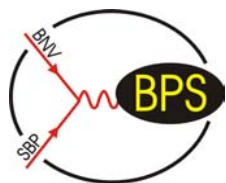


JJC 2003 La Roche-en-Ardennes (Belgique)



LPNHE Paris

$H \rightarrow \gamma\gamma$ at ATLAS

M. Escalier

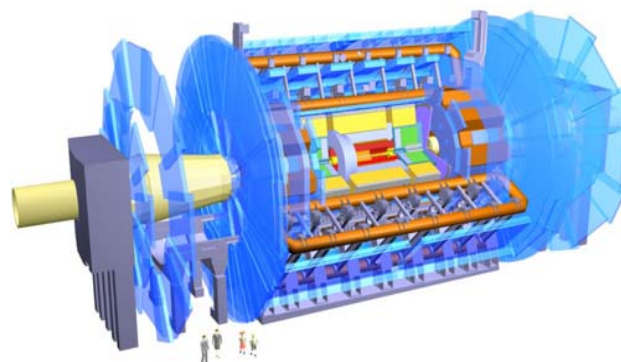
Directeur: B. Laforge

Atlas

7000 tonnes

44 m de long

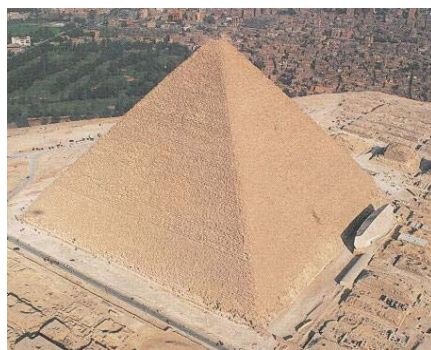
22 m de haut



Tour Eiffel

10 100 tonnes

H=324 m(avec antenne)



Pyramide de Khéops

carrée : 230 m de coté

H=137 m (146 m à l'origine)

7 500 000 tonnes

Objectifs de physique

Précision électrofaible et boson de Higgs

- recherche directe
- mesures de précision (W, Z)

Étude de t 10^7 paires $t\bar{t}$ /an ($\delta M_t \sim 2$ GeV accessible)

Étude de b ($2,3 \cdot 10^{10}$ paires $b\bar{b}$)

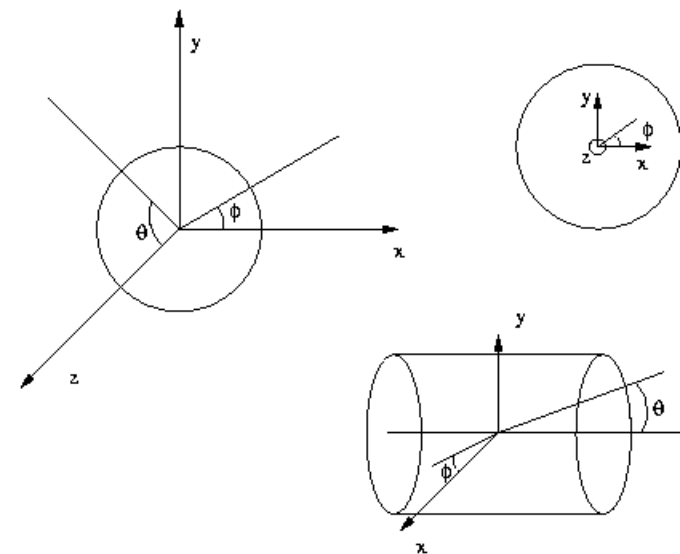
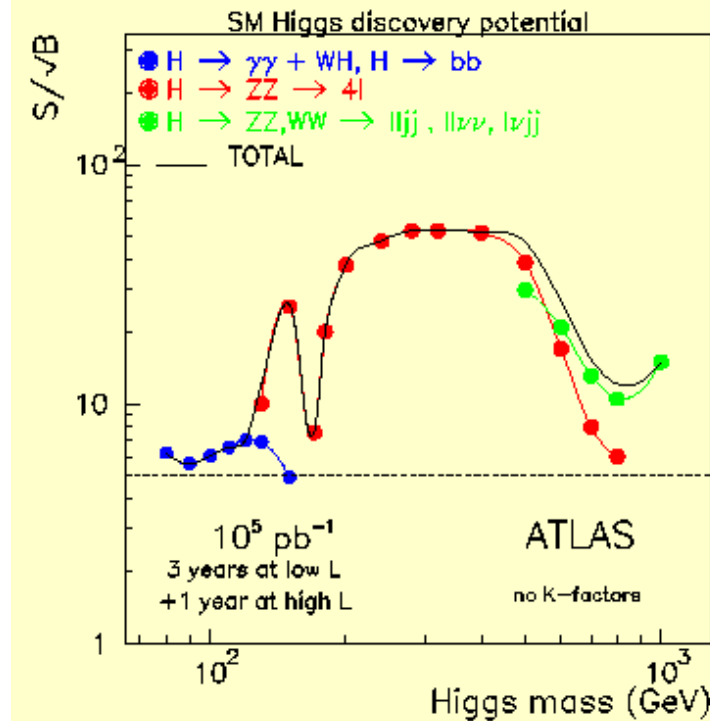
Violation de symétrie CP dans mésons B

