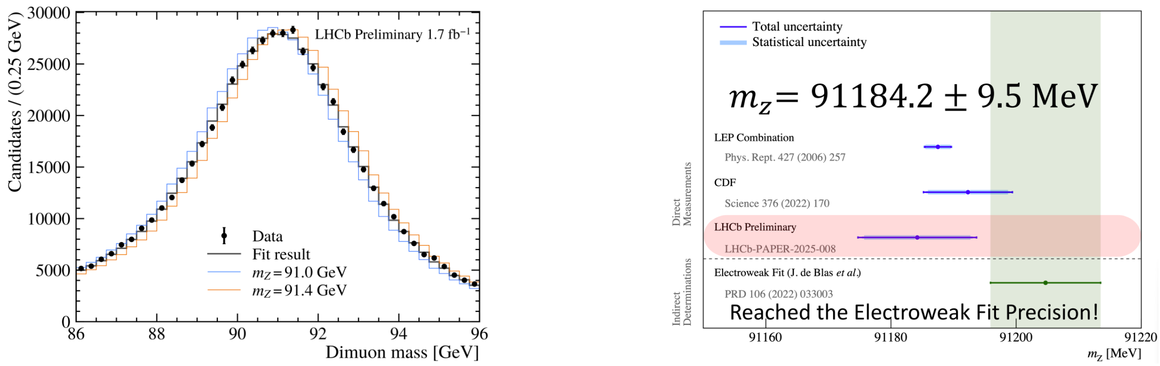

Figure 2 – Fit of theoretical models to the LHCb 2016 dataset as function of the dimuon mass (left), and the measured value of m_Z along with comparisons to other experimental measurements and the global electroweak fit (right).

and momentum calibrations and corrections are employed, including the pseudo-mass method [10] which corrects data for curvature biases.

The observed value of m_Z is found to be 91184.2±9.5 MeV, which is consistent with the SM expectation and similar precision to the global electroweak fit.

4 Probing QCD With Lund Jet Plane Measurement

For many years, QCD theory has held the expectation that there exists a suppression of collinear radiation around quarks during parton showering [11]. This phenomenon is referred to as the dead cone effect. The dead cone effect can be observed experimentally with measurements of the Lund Jet Plane [12], a 2-dimensional observable which details how particles inside a jet shower by angle and momentum.

Direct observation of the dead cone effect has been previously observed by the ALICE collaboration [13] in charm decays. The LHCb measurement expands on this observation by looking for a similar effect in B decays. A light jet enriched sample is collected by selecting jets recoiling from Z boson decaying to a pair of muons. A B initiated jet sample is collected by selecting events with a fully reconstructed B meson in the decay mode $B^{\pm} \to J/\psi(\to \mu^+\mu^-)K^{\pm}$. To ensure a fair comparison between jets, a Winner-Take-All [14] tag is utilized, requiring the heavy-flavor particle to always be the hardest at each decay node of the shower. Lund jet planes are then populated for k_T and z variables using a declustering of jet constituents.

Measured Lund jet planes for k_T are provided in Figure 3. Suppression of small angle emissions is observed in the B-tagged jet sample in comparison to the light jet enriched sample, producing the first observation of the dead cone effect in B-initiated jets.

5 Exotic Decays and Outlook for Run 3

Significant EW and QCD measurements have been recently performed by the LHCb collaboration. The significant increase in expected delivered integrated luminosity of Run 3 will significantly enhance these fields, alleviating the loss of precision due to limited sample sizes. Additionally, the exotic searches targeted by LHCb [15] [16] with this sample have significant increases in sensitivity thanks to the fully software-based triggering and event reconstruction. The coming years are expected to yield incredibly fruitful results from the LHCb electroweak, QCD, and exotics physics program.