



“Tell me that you have found no sign of
New Physics again, I dare you.
I double dare you. Tell me
one more goddamn **time!**”

Anomalies Round Table

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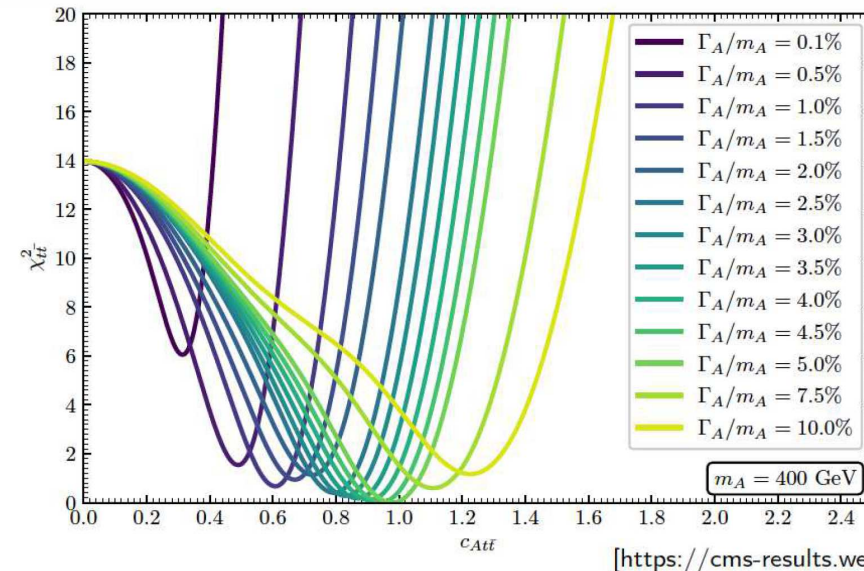
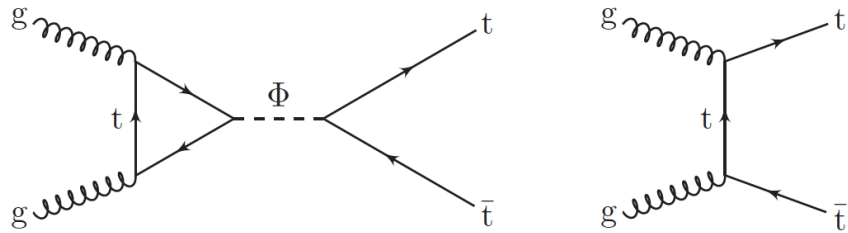
Madrid, 05/2022

Three anomalies (also) at the LHC . . .

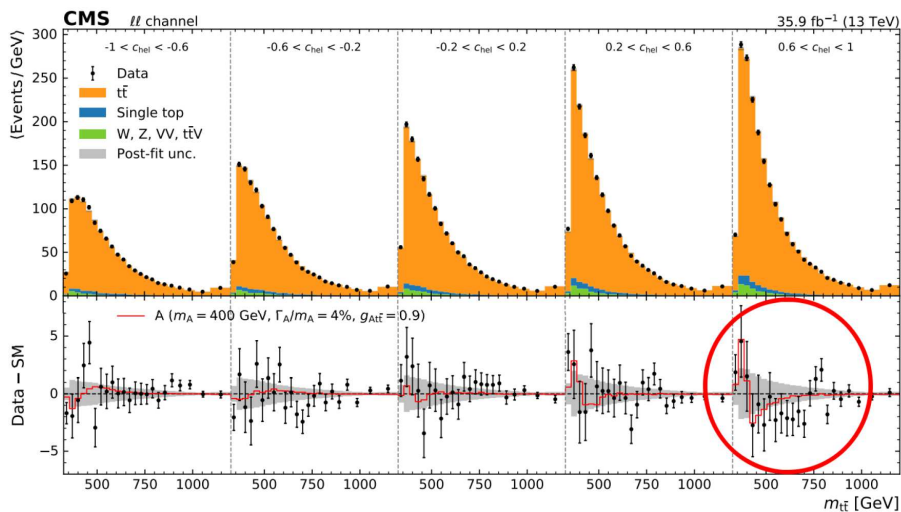
. . . and what the LHC does (not) do about them!

