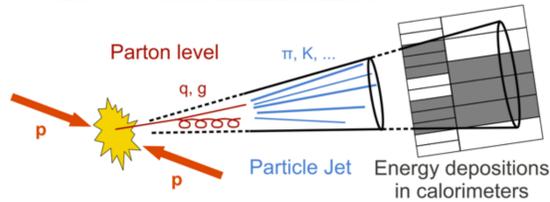


As LHC luminosity and energy increase with respect to Run1 values, many analyses have been focusing upon searches for heavy new resonances decaying into Standard Model objects. An important example is represented by the diboson analyses. One of the most appealing one is the $Z\gamma$, where the analysers look for a Z and a photon in the final state. This particular signature is predicted by many different theoretical models and can probe a very large scale of energy, from hundred of GeV to tenths of TeV. Moreover it can test and validate any possible signature seen in the diphoton analyses as the $\gamma\gamma$ coupling and Feynman diagram are very correlated to the $Z\gamma$ one

WHAT IS A JET?



A jet is a narrow cone of hadrons and other particles produced by the hadronization of a quark or gluon that carry a color charge and therefore cannot exist in free form because of QCD confinement.

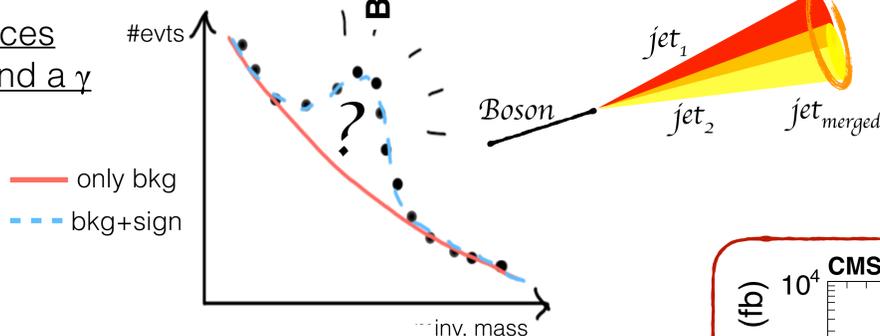
The analysis search for heavy resonances decaying into a jet (the Z candidate) and a γ

- Signal backgrounds:
- irreducible: γ +Jets
 - reducible: QCD, Z+Jets, W+Jets

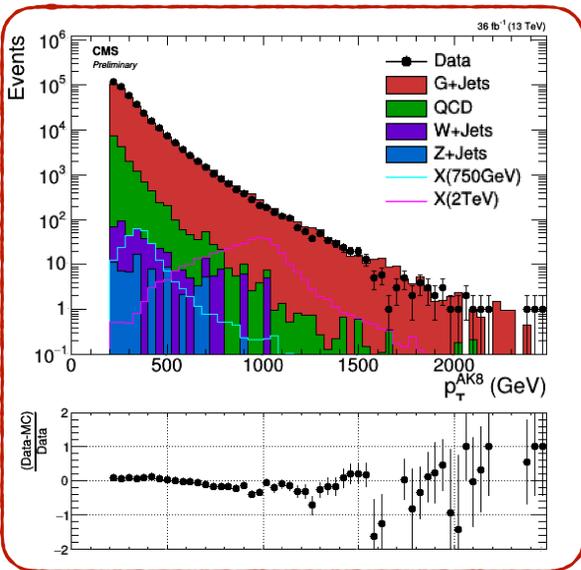
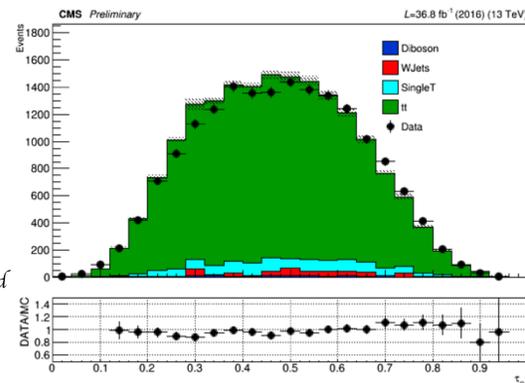
BOOSTED TOPOLOGY

As the resonances searched have a very high mass (greater than 1 TeV), the resulting products of the decay have a high p_T . This means that they will be very collimated and therefore, in the hadronic channels, the two jets coming from the boson, will be reconstructed as a single merged jet.

