

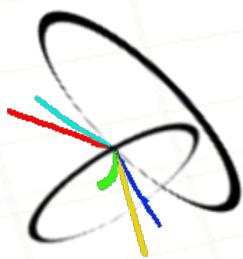
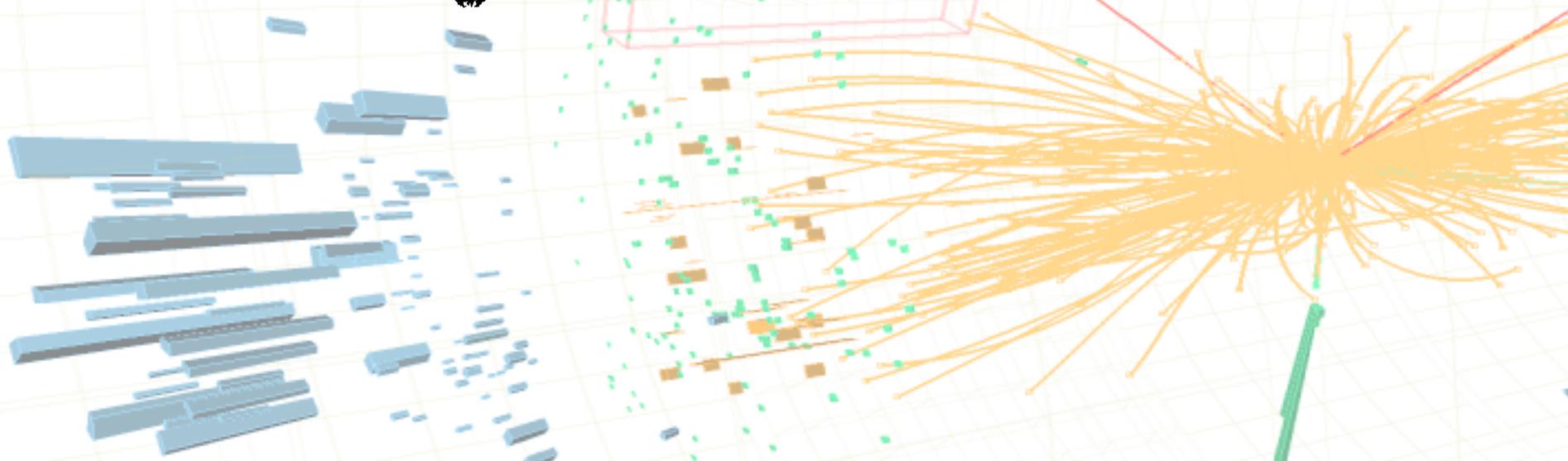


CMS Experiment at the LHC, CERN

Data recorded: 2011-May-25 08:00:19 229673 GMT(10:00:19 CEST)