Anomalie I: $pp \rightarrow \phi \rightarrow t\bar{t}$ at $m_\phi \sim 400$ GeV

[CMS '19]



[https://cms-results.web.cern.ch]

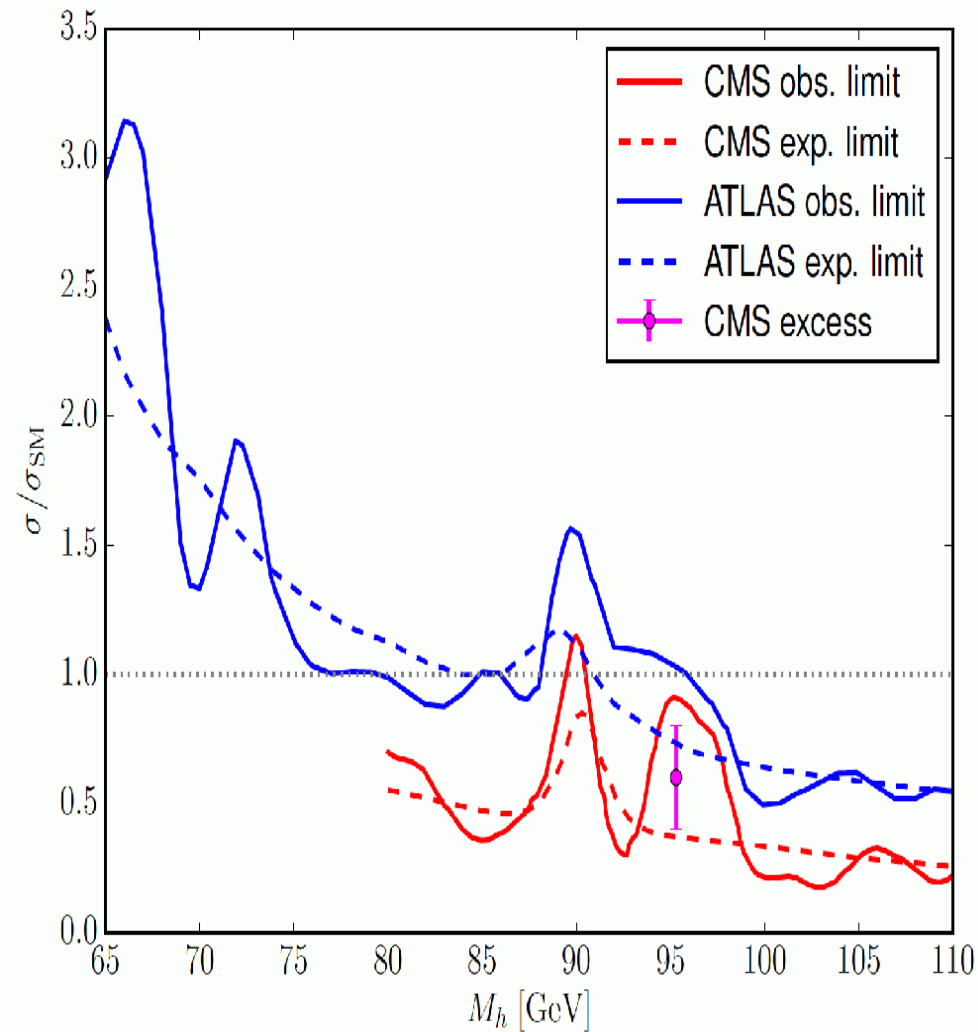


[CMS: 1908.01115]

