

## Supplemental Material for *BABAR-PUB-21/002*

### *Search for Darkonium in $e^+e^-$ Collisions*

Additional figures for the dark sector bound state search are presented in this Supplemental Material.

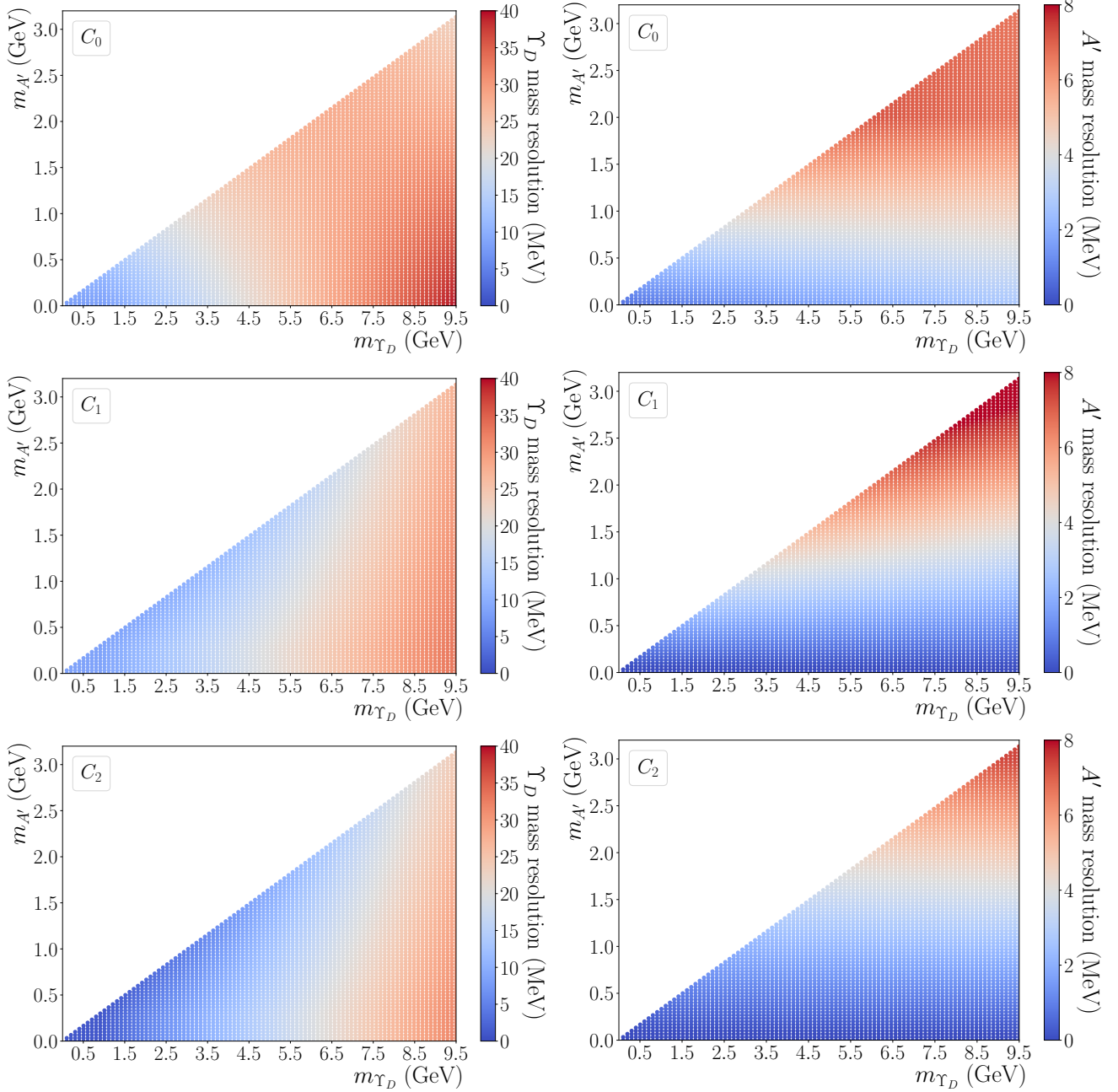


FIG. 1: The  $\Upsilon_D$  and  $A'$  mass resolution for each category of events (see text) for prompt  $A'$  decays.