Run / Event: 165633 / 394010457

# Resultados del ejercicio W/Z



cfp

CIEMAT

física de partículas



EXCELENCIA  
MARÍA  
DE MAEZTU

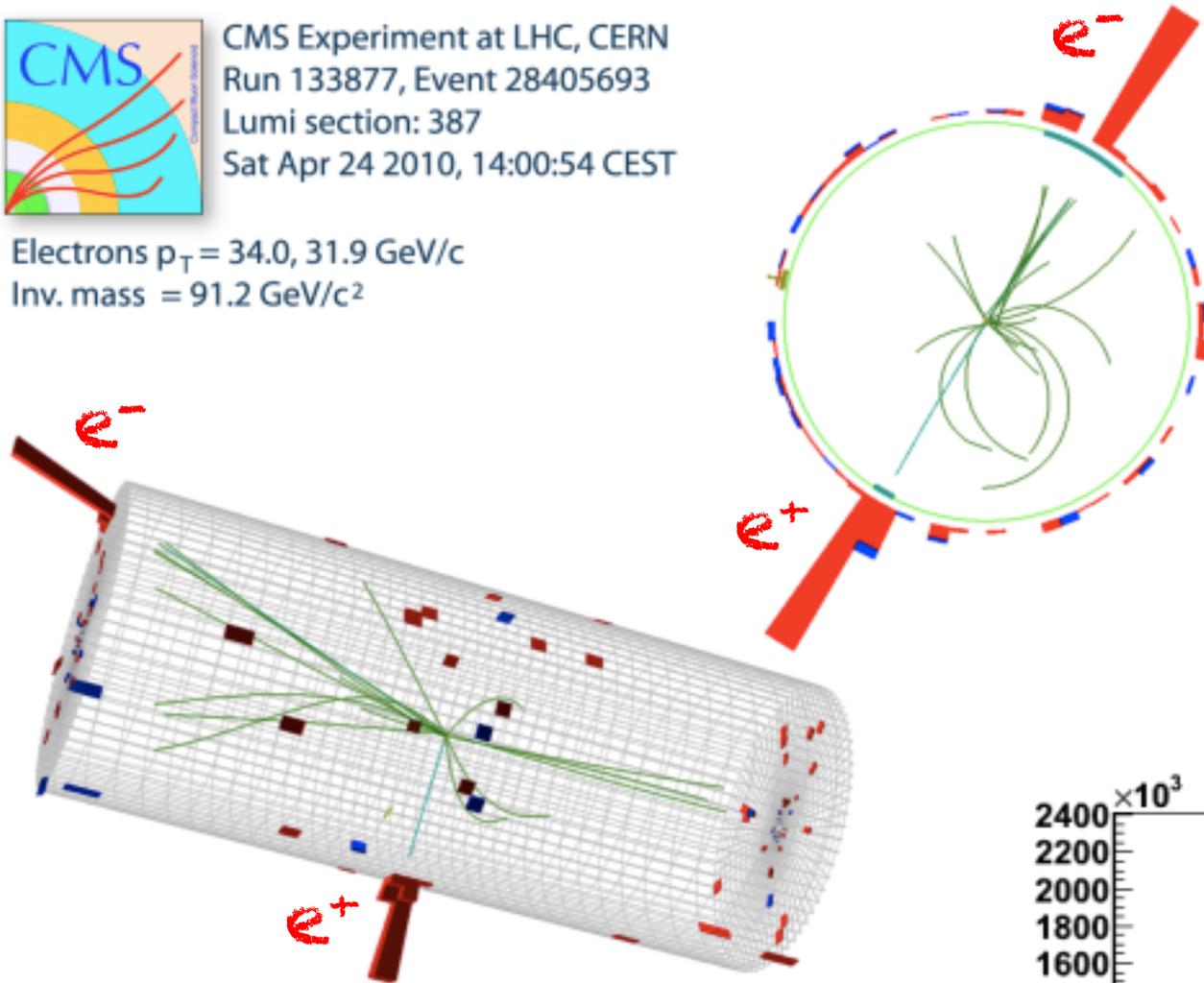
Pablo García Abia

Programa español para  
profesores, CERN, Junio 2016



CMS Experiment at LHC, CERN  
Run 133877, Event 28405693  
Lumi section: 387  
Sat Apr 24 2010, 14:00:54 CEST

Electrons  $p_T = 34.0, 31.9$  GeV/c  
Inv. mass = 91.2 GeV/c<sup>2</sup>

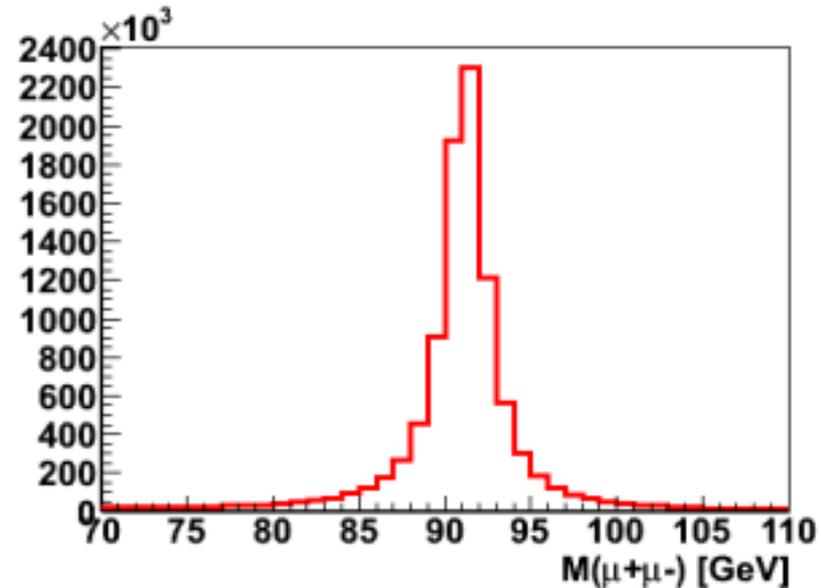


Candidato a Z:

2 leptones  
cargados del  
mismo sabor  
(e,  $\mu$ ) y carga  
opuesta.

Balanceados en  
el plano  
transverso.

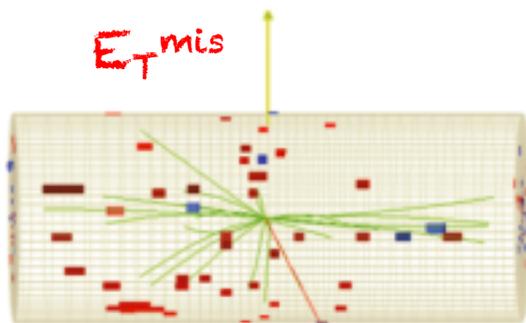
$$pp \rightarrow Z+X \rightarrow e^+e^-+X$$





CMS Experiment at LHC, CERN  
 Run 133875, Event 1228182  
 Lumi section: 16  
 Sat Apr 24 2010, 09:08:46 CEST

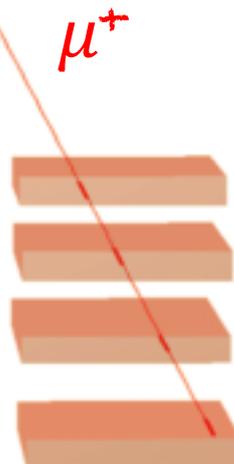
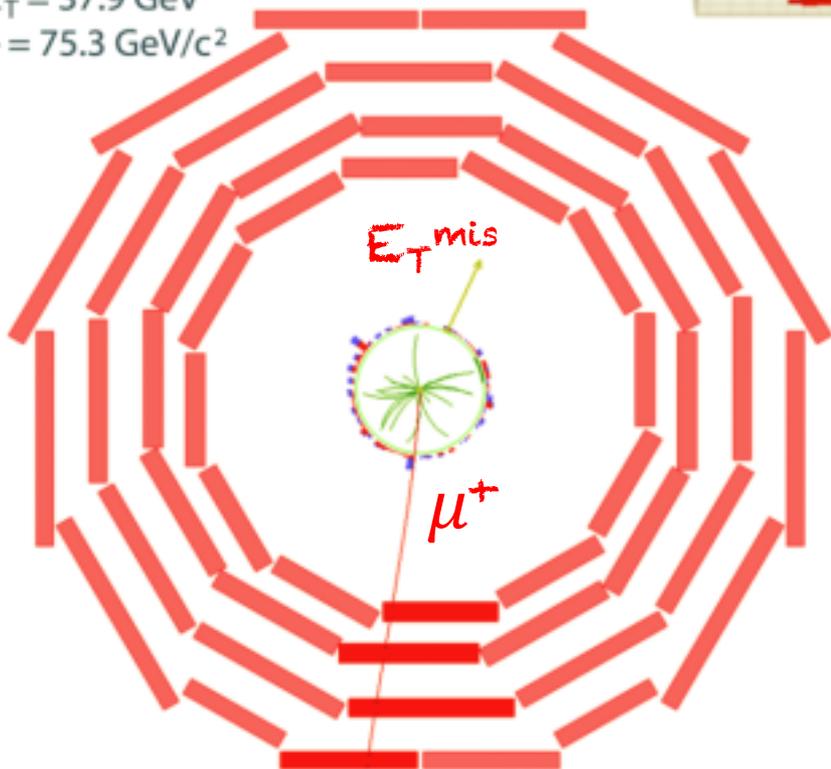
Muon  $p_T = 38.7$  GeV/c  
 $ME_T = 37.9$  GeV  
 $M_T = 75.3$  GeV/c<sup>2</sup>