Oscillations B_s , désintégrations rares

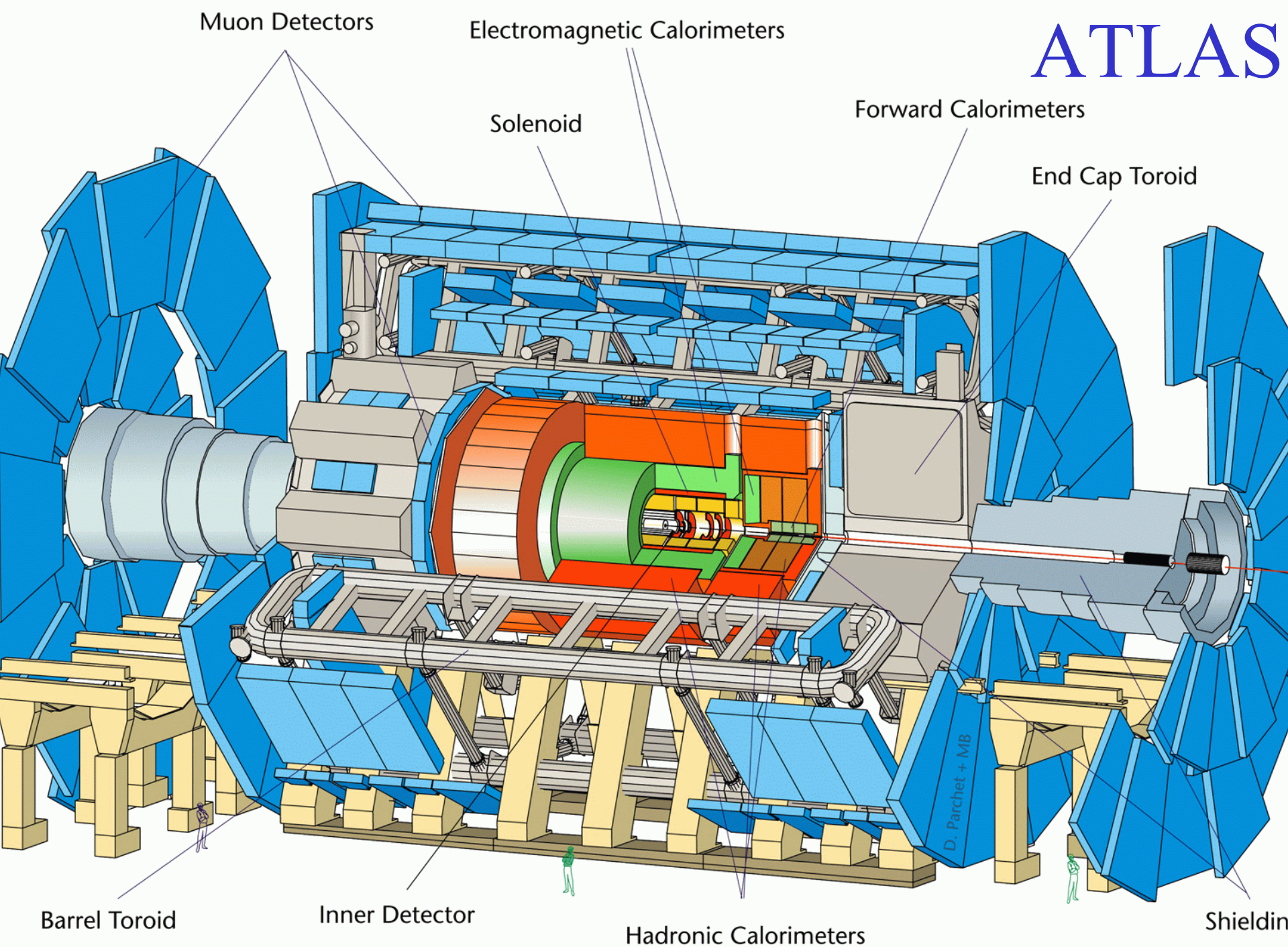
Nouvelle physique :