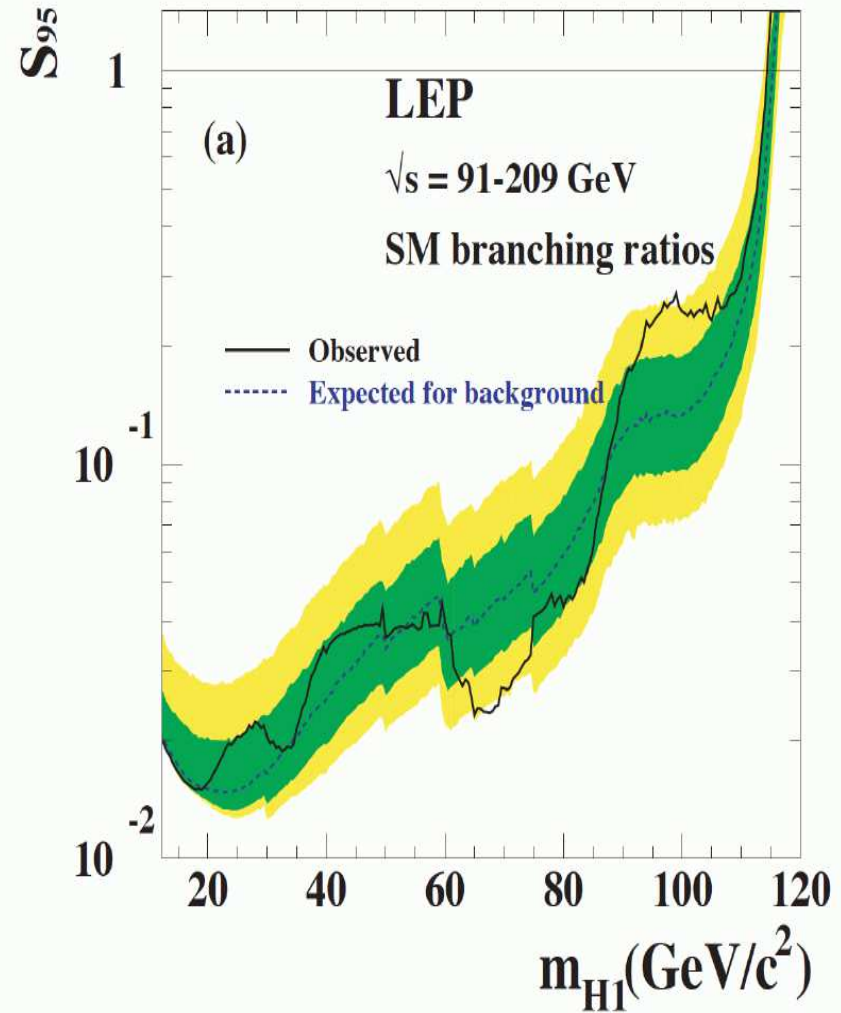
- local significance: 3.5σ
- it took ~ 1 year to get the χ^2 contribution from CMS
- **Where is ATLAS??**