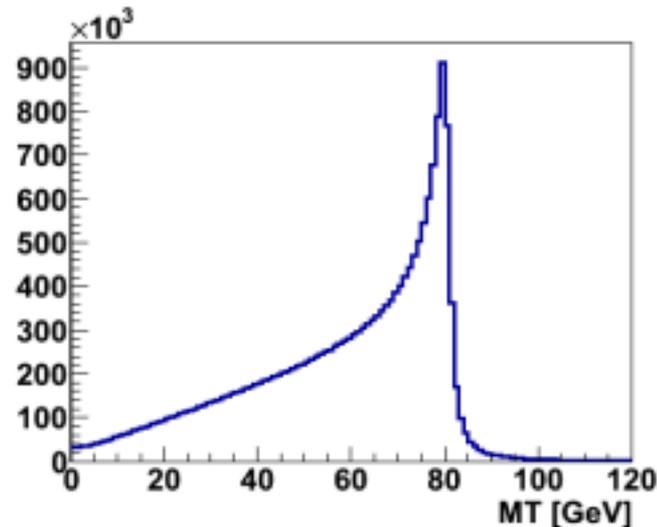
### Candidato a W:

1 *leptón cargado* (e,  $\mu$ ) y un *neutrino* ( $E_T^{mis}$ ).

El neutrino se manifiesta por la *falta aparente de conservación de energía-momento*.



$$pp \rightarrow W+X \rightarrow \mu^+ \nu + X$$



# Números de $W^\pm/Z$ , $e^\pm/\mu^\pm$

Group	Muon	Electron	W	W-	W+	Z	Higgs	Zoo	Total
1	46	34	1	19	28	32	4	16	100
2	26	23	1	18	17	13	1	19	69
3	28	17	0	12	16	17	1	9	55
4	17	14	0	9	10	12	2	7	40
5	48	46	6	24	32	32	2	4	100
6	46	36	0	22	30	30	2	16	100
7	8	6	0	2	5	7	2	3	19
8	10	10	0	9	2	9	1	4	25
9	27	15	0	8	16	18	2	23	67
10	17	15	1	7	10	14	0	8	40

grupo 1: 364

grupo 2: 251

total: 615

# Resultados

**Total:**

<b>Muon</b>	<b>Electron</b>	<b>W</b>	<b>W-</b>	<b>W+</b>	<b>Z</b>	<b>Higgs</b>	<b>Zoo</b>	<b>Sum</b>	<b>e/mu</b>	<b>W+/W-</b>
273	216	9	130	166	184	17	109	615	0.79	1.28

# Resultados

Total:

Muon	Electron	W	W-	W+	Z	Higgs	Zoo	Sum	e/mu	W+/W-
273	216	9	130	166	184	17	109	615	0.79	1.28

$$e/\mu = 0.79$$

$$\text{CMS: } e/\mu = 1$$

$$W^+/W^- = 1.28$$

$$\text{CMS: } W^+/W^- \approx 1.60$$

# Resultados

Total:

Muon	Electron	W	W-	W+	Z	Higgs	Zoo	Sum	e/mu	W+/W-
273	216	9	130	166	184	17	109	615	0.79	1.28

$$e/\mu = 0.79$$

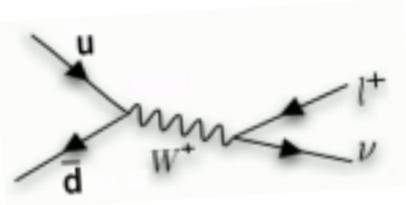
$$\text{CMS: } e/\mu = 1$$

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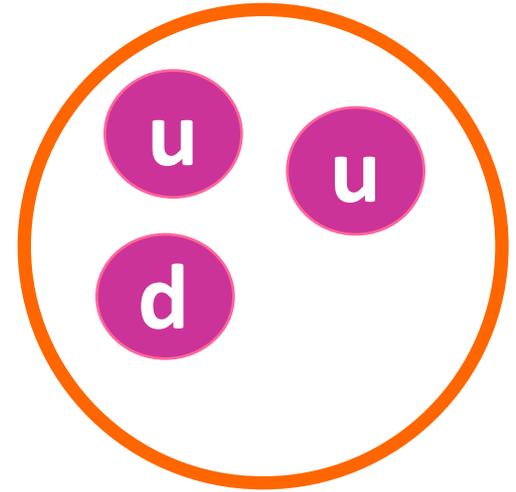
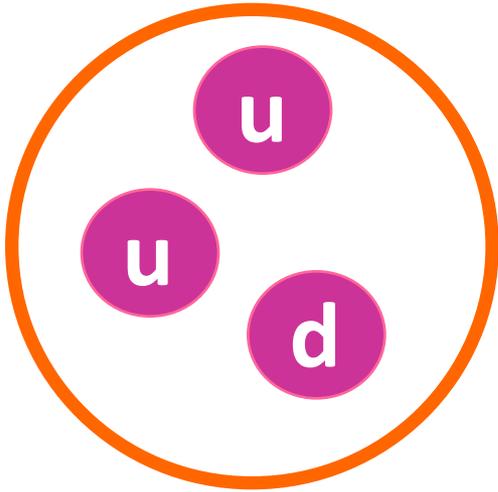
Error en las medidas:  $\sqrt{N}/N \approx 0,04$ , donde  $N = 615$