Dimensions supplémentaires

SUSY, Technicolor, Leptoquarks, quarks excités



ATLAS



Muon Detectors

Electromagnetic Calorimeters

Forward Calorimeters

End Cap Toroid

Solenoid

Barrel Toroid

Inner Detector

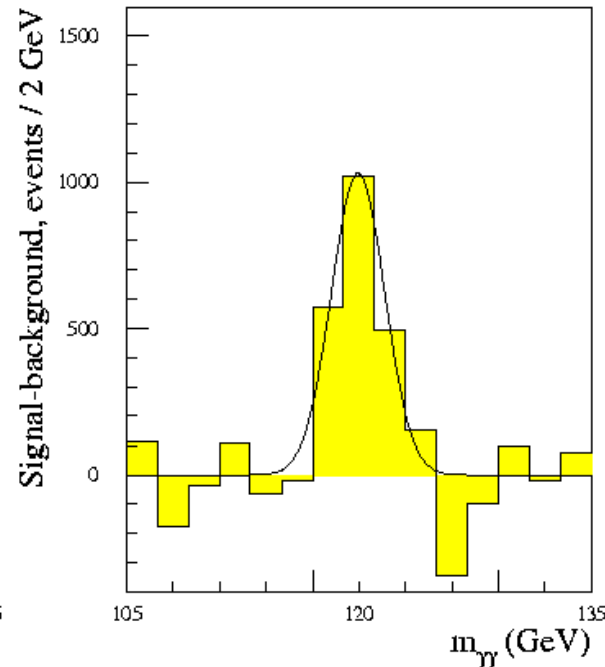
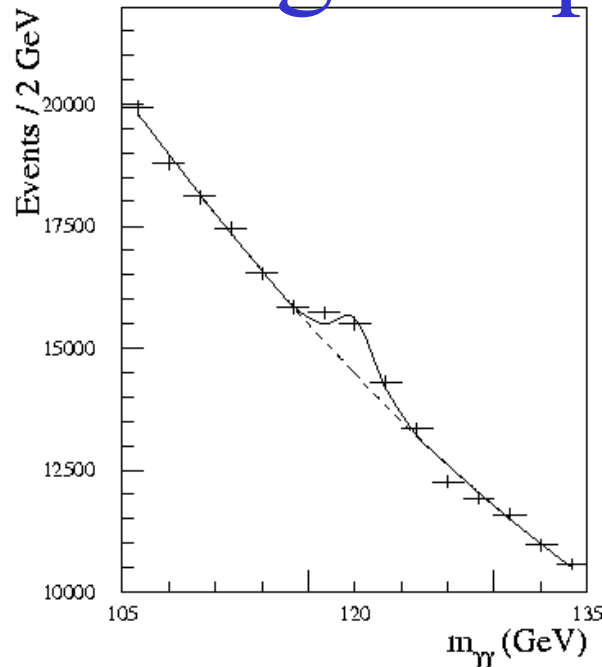
Hadronic Calorimeters

Shielding

Technical Design Report

- LO: CTEQ 2L
- pas de K factor
- Pythia 5.700
- ISR, FSR
- Atfast 2.0

partir de simu. complète

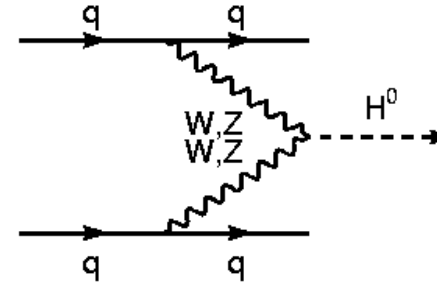
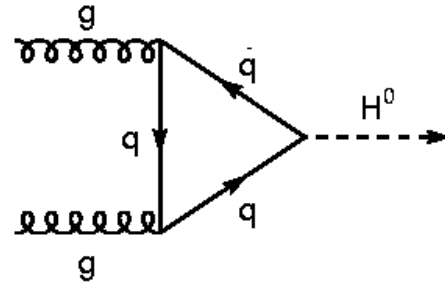