Anomalie II: possible Higgs boson at ~ 95 GeV

CMS: $pp \rightarrow h_{95} \rightarrow \gamma\gamma$



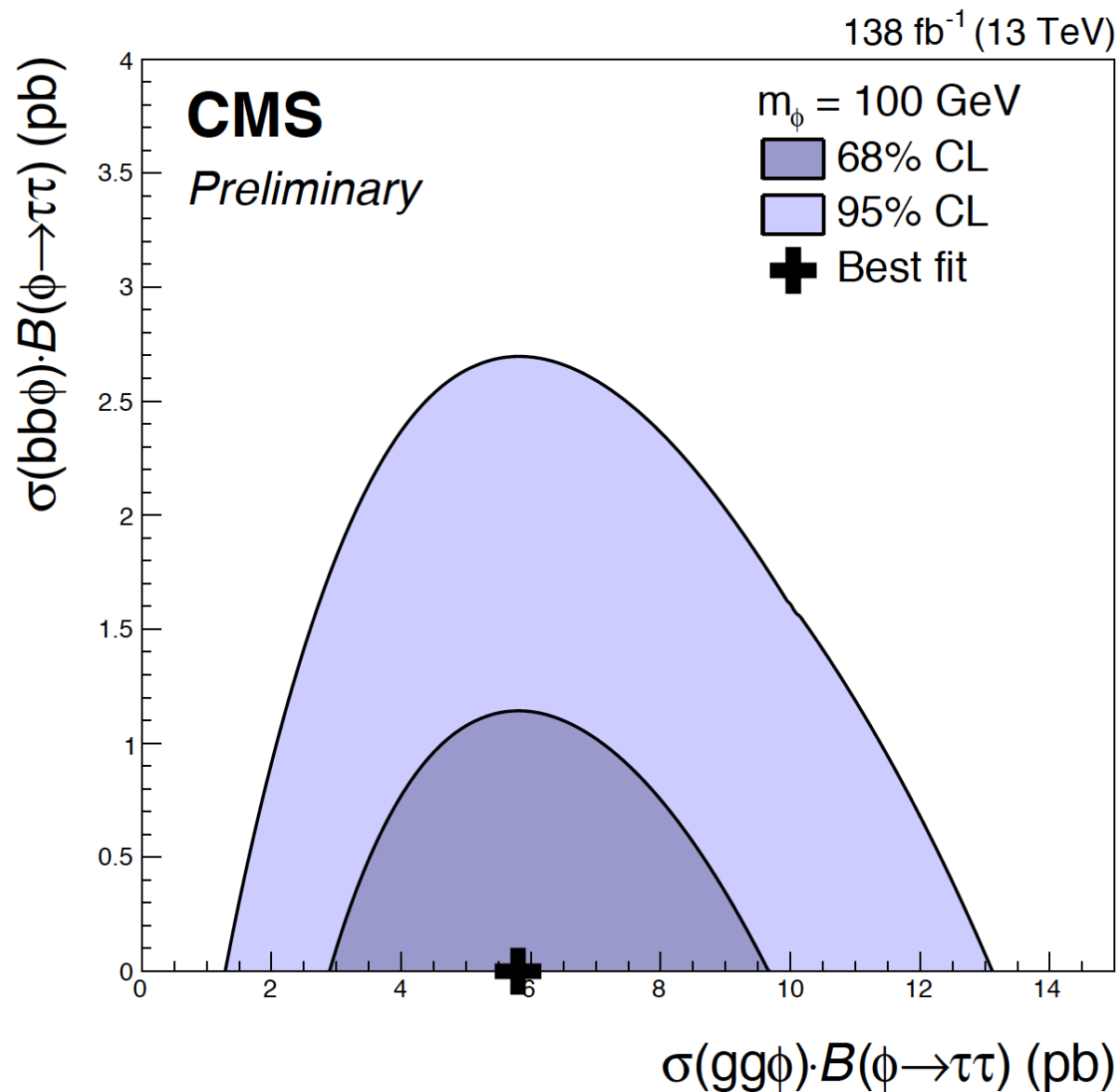
LEP: $e^+e^- \rightarrow Zh_{98} \rightarrow Zb\bar{b}$



Where is ATLAS??

Anomalie II: possible Higgs boson at ~ 95 GeV

[CMS '22]



\Rightarrow clear excess of $\sim 3\sigma$ at ~ 100 GeV \Rightarrow Where is ATLAS?

Now we have three excesses at ~ 95 GeV

$$\mu_{bb}^{\text{exp}} = 0.117 \pm 0.057, \quad \mu_{\gamma\gamma}^{\text{exp}} = 0.6 \pm 0.2, \quad \mu_{\tau\tau}^{\text{exp}} = 1.2 \pm 0.5$$

corresponding to

$$\mu_{bb}^{\text{exp}} \sim 2\sigma, \quad \mu_{\gamma\gamma}^{\text{exp}} \sim 3\sigma, \quad \mu_{\tau\tau}^{\text{exp}} \sim 2.4\sigma$$

