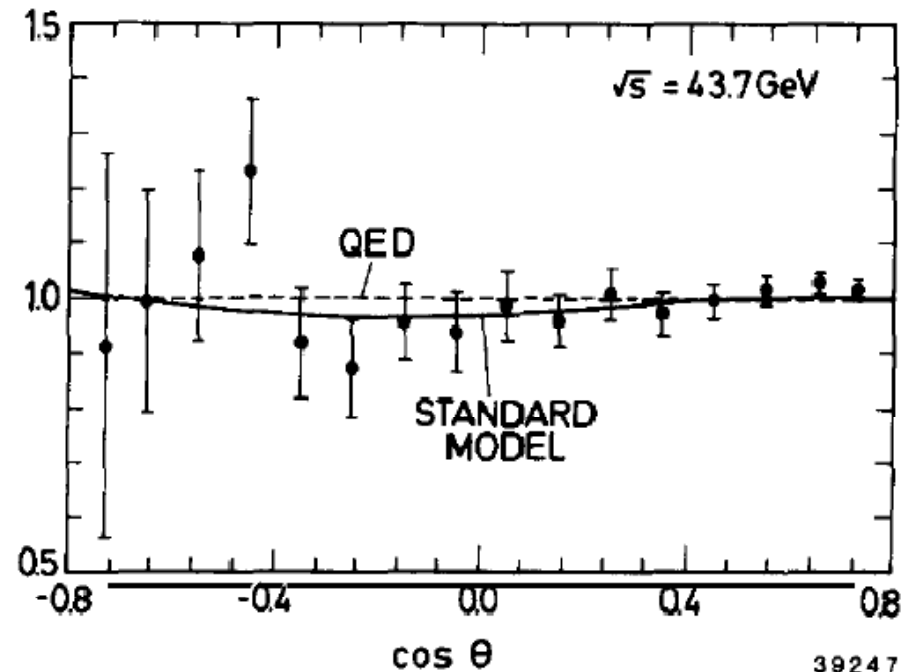
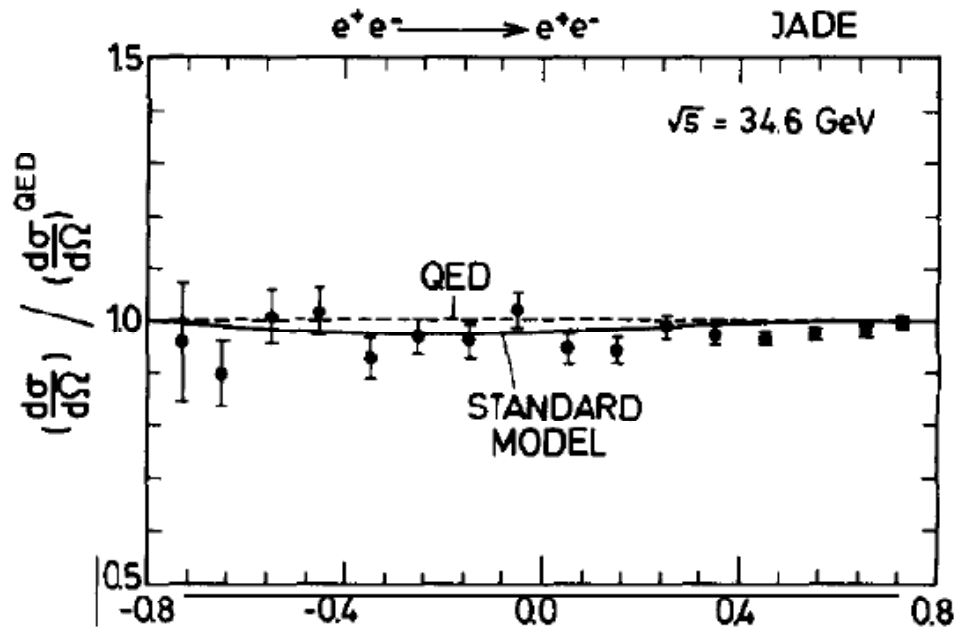
# Differentieller WG für $e^+e^- \rightarrow \tau^+\tau^-$



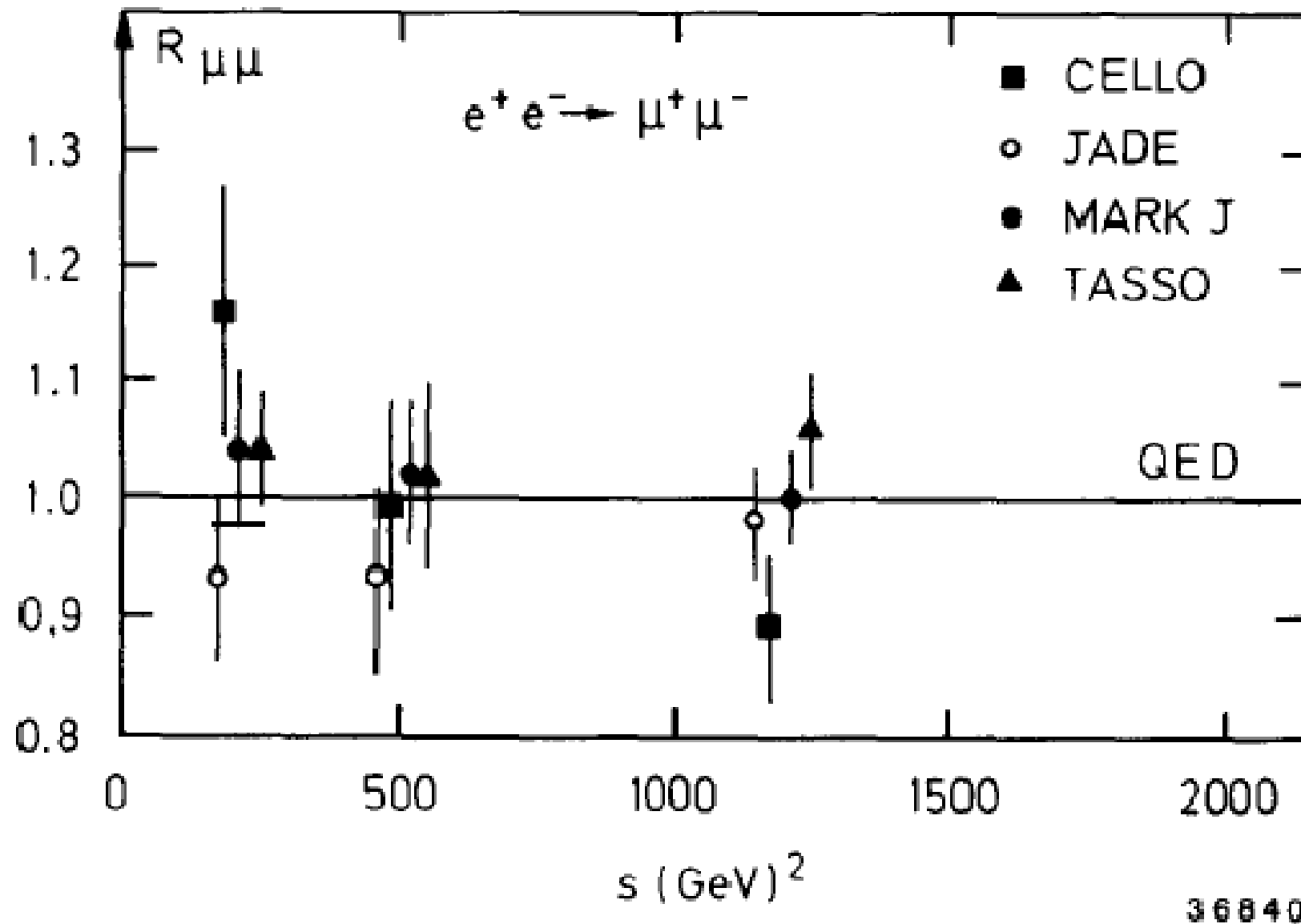
# Totaler u. differentieller WQ für $e^+e^- \rightarrow e^+e^-$