# Asimetría en la producción de $W^\pm$

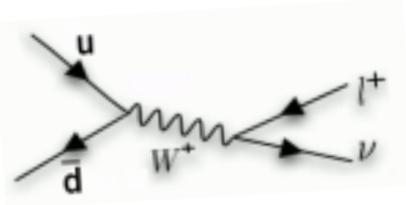


$$u\bar{d} \rightarrow W^+$$

$$\bar{u}d \rightarrow W^-$$

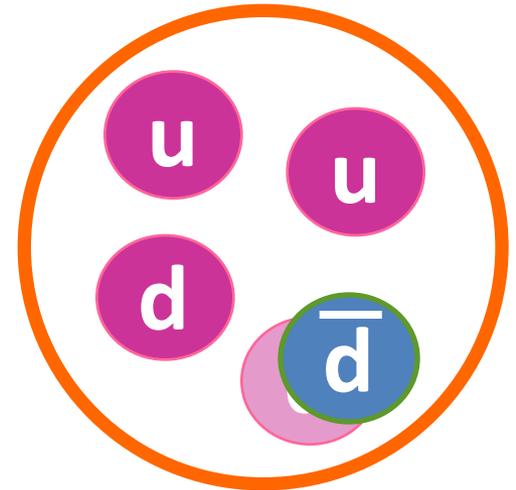
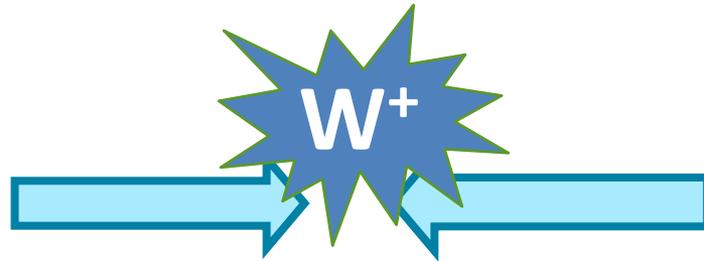
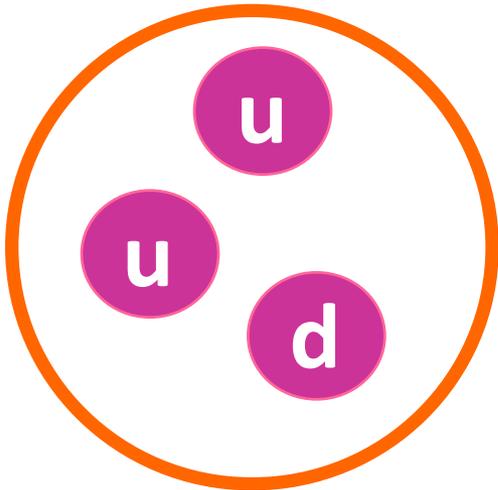
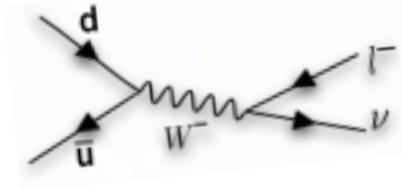