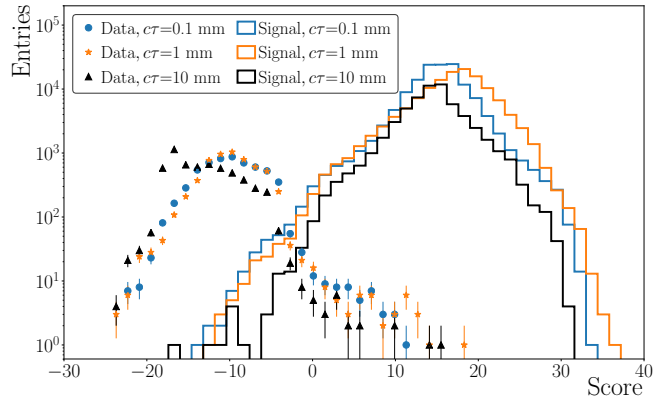


FIG. 2: The distribution of the classifier scores for data (markers) and signal MC simulations (solid lines) for dark photon lifetimes corresponding to (top)  $c\tau_{A'} = 0.1$  mm, (middle)  $c\tau_{A'} = 1$  mm, and (bottom)  $c\tau_{A'} = 10$  mm. The MC simulations are arbitrarily normalized.

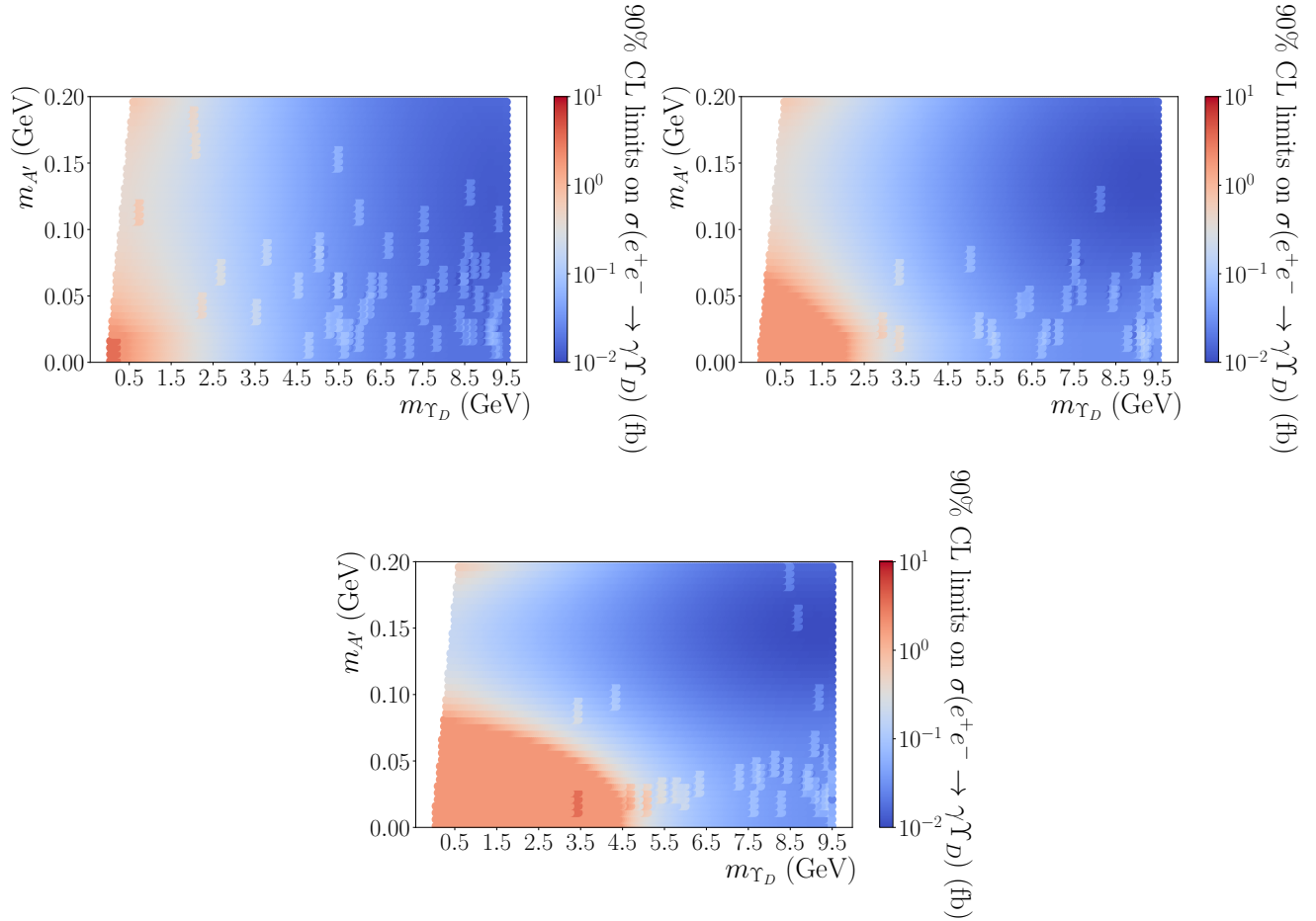


FIG. 3: The 90% CL upper limits on the  $e^+e^- \rightarrow \gamma\Upsilon_D$  cross section for dark photon lifetimes corresponding to (top left)  $c\tau_{A'} = 0.1$  mm, (top right)  $c\tau_{A'} = 1$  mm, and (bottom)  $c\tau_{A'} = 10$  mm.