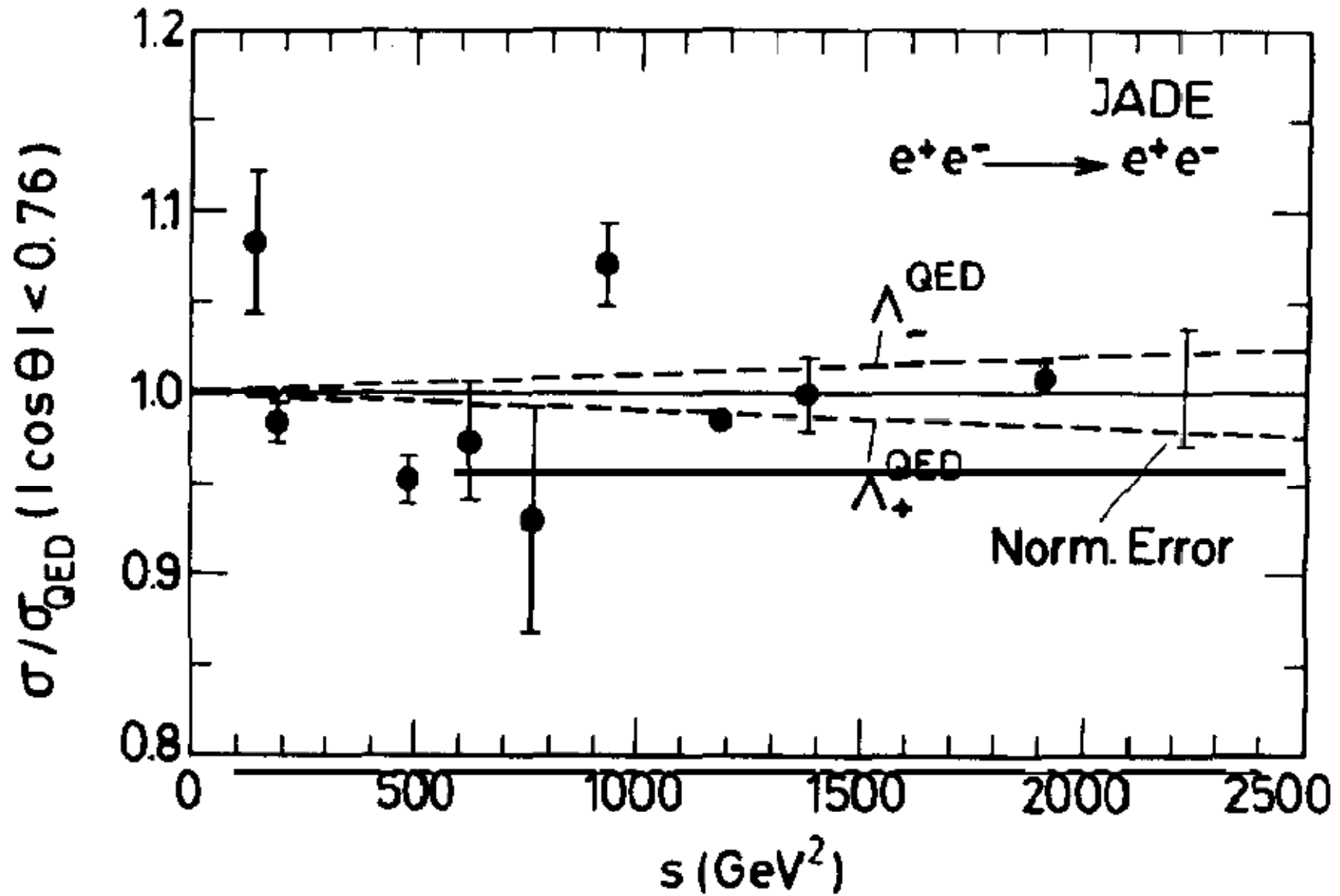
# Vergleich diff. WQ mit QED-Vorhersage



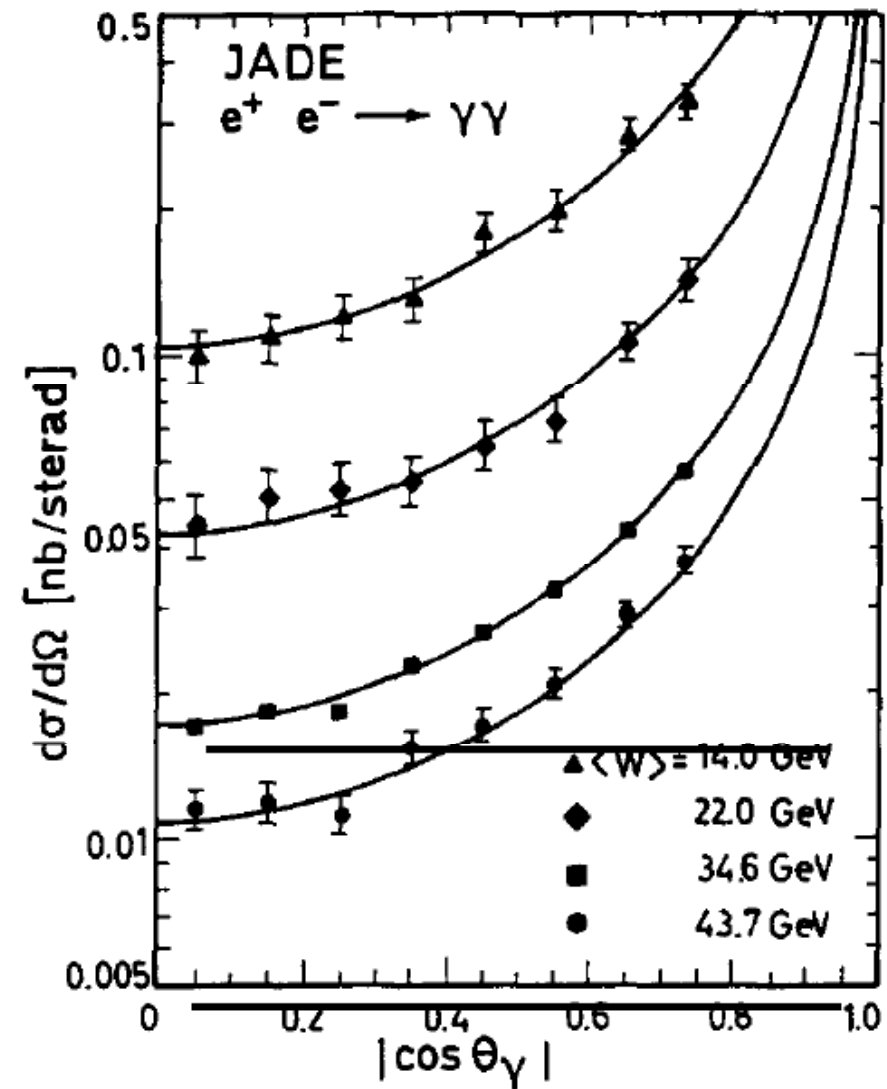