# Asimetría en la producción de $W^\pm$

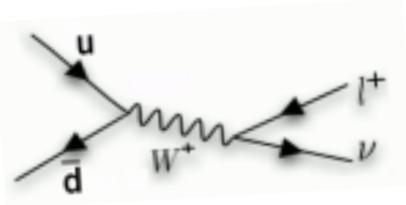


$$u\bar{d} \rightarrow W^+$$

$$\bar{u}d \rightarrow W^-$$

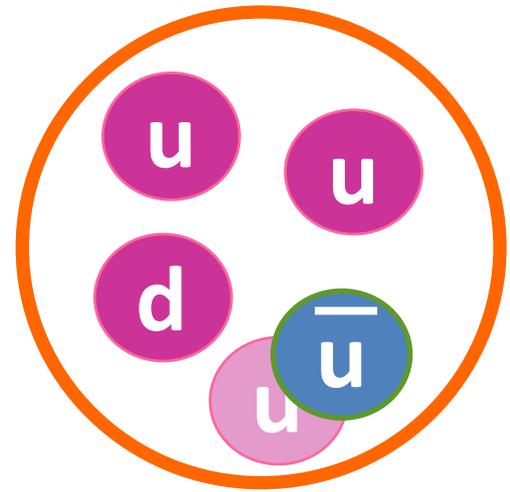
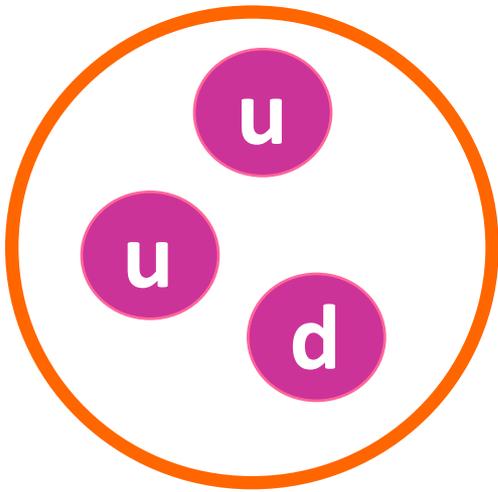
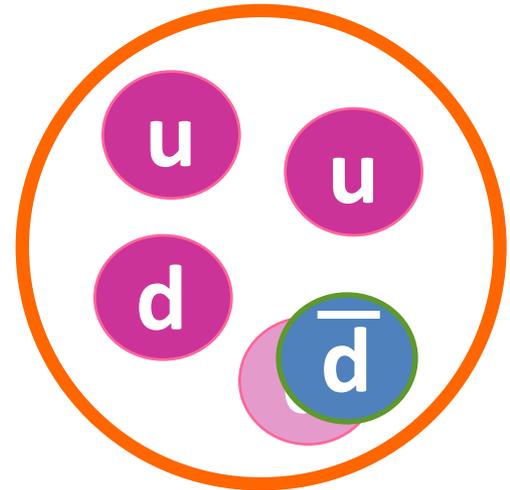
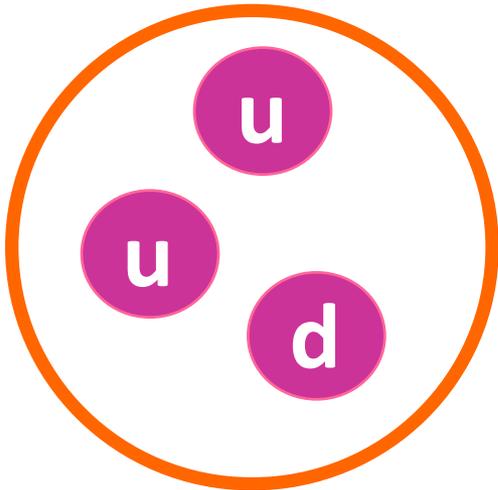
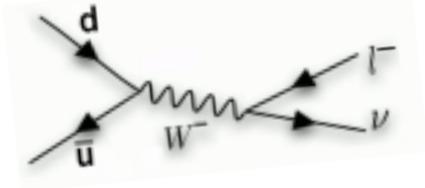


# Asimetría en la producción de $W^\pm$

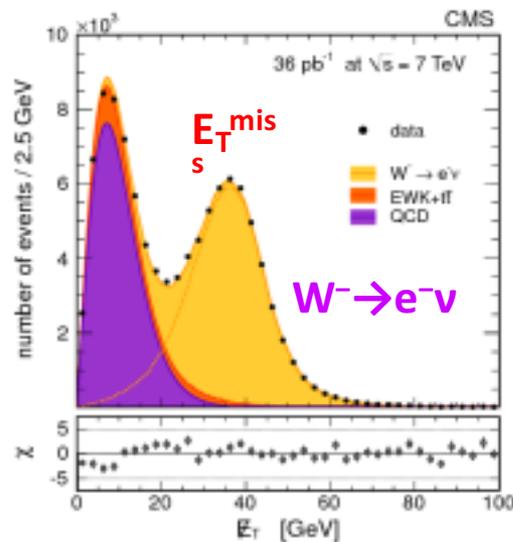
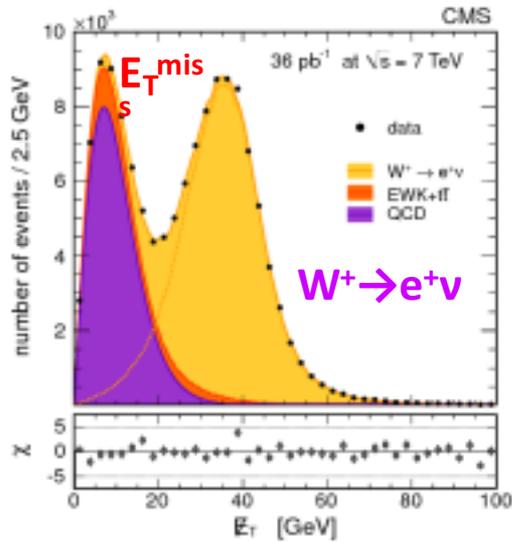