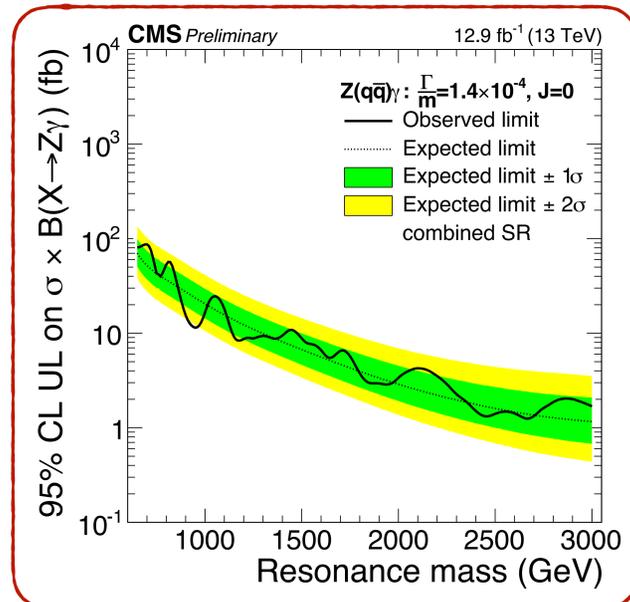
$$\tau_{21} = \frac{\sum_k p_{T,k} \cdot \min(\Delta R_{1,k}, \Delta R_{2,k})}{\sum_k p_{T,k} \cdot \Delta R_{1,k}}$$



The analyses look for a bump in the $Z+\gamma$ invariant mass spectrum



Good Data/MC agreement



NARROW RESONANCE LIMIT

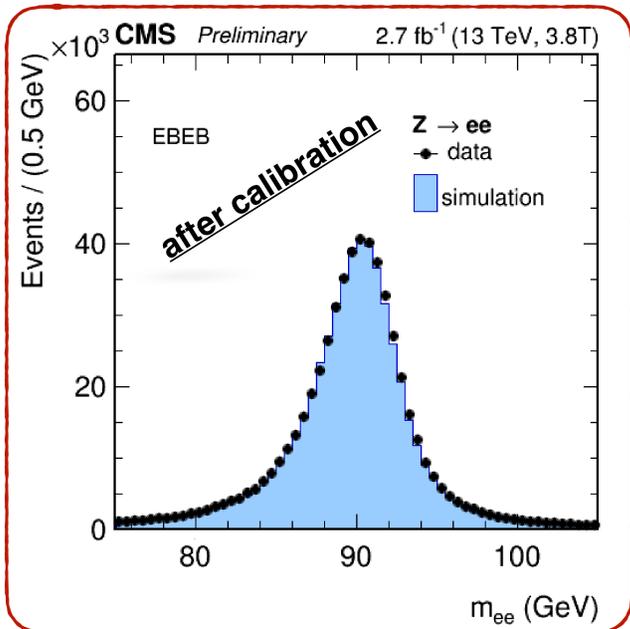
No evidence of new physics so far

The analysis search for heavy resonances decaying into a couple of opposite-sign leptons, which comes from the Z decay and a γ

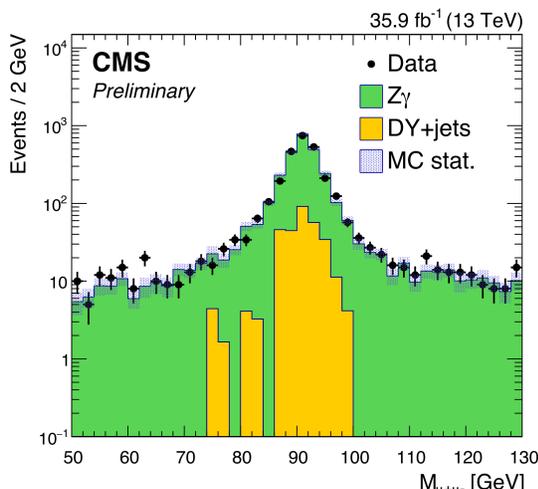
Signal backgrounds:

- Z+ γ , Drell-Yan+Jets

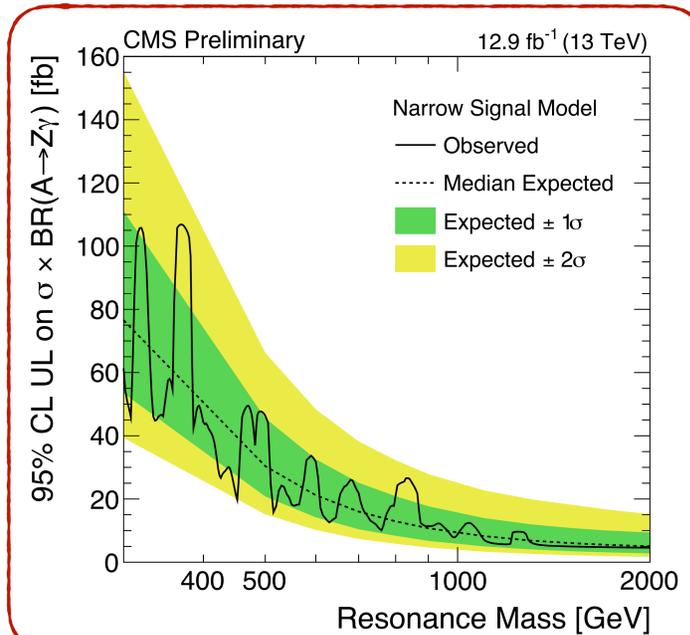
e γ CALIBRATION



To ensure the right energy values coming from reconstructed photons and/or electrons all events are calibrated using a pure sample of leptonically decaying Z bosons (for the γ , the tracks are removed and only the calorimeter deposits are used)



Invariant mass of the opposite charged di-muon system. Clearly visible the Z mass peak



NARROW RESONANCE LIMIT