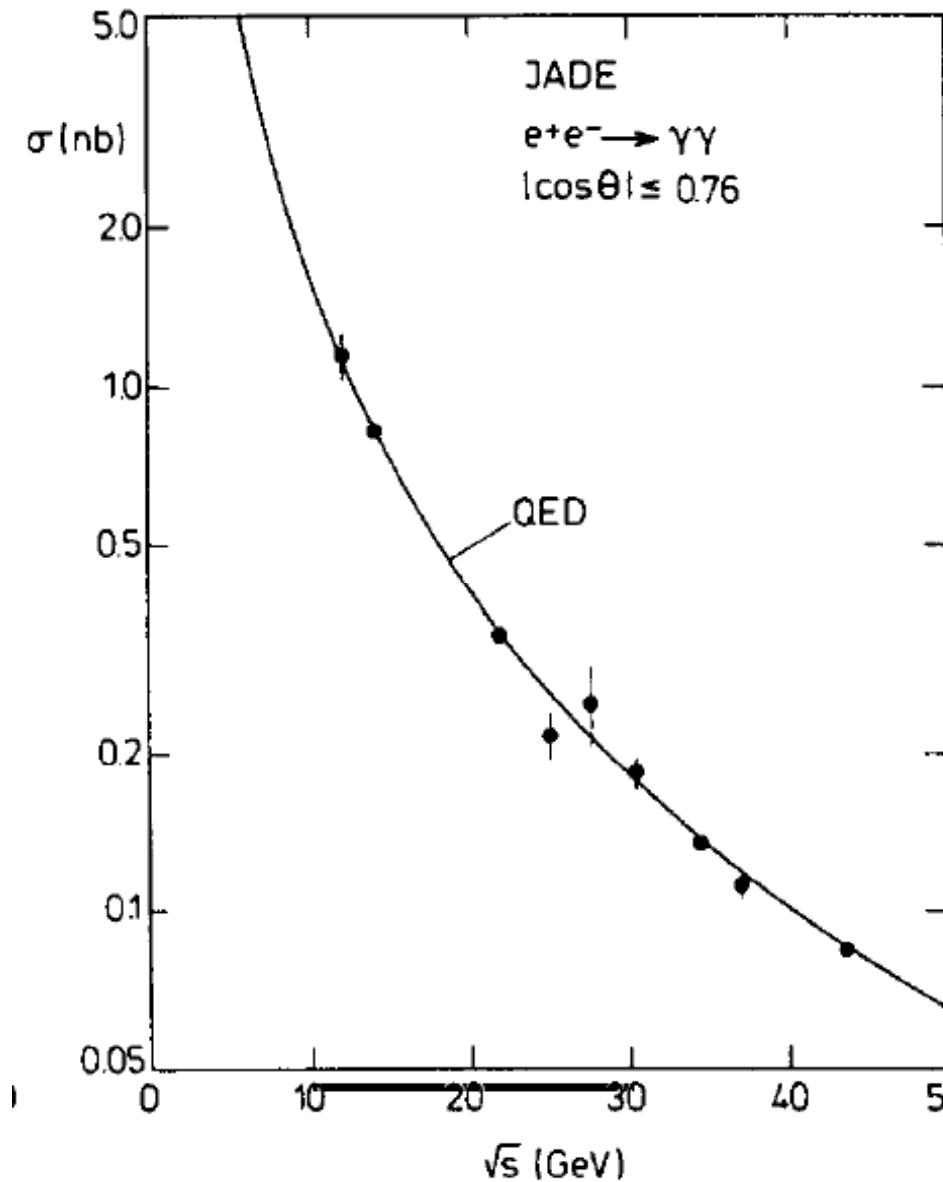
# Vergleich von tot. WQ mit QED-Vorhersage



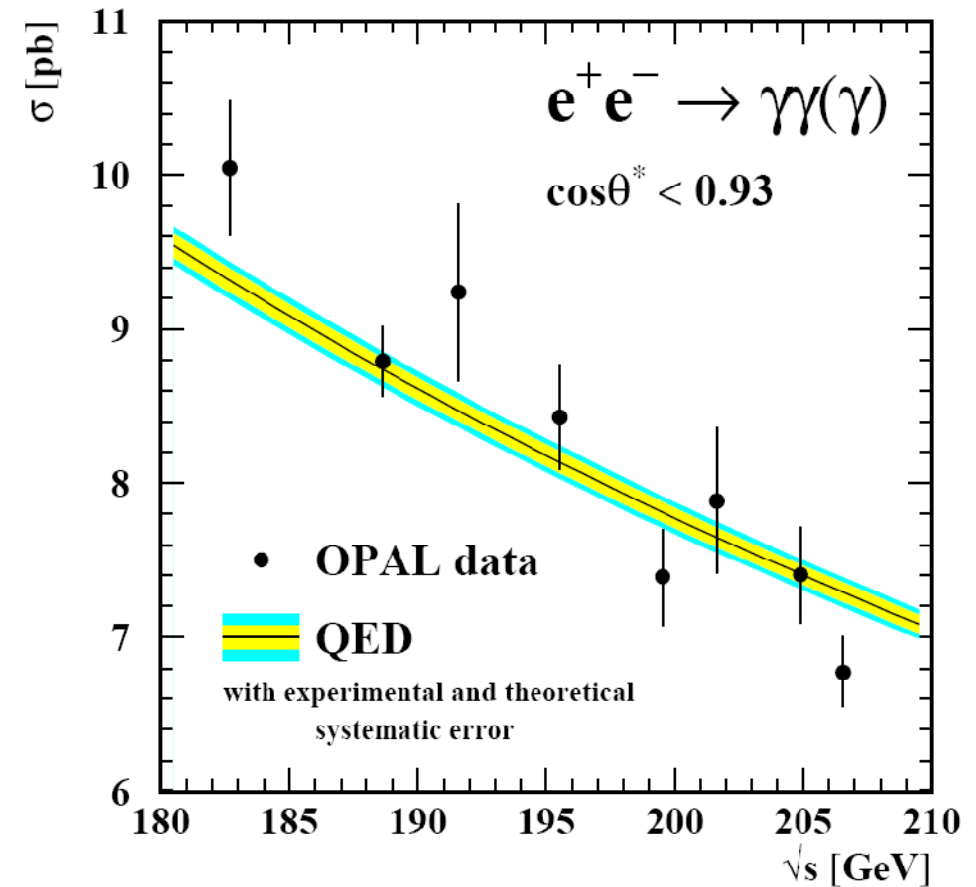