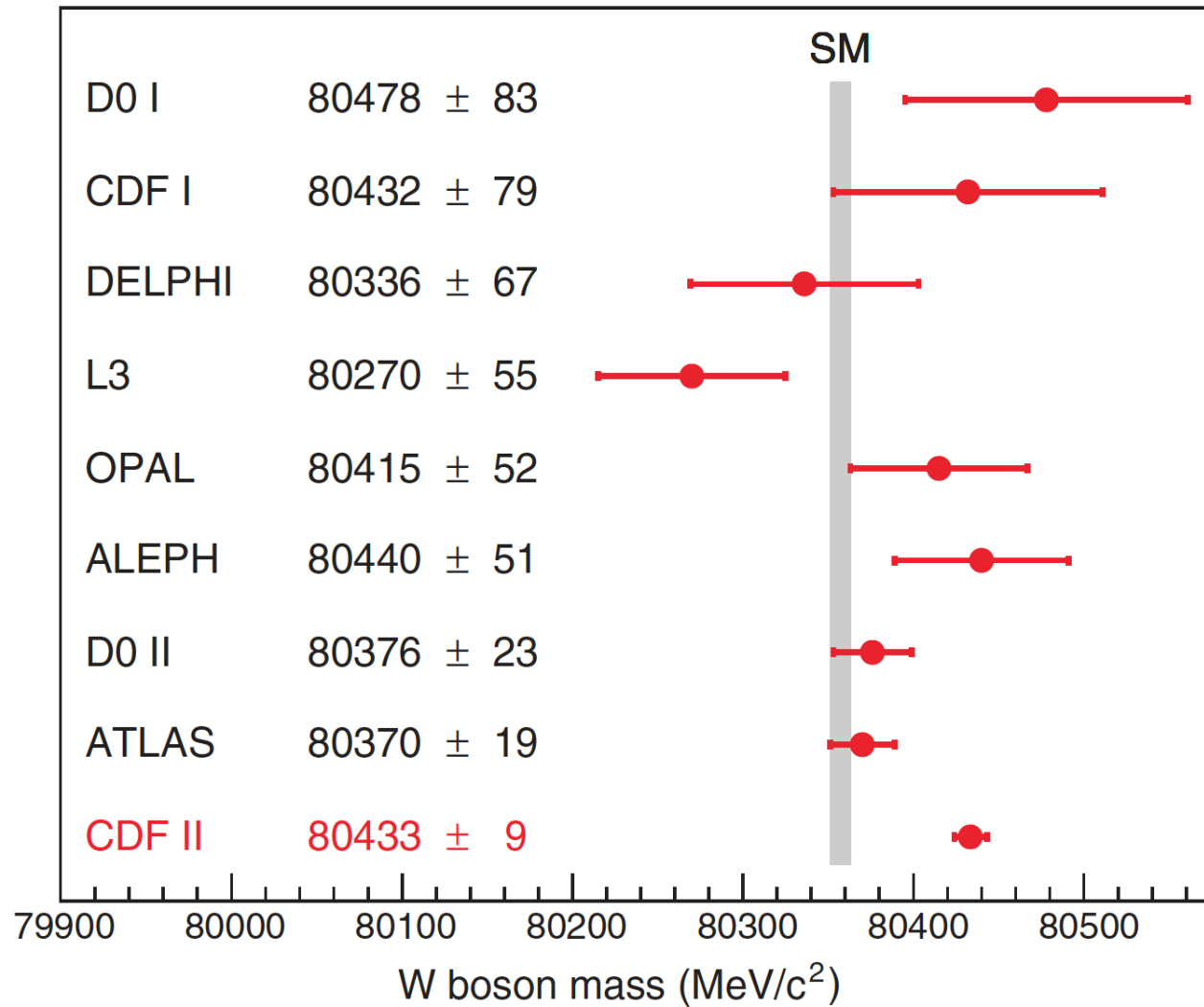
Three (effectively) independent channels

\Rightarrow no LEE (as theorist I am allowed to add naively)

