

Ricerca di risonanze in due corpi

discussione

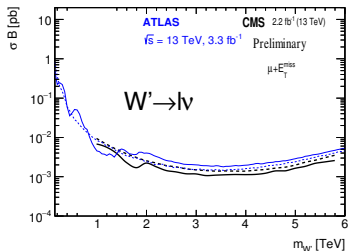
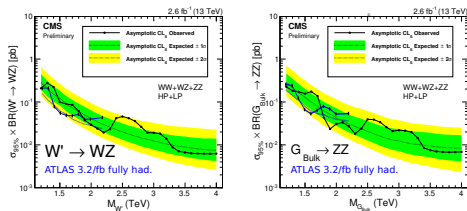
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- Analyses dominated by the statistical uncertainty

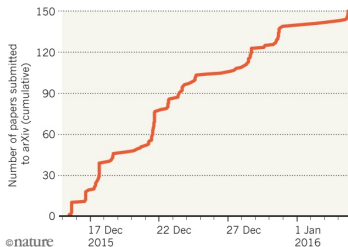


- Similar expected limits. CMS equal in W' with less statistics.

- ATLAS 13 TeV:
 - spin-0 $\Gamma_X = 45$ GeV (6%), z-local: 3.9σ , z-global 2.0σ
 - spin-2 $k/M_{Pl} = 0.2$ ($\Gamma_G = 6\%m_G$), z-local: 3.6σ , z-global: 1.8σ
- CMS 8 + 13 TeV
 - z-local 3.4σ z-global: 1.6σ narrow
- \sim ATLAS CONF cited 334 times on arXiv (ATLAS diboson 8 TeV 2.5σ global “only” 191 times): is this excitement justified?

HINT OF NEW BOSON SPARKS FLOOD OF PAPERS

In just 21 days, physicists have posted 150 papers on the arXiv preprint server about tantalizing results at the Large Hadron Collider.



What is the next step if the excess is confirmed? σ , Γ , spin, $d\sigma/dO$, (limit on) σ_{13}/σ_8

- Other decay channels: ZZ , $Z\gamma$, WW
- If the width is very large (as in ATLAS) it must decay to tt or invisibly. Possible to measure?
- Associated production $X + \gamma$ would allow to determine:
 - production mechanism
 - nature of the resonance (singlet, doublet, CP, ...)
- Look for double production: $\gamma\gamma jj$, $4j$, 4γ (Franceschini et al. 1604.06446)
- Will it be possible to discover other nearby states, if not a singlet?
- Vector-like quarks must be somewhere, not too heavy. Their phenomenology is not necessarily the same as in CHM!

- Shape from MC. Pro: potential null statistical uncertainty, systematics well defined (PDF, scales, experimental effects, ...). Cons: theoretical uncertainty can be large, you have to trust the MC
- Shape (and normalization) from fit with a functional form on data. Pro: data-driven, systematics usually smaller. Cons: **how to choose the (non-physical) functional-form.**
How to study the systematics on the bias?
- ATLAS: spurious signal (SS). $s+b$ fit on MC (repeat for all the uncertainties on MC). $\hat{s}(M)$ is the bias (SS) included in the model ($s + SS + b$).
- CMS: study in MC difference between the true and predicted number of background events in different mass windows
 - create toys from MC normalized to data
 - fit with background-only
 - Assign a systematic to the bkg parametrization if the $|\text{pull}|$ of the fitted events is > 0.5
 - In the final fit add a spurious signal with the normalization distributed as $N(0, \text{bias})$ in such a way that the absolute value of the pull is < 0.5 when introducing the bias.
- Other: discrete profiling method (CMS)