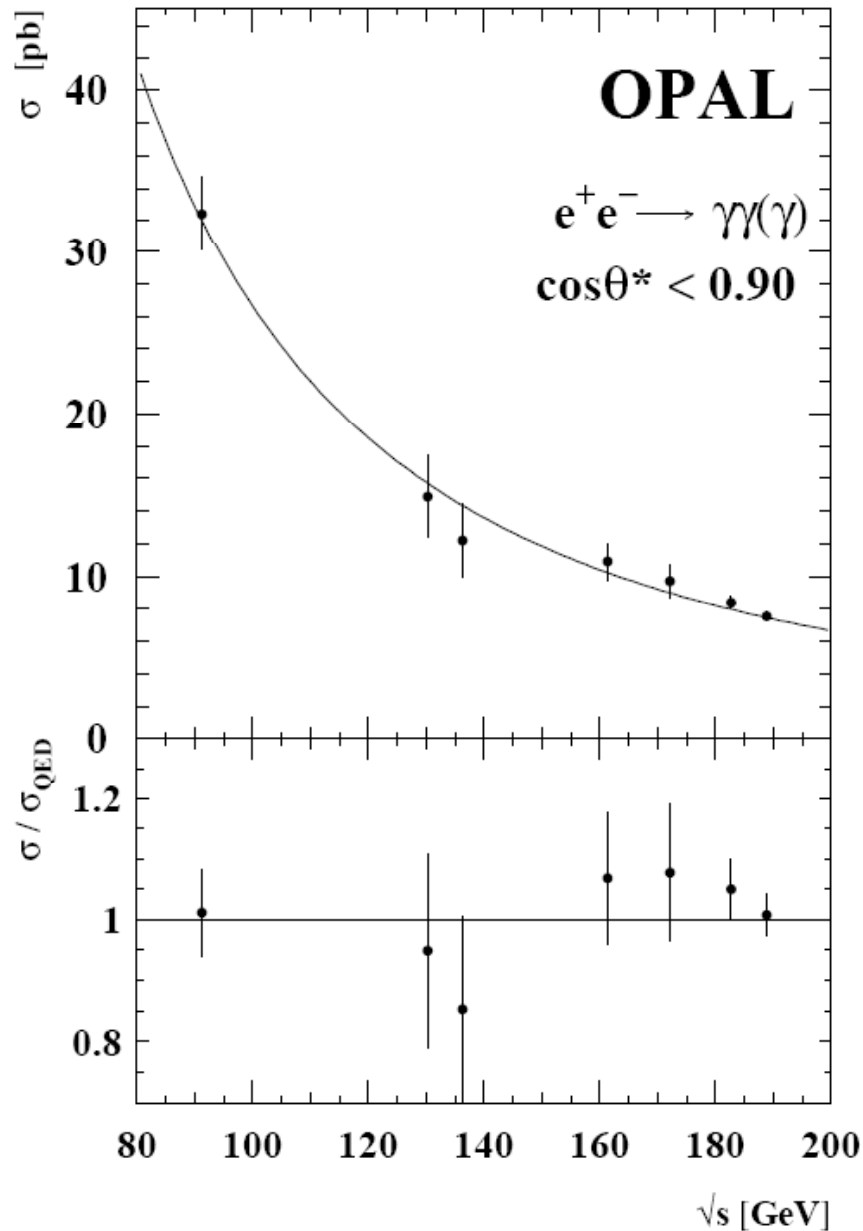
# Gültigkeit der QED



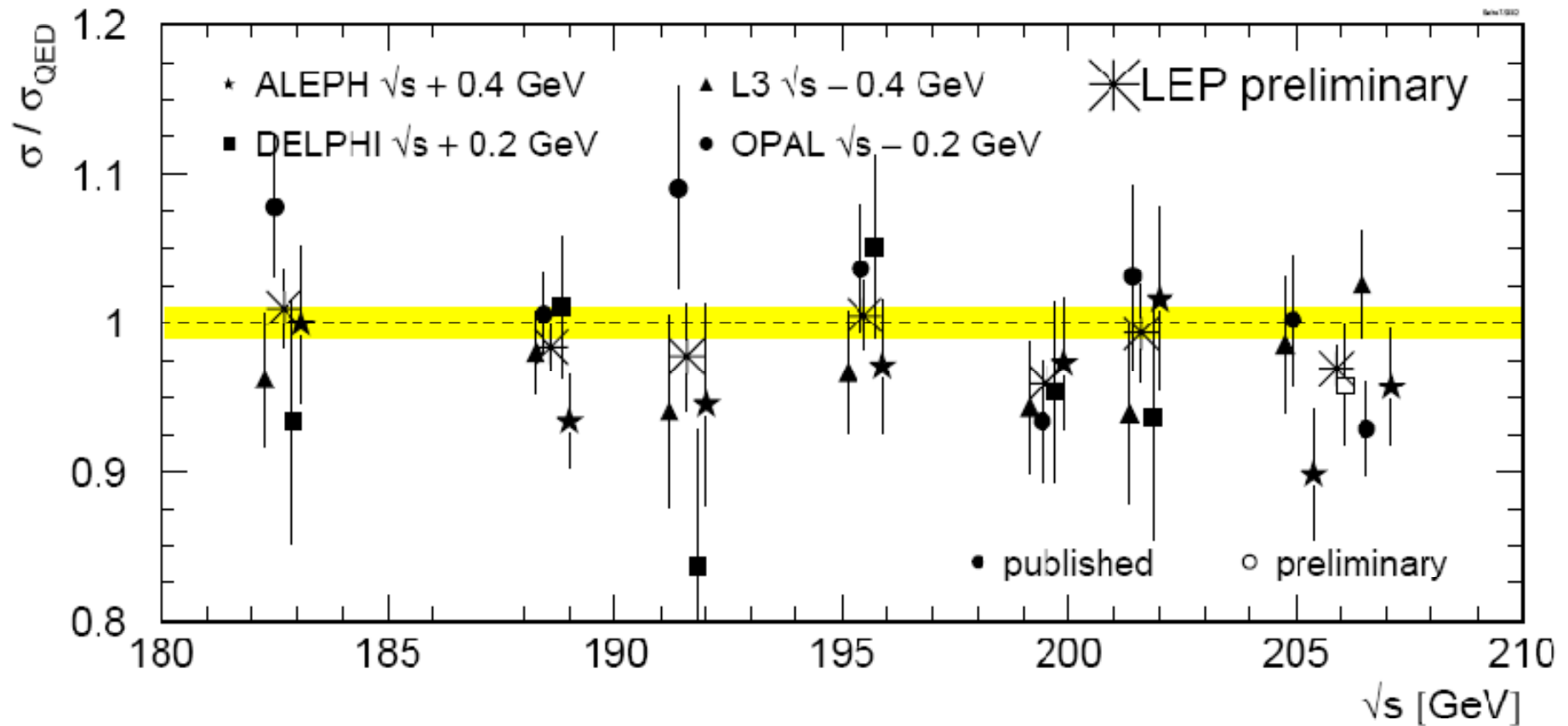
# Totaler und differentieller