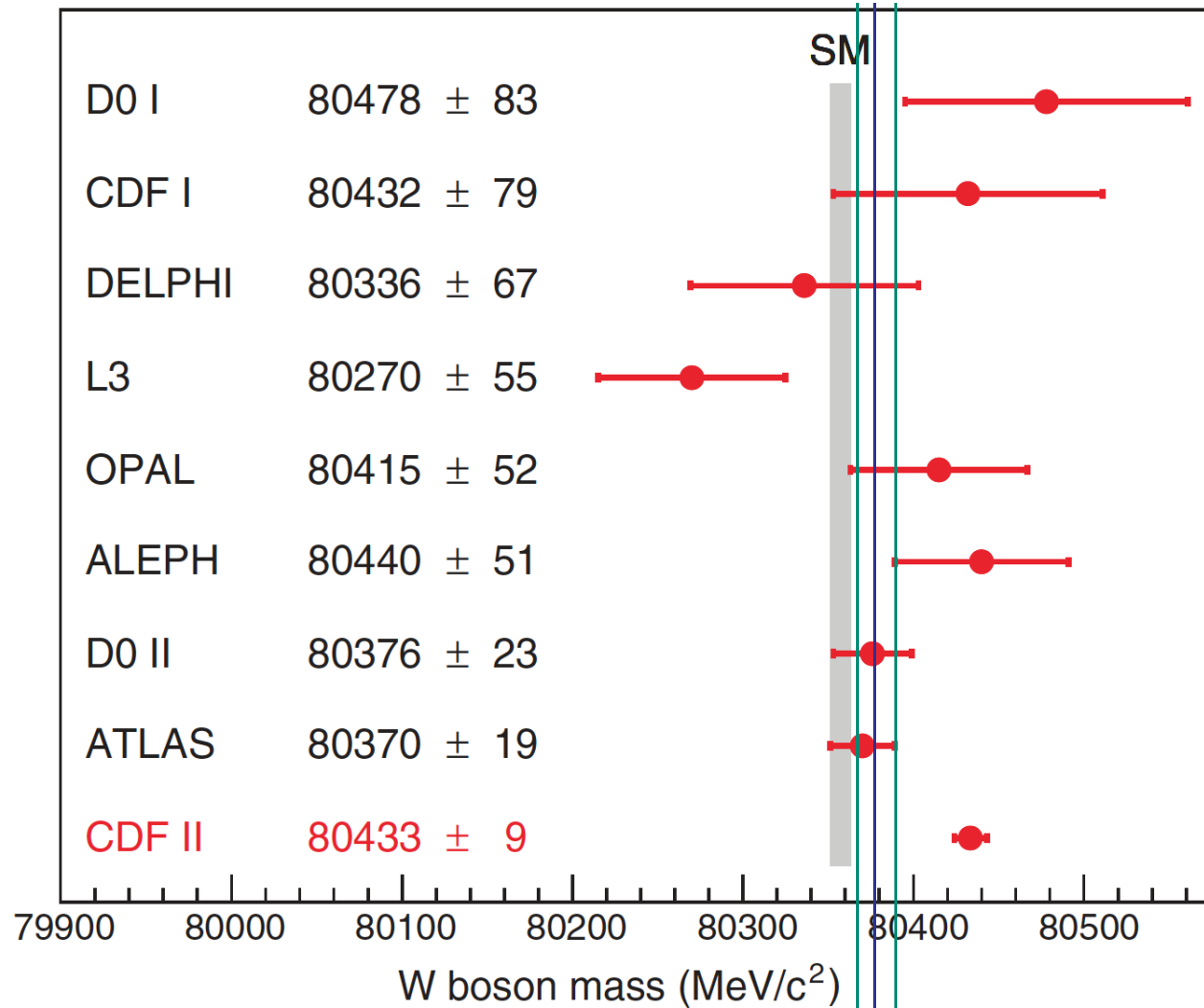
$$\Rightarrow \sim 4.3\sigma$$

$$\chi_{95}^2 = \frac{(\mu_{bb}^{\text{theo}} - 0.117)^2}{(0.057)^2} + \frac{(\mu_{\gamma\gamma}^{\text{theo}} - 0.6)^2}{(0.2)^2} + \frac{(\mu_{\tau\tau}^{\text{theo}} - 1.2)^2}{(0.5)^2}$$

\Rightarrow this has to be clarified (experimentally)! Soon!