Higgs mass (GeV)	80	90	100	110	120	130	140	150
Cross-section (pb)	38.4	32.4	27.8	24.2	21.2	18.8	17.0	15.4
Branching ratio (%)	0.089	0.119	0.153	0.190	0.219	0.222	0.193	0.138
$\sigma \times BR$ (fb)	34.2	38.6	42.5	46.0	46.4	41.8	32.8	21.2
Acceptance	0.29	0.38	0.44	0.48	0.51	0.53	0.55	0.58
Mass resolution (GeV)	1.11	1.20	1.31	1.37	1.43	1.55	1.66	1.74

Signal

cross sections eff. **Pythia** (LO)

ID	process($pp \rightarrow H^0$)	$\sigma(\text{mb})$
02	$gg \rightarrow H^0$	$1.820 \cdot 10^{-8}$
24	$qq \rightarrow qqH^0$ (W^+W^- fusion)	$3.040 \cdot 10^{-9}$
06	$q\bar{q} \rightarrow W^+H^0$	$1.267 \cdot 10^{-9}$
23	$qq \rightarrow qqH^0$ (Z^0Z^0 fusion)	$1.229 \cdot 10^{-9}$
03	$q\bar{q} \rightarrow H^0$	$1.035 \cdot 10^{-9}$
04	$q\bar{q} \rightarrow Z^0H^0$	$7.379 \cdot 10^{-10}$
21	$gg \rightarrow Q\bar{Q}H^0$	$4.248 \cdot 10^{-10}$
22	$q\bar{q} \rightarrow Q\bar{Q}H^0$	$1.753 \cdot 10^{-10}$



decay: corrections QCD

Glu (NLO)

contribution	mean value (pb)
σ_{LO}	$15.14 \pm 0.54 \cdot 10^{-3}$
σ_{virt}	$8.64 \pm 0.31 \cdot 10^{-3}$
σ_{gg}	$12.52 \pm 0.62 \cdot 10^{-1}$
σ_{gq}	$0.159 \pm 0.17 \cdot 10^{-1}$
$\sigma_{q\bar{q}}$	$0.46 \cdot 10^{-1} \pm 0.24 \cdot 10^{-3}$
σ_{NLO}	$36.50 \pm 0.64 \cdot 10^{-1}$

Incertitudes production (cteq6m)

