Search for the $X(5568)$ state decaying into $B_{s}^{0}\pi^{\pm}$ in proton-proton collisions at $\sqrt{s} = 8$ TeV

— Supplemental Material —

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EFFECT OF $\Delta R(B_{s}^{0},\pi^{\pm})$ REQUIREMENT ON THE $M^{\Delta}(B_{s}^{0}\pi^{\pm})$ DISTRIBUTION

The D0 Collaboration obtains a significance above five standard deviations for the $X(5568)$ state only when an upper limit on $\Delta R = \sqrt{(\Delta \eta)^2 + (\Delta \phi)^2}$ is imposed, namely, $\Delta R < 0.3$. Here, $\Delta \eta$ and $\Delta \phi$ are the pseudorapidity and azimuthal angle (in radians) differences between the directions of the $B_{s}^{0}$ and $\pi^{\pm}$. As shown in Fig. 1, a requirement on this variable significantly changes the $M^{\Delta}(B_{s}^{0}\pi^{\pm})$ distribution and can even produce a peaking shape; therefore, it is not used in this analysis.

FIG. 1. The $M^{\Delta}(B_{s}^{0}\pi^{\pm})$ distributions for events in the $B_{s}^{0}$ (a) signal and (b) sideband regions for different $\Delta R$ requirements. The uncertainties are not shown for the sake of clarity. The vertical band indicates the region $m_{X} \pm \Gamma_{X}$.