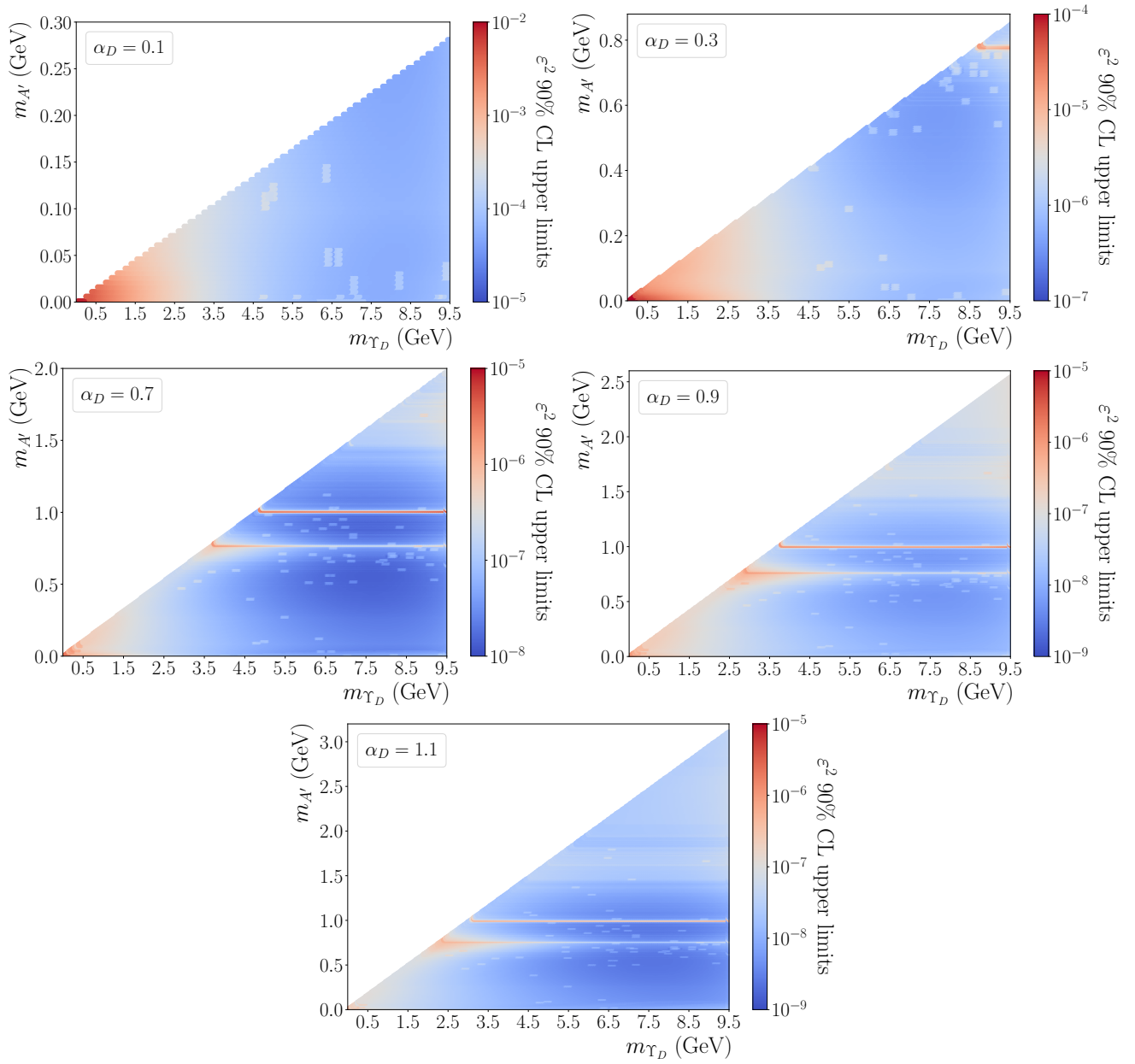


FIG. 4: The 90% CL upper limits on the kinetic mixing  $\epsilon^2$  as a function of the  $\Upsilon_D$  mass,  $m_{\Upsilon_D}$ , and dark photon mass,  $m_{A'}$ , assuming (top left)  $\alpha_D = 0.1$ , (top right)  $\alpha_D = 0.3$ , (middle left)  $\alpha_D = 0.7$ , (middle right)  $\alpha_D = 0.9$ , and (bottom)  $\alpha_D = 1.1$ .