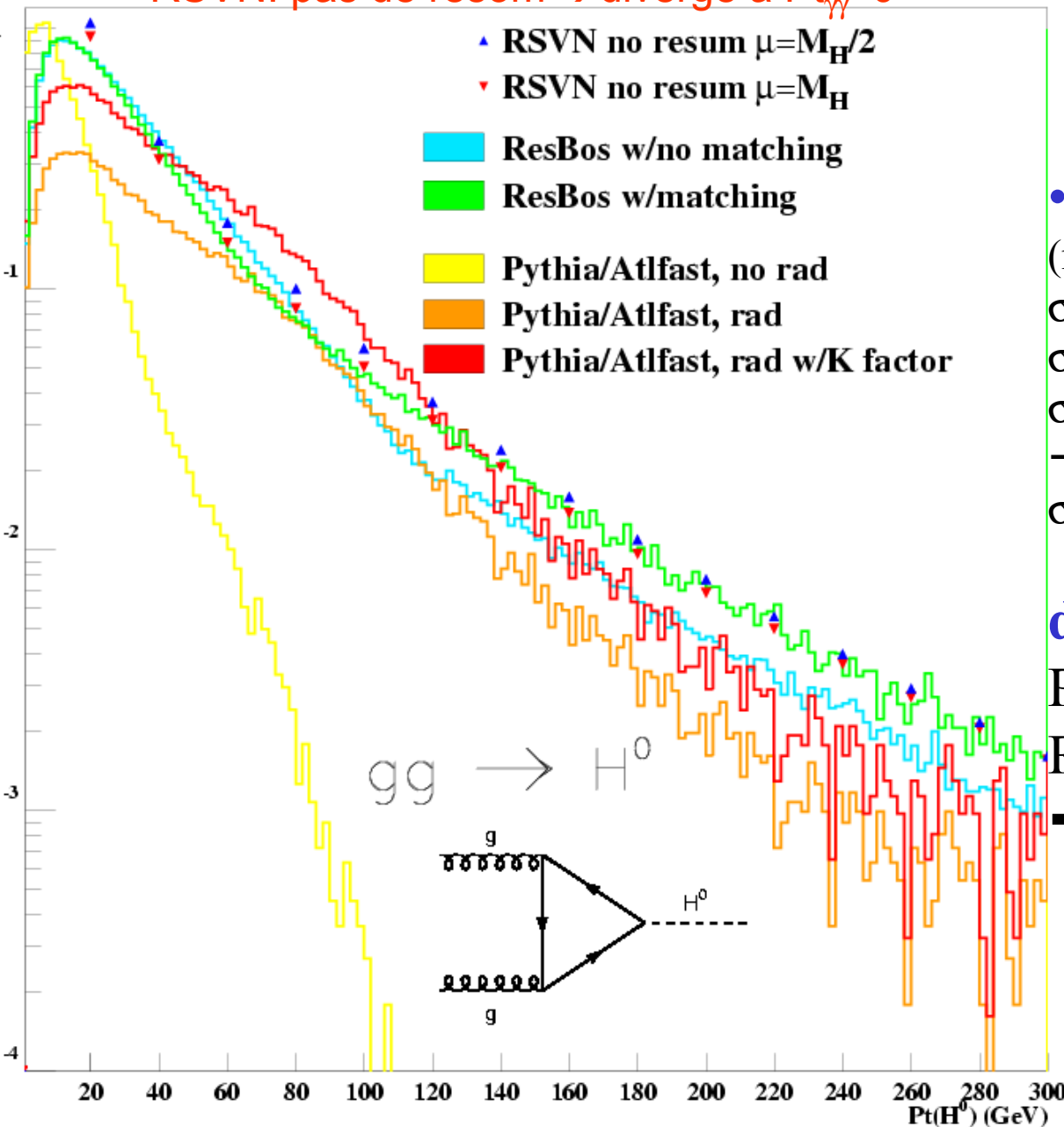
$$\delta\sigma_{NLO} = \begin{matrix} +3.44 \\ -4.64 \end{matrix} \% \quad \longrightarrow \quad 5\%$$

Fusion gluon: $K=1.8$

Vbf: $K=1.04$

Production du H^0

RSVN: pas de resum \rightarrow diverge à $Pt_{\gamma} = 0$



• Pas de désintégration spéc

(même échelle, $\mu=M_H$)

$\sigma=36.7$ pb (ResBos)

$\sigma=33.67$ pb (ResBos+match.)

$\sigma=36.4$ pb (HiGlu)

\rightarrow excellent accord

$\sigma=35.80$ pb (ResB+K à haut pt)

désintégrat.: $gg \rightarrow H_0 \rightarrow \gamma\gamma$

Pythia $\sigma=52$ fb

ResBos $\sigma=78$ fb

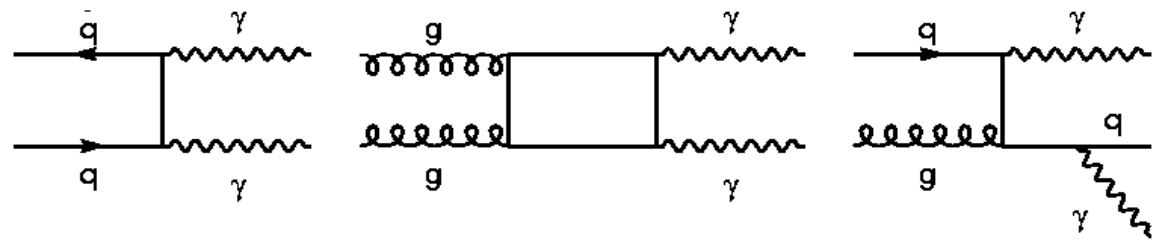
$\rightarrow K=1.5$

(RSVN data):