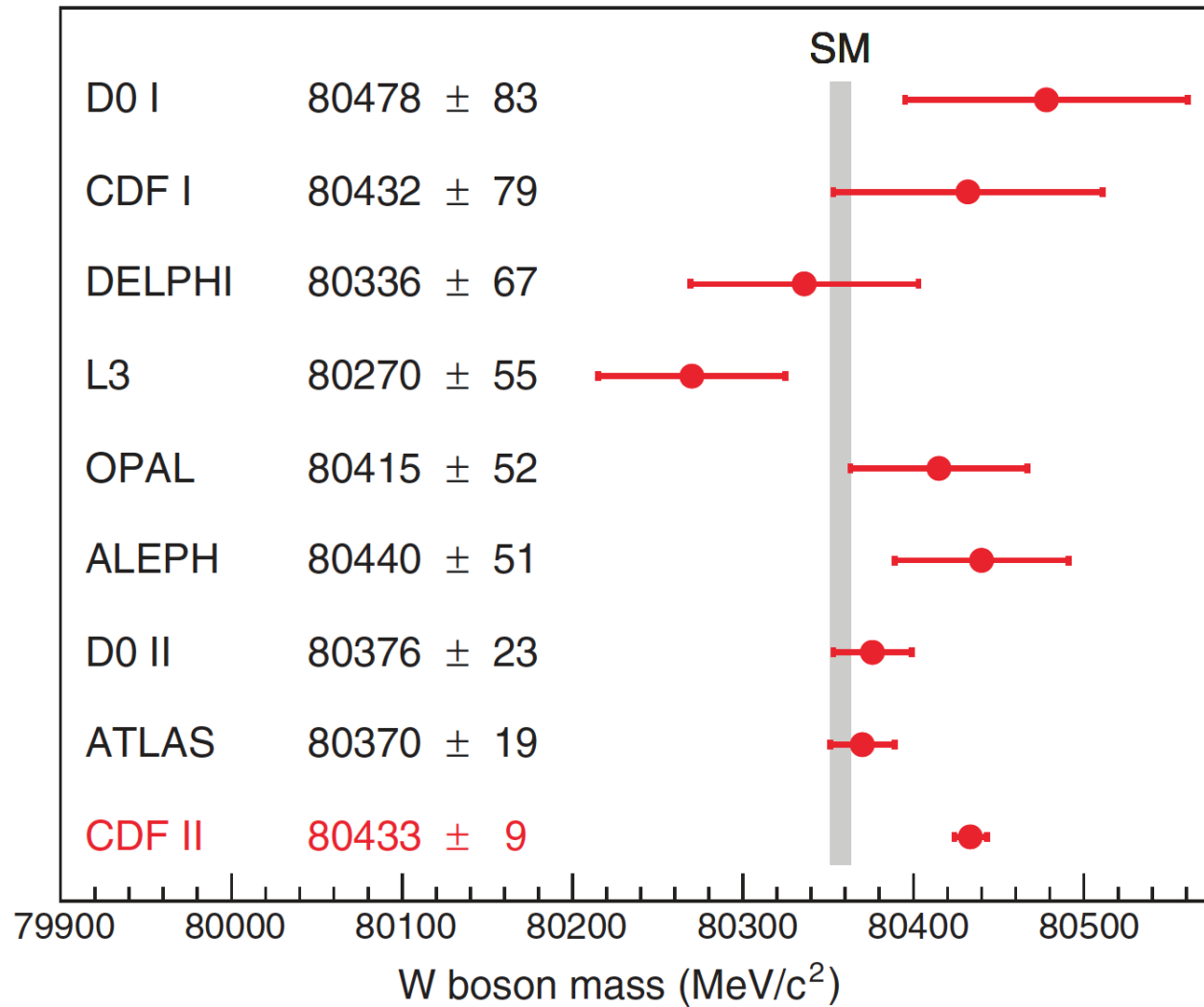


⇒ large discrepancy with the SM prediction



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⇒ large discrepancy with other measurements: $M_W^{\text{PDG}} = 80379 \pm 12 \text{ MeV}$



⇒ large discrepancy with the SM prediction

At least ATLAS got their Run I result out ... ⇒ Where is CMS?