$$u\bar{d} \rightarrow W^+$$

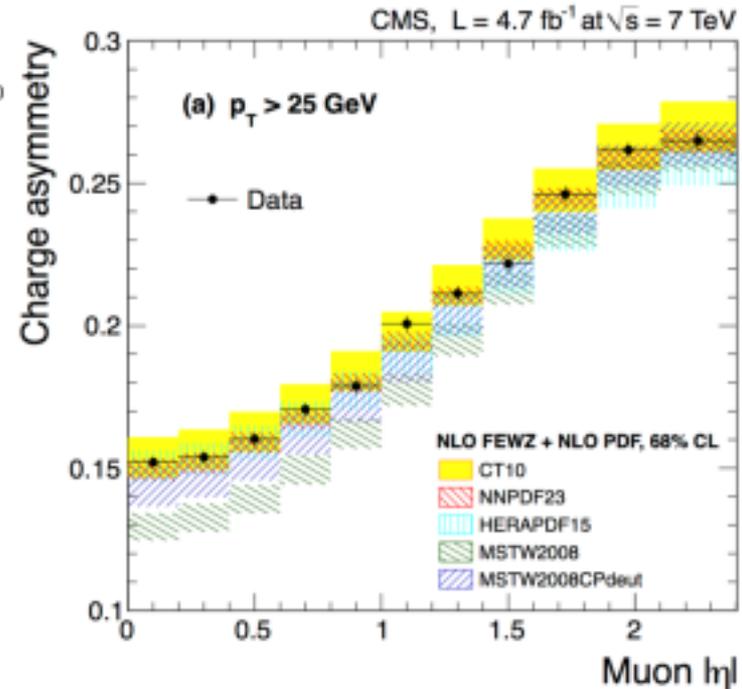
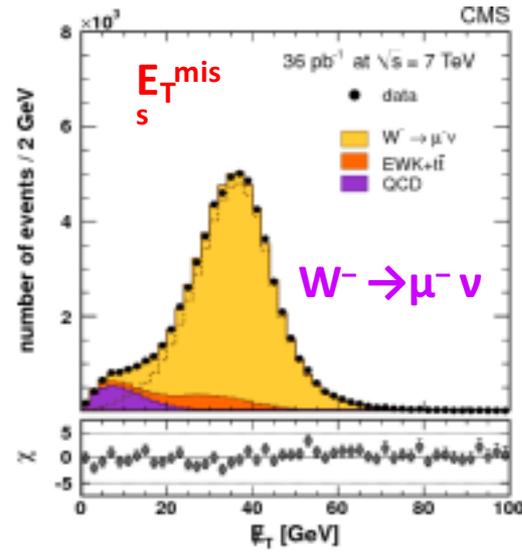
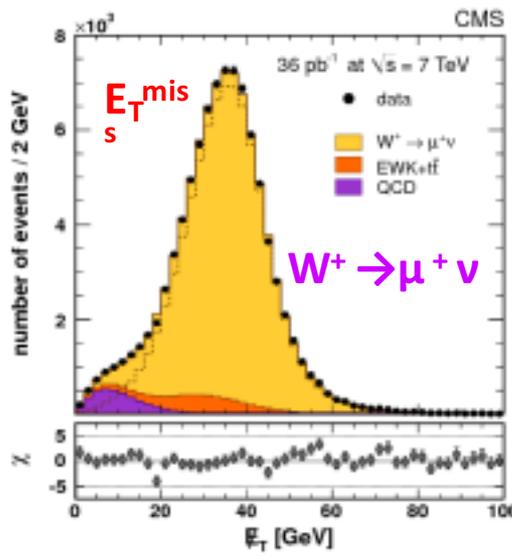
$$\bar{u}d \rightarrow W^-$$