J. Smith, private comm.

Bruit de fond

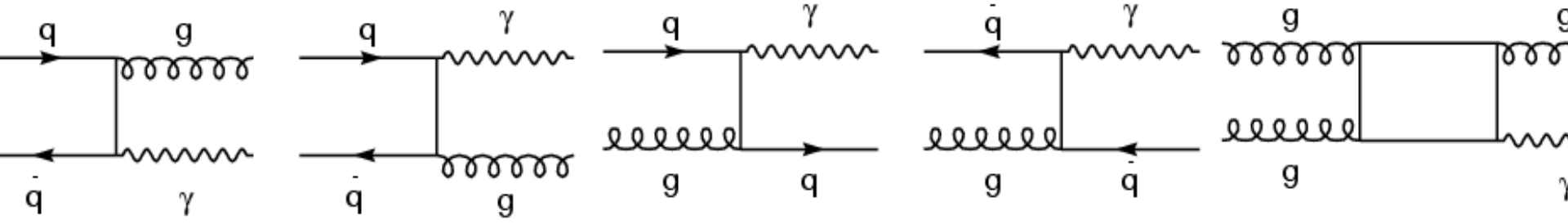
• bruit irréductible → Pythia (LO), Diphox/ResBos (NLO)



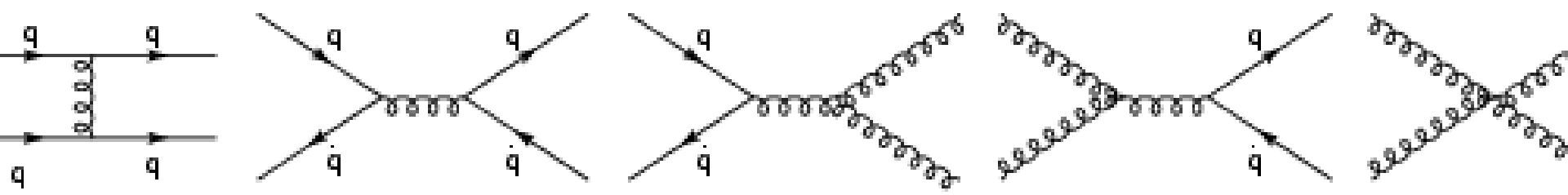
diagrammes Feynman LO

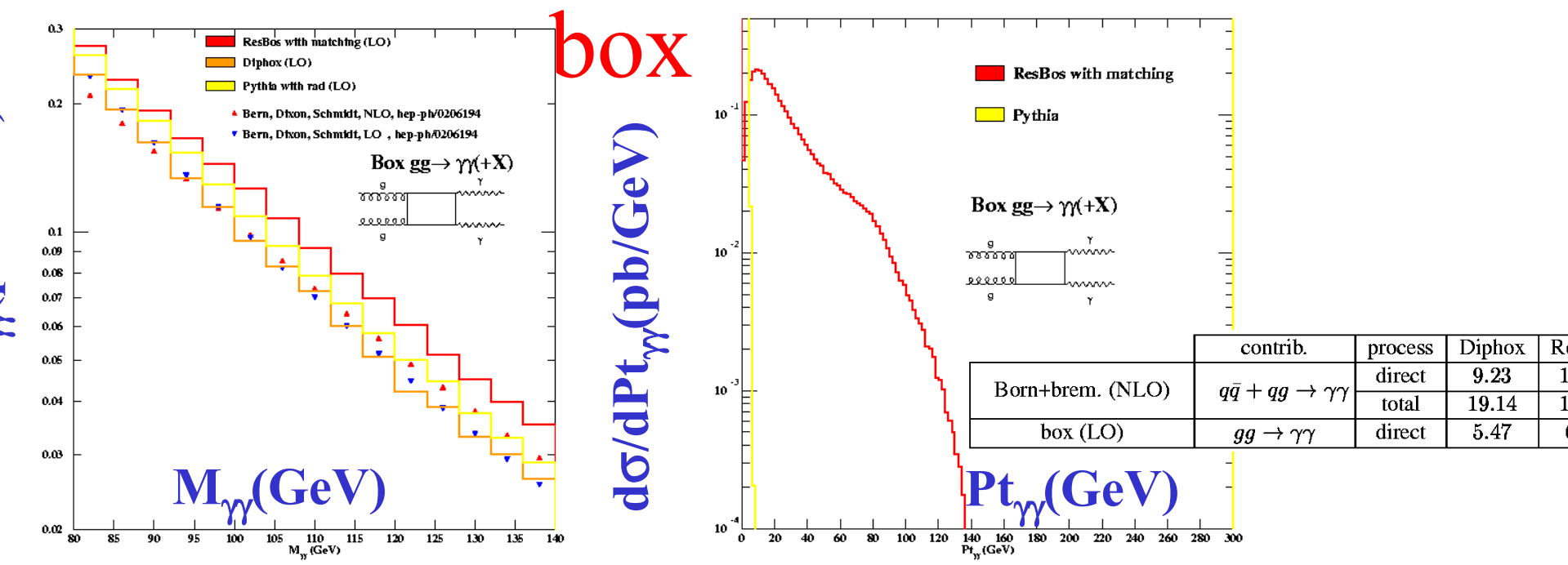
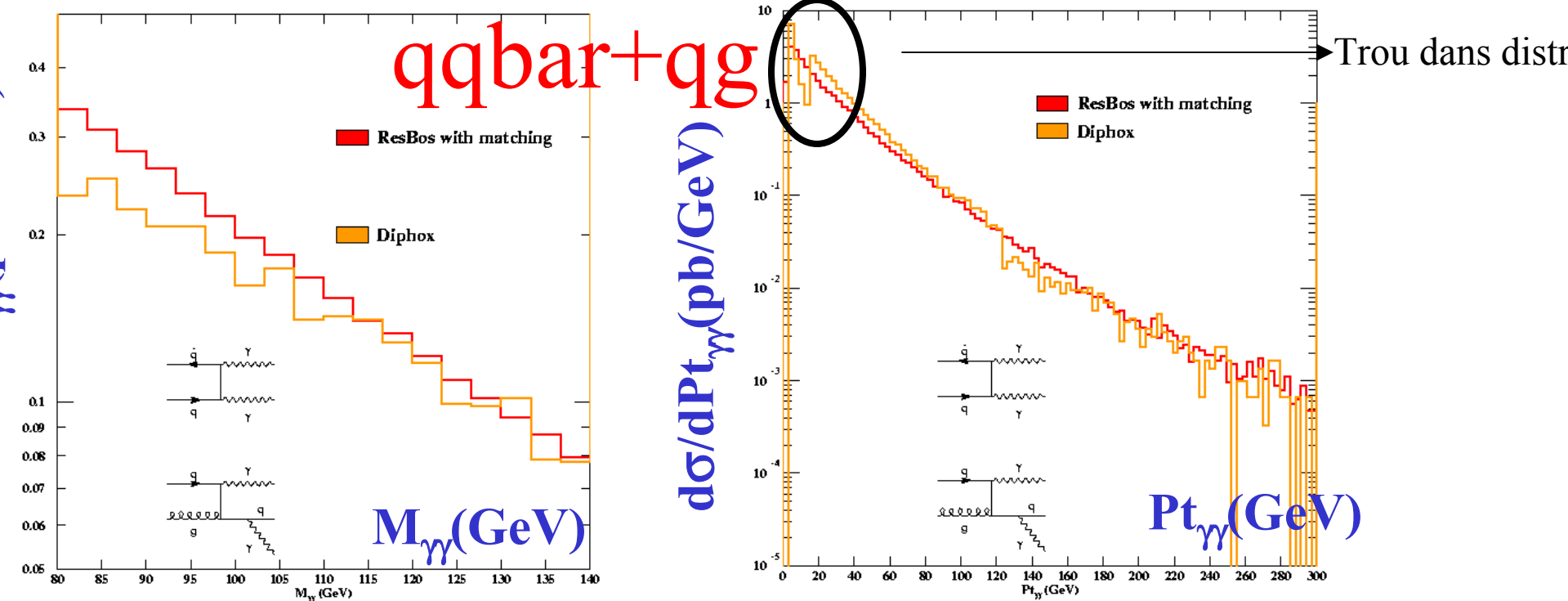
• bruit réductible (LO Pythia)

• gamma-jet 1 jet mal identifié



• jet-jet 2 jets mal identifiés (LO)





Conclusion

Étude du signal et du bruit de fond

- **Signal:** Pythia (LO)+ Hdecay
HiGlu (NLO), ResBos (NLO)
- **Bruit de fond:**
irréductible: Pythia (LO)
ResBos(NLO), Diphox(NLO): qqbar+qg
ResBos(LO), Diphox(LO): box(NLO!)

Perspectives

Box au NNLO

Bruit réductible: en développement

Jet tagging (vbf)