WQ für $e^+e^- \rightarrow \gamma\gamma$



# Totaler WQ für $e^+e^- \rightarrow \gamma\gamma$ bei OPAL

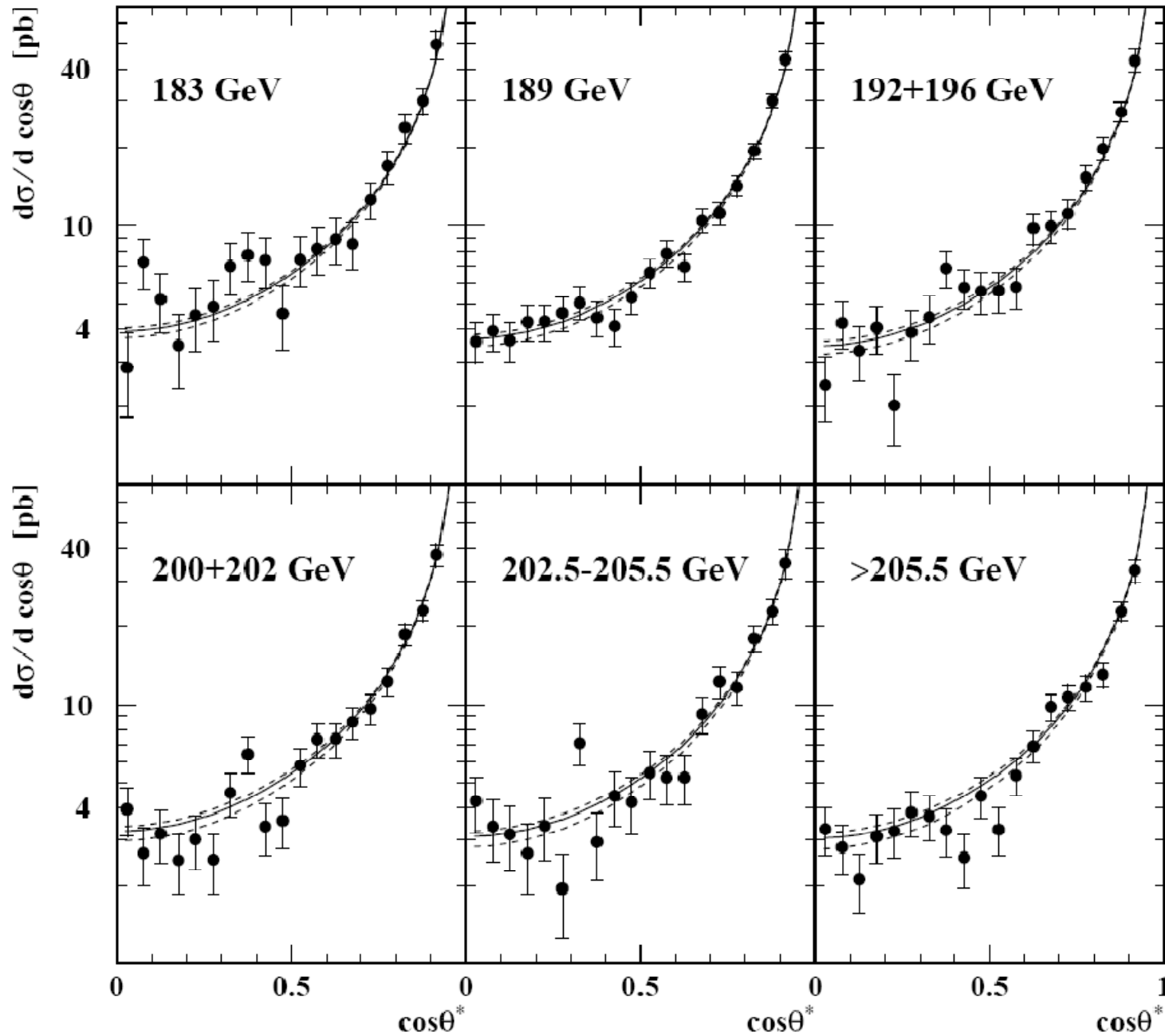


# Totaler WG bei LEP für $e^+e^- \rightarrow 2$ Photonen

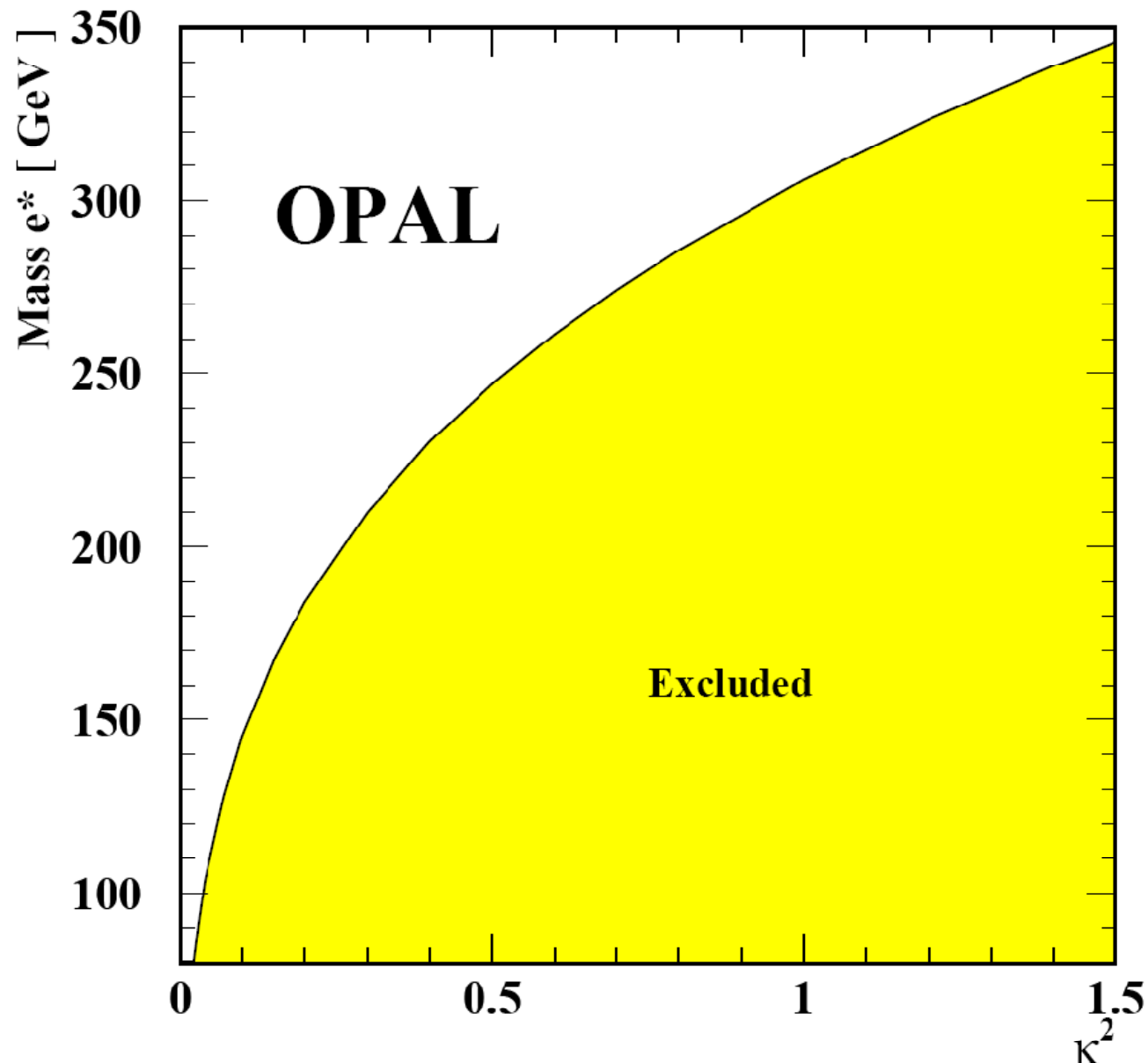




# $e^+e^- \rightarrow \gamma(\gamma)$ OPAL



# Grenze auf die Masse eines schweren Elektrons



# Laufende Kopplung der QED

