

Figure 1: Description of Angles

1 Distribution of Helicity Angles

Several other kinematic quantities characterize the $Z\gamma$ final state. These include the helicity angles, $\theta_Z, \phi_Z, \theta_{\ell^+}, \phi_{\ell^+}$. The first two represent the polar and azimuthal angles of the Z -boson in the $Z\gamma$ rest frame. The last two denote the polar and azimuthal angles of the positively charged lepton in the rest frame of the Z -boson. The quantity $\psi = \phi_{\ell^+} - \phi_Z$ can be interpreted as the angle between the $Z\gamma$ production plane and the Z decay plane.

Figures 2, 3, and 4 compare the distributions of $\cos \theta_Z, \cos \theta_{\ell^+}$, and ψ observed in the data to those predicted by the standard model. The agreement between data and Monte Carlo verifies detailed aspects of the CMS efficiency corrections.

A future analysis will extract the helicity parameters underlying these angular distributions. The helicity analysis may be sensitive to interference effects not present in the distributions of photon p_T .

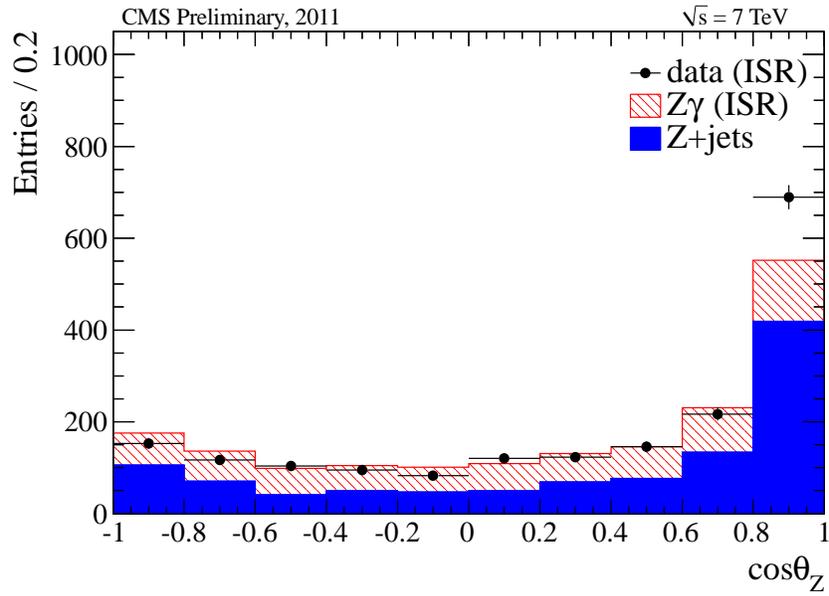


Figure 2: Comparison between data and SM prediction for $\cos\theta_Z$

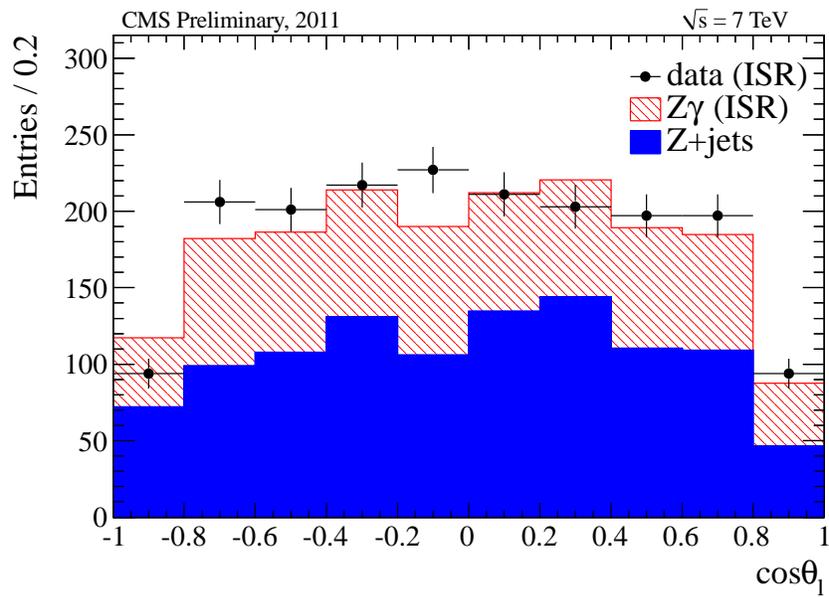


Figure 3: Comparison between data and SM prediction for $\cos\theta_\ell$

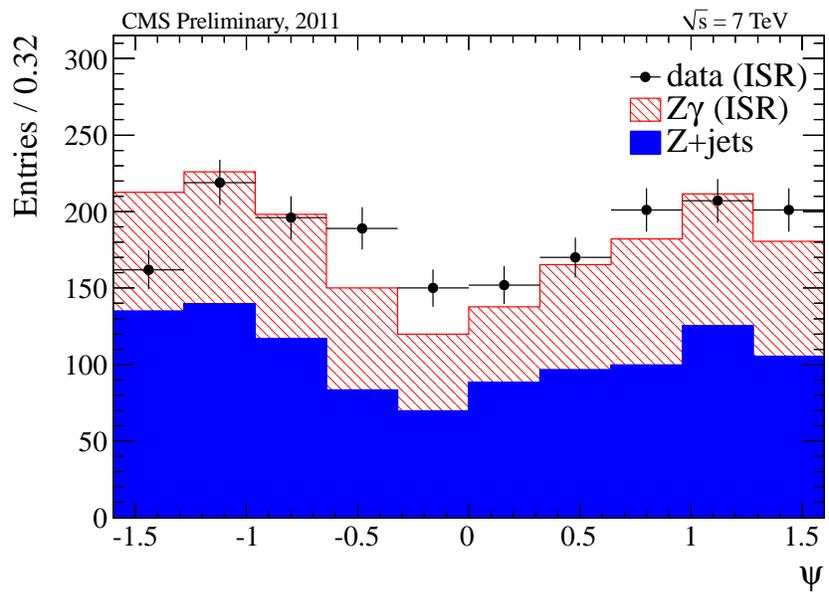


Figure 4: Comparison between data and SM prediction for ψ