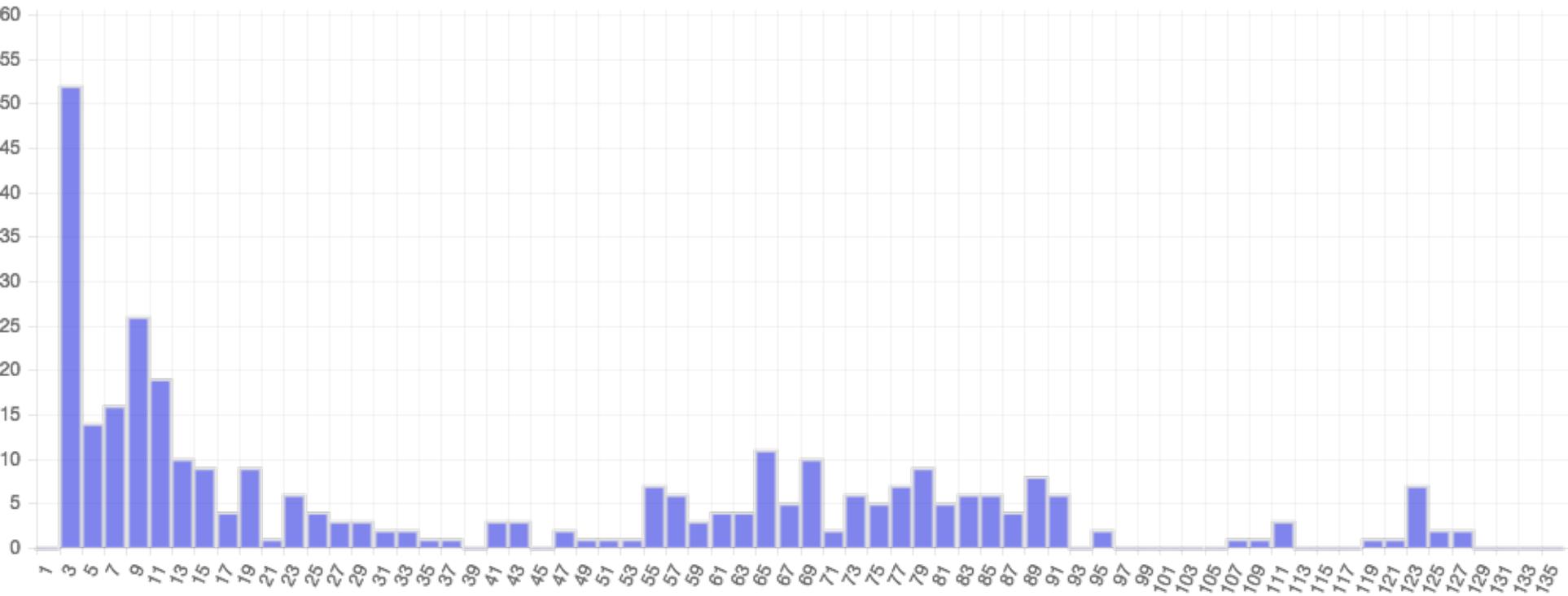
# Asimetría en la producción de $W^\pm$



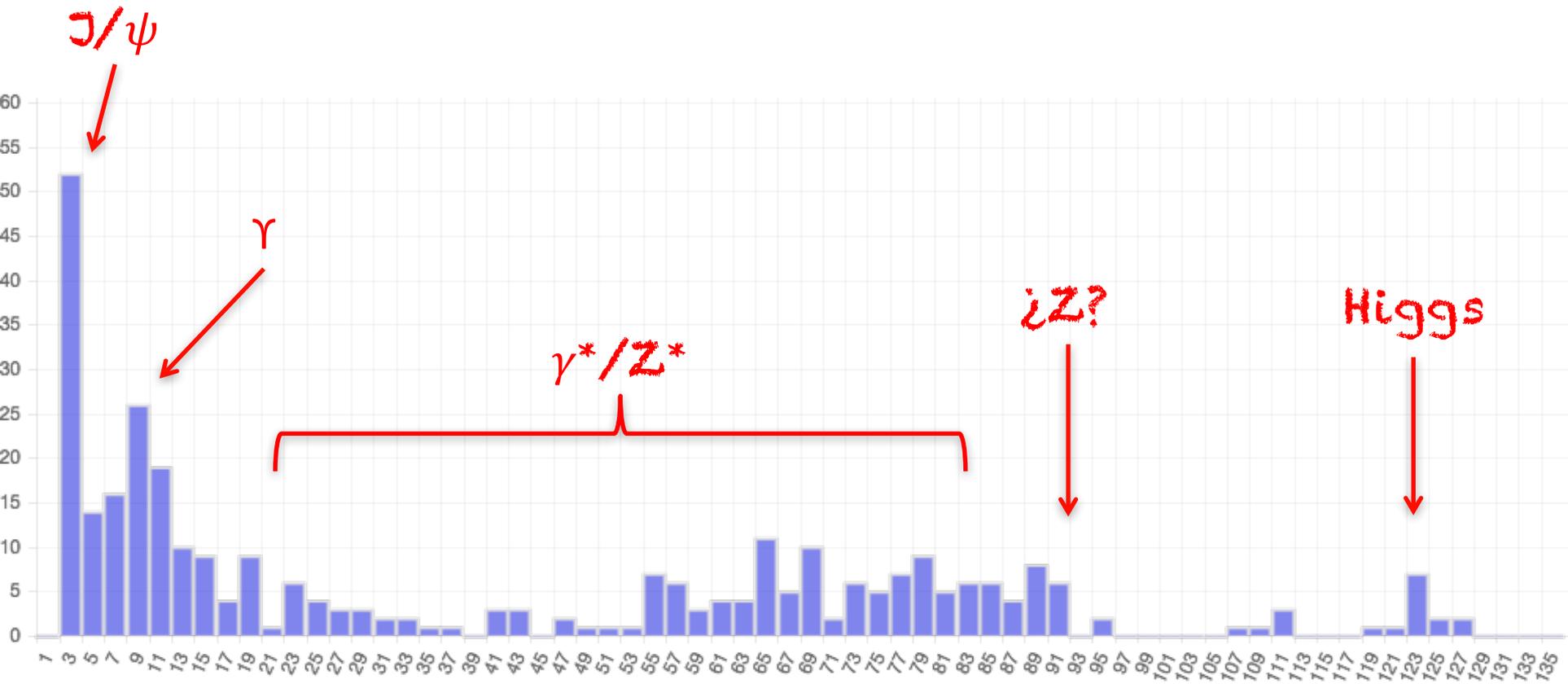
CMS:  $A = 0.23$   
SLTP:  $A = 0.13$



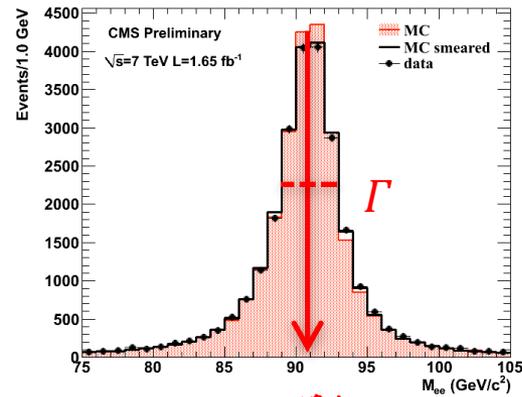
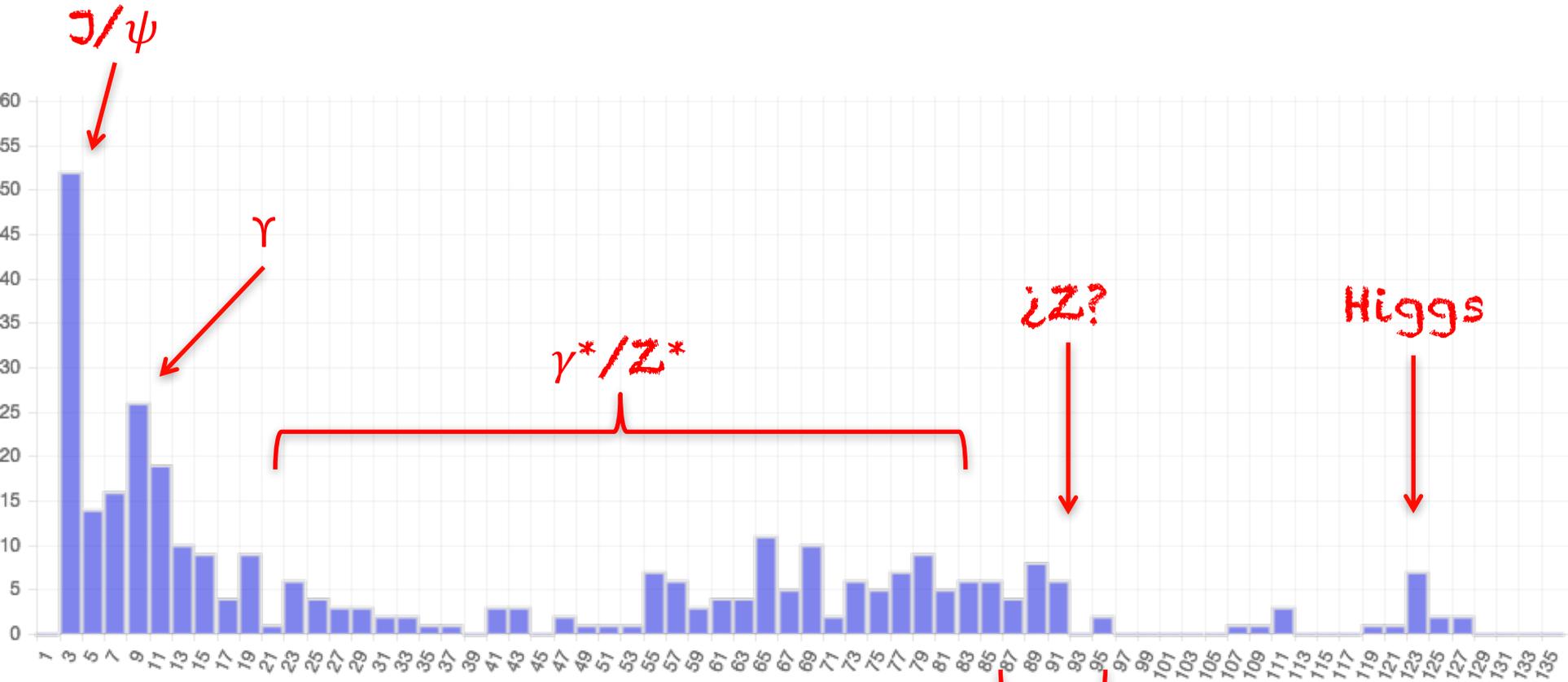
# Espectro de masa de $e^+e^-$ y $\mu^+\mu^-$



