

XVI. Physics Reach of DarkSide-20k



- A. Simulation Tools Description
- B. Studies of Backgrounds
- C. DarkSide-20k sensitivity to WIMPs

8187 should be moved into the section of Ar procurement and made consistent with the rest. Augusto I think should take care of this. it seems to me that there are statements not in agreement with what in that section. e.g Kr should be removed by Urania. do we state the need of 2 passes with Aria? fine but must be removed
 also the discussion on the shipping Ar should be moved to the procurement chapter

Table XIV some strange numbers

TABLE XIV. Expected β/γ and nuclear recoil (NR) backgrounds expected during the full DarkSide-20k exposure, based on current data and Monte Carlo simulations. The center column gives the total number of single-scatter events within the energy region of interest before the application of the fiducial and veto cuts and the PSD. The right-most column is the total number of events surviving the veto cut, fiducial volume cut, and PSD. Internal β/γ background does *not* include the ^{39}Ar depletion expected from Aria. External backgrounds are shown for a stainless steel cryostat.

Source	Events in ROI [100 t yr] ⁻¹	Background [100 t yr] ⁻¹
Internal β/γ	2.6×10^8	0.06
Internal NR	–	–
External β/γ	10^7	<0.05
External NR	Bianca?	0.120 ± 0.006
Cosmogenic β/γ	3×10^5	$\ll 0.01$
Cosmogenic NR	–	<0.1

8182 can we show with simulation that PSD improved from Ds50 to Ds20K by the factor we need and we promise at the beginning of the chapter?

fig 112 Again it is not clear why a fix acceptance cut of 10% of NR events is used. At high #of PE there is no overlap with the background. At low #of PE it would be useful to take lower acceptance on NR but go to lower threshold. (maybe you already thought about this and excluded for some reason).

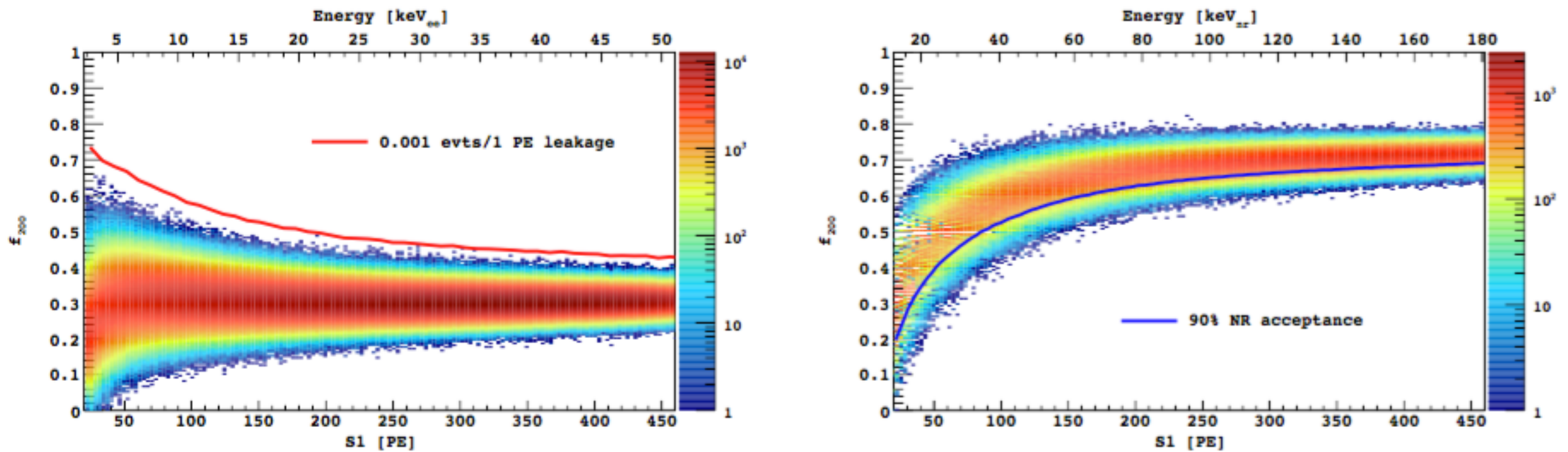


