Contribution ID: **36** Type: **Oral**

Evaluation of the impact on measurements precision in search for resonances at ATLAS Experiment

Motivated by the recent emergence of multi-lepton anomalies as deviations from Standard Model (SM) predictions in several ATLAS and CMS analyses of Large Hadron Collider data, it is anticipated that the production of Higgs-like scalar H and excesses in the multi-lepton final states at the Large Hadron Collider will have a significant rate. A 2HDM+S model, where S is a singlet scalar in the mass range of 130 GeV to 160 GeV, describes these anomalies reasonably well and could point to the existence of physics beyond the Standard Model (BSM). Here we search for such excesses at a mass of $m_S = 150$ GeV in the $Z\gamma$ final state, where Z boson decays leptonically to $\mu^+\mu^-$ and e^+e^-. In order to understand well the distributions of BSM signal and SM background, accurate and precise measurements are crucial. The quantification of anticipated experimental systematic uncertainties and spurious signals impacting measurement precision are the focus of this study. According to preliminary results, both systematic uncertainties and spurious signal over its background fluctuations ($S/\delta S$) are within the allowable threshold of 5% and 50%, respectively.

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