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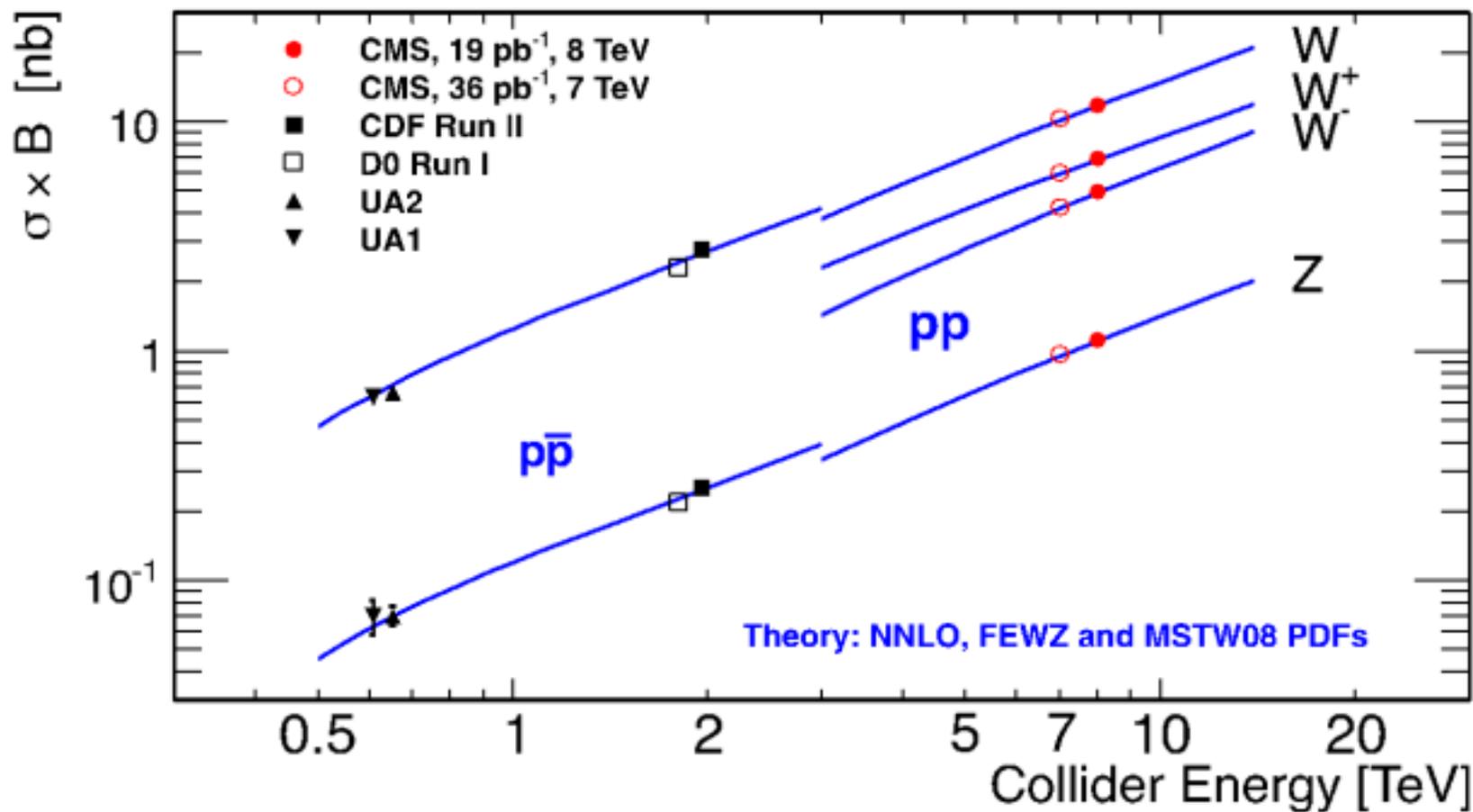


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$$W/Z \approx \sigma(W)/\sigma(Z)$$

CMS:  $W/Z \approx 12$

SLTP:  $W/Z \approx 12.7$  (305/24)



# !!! FELICIDADES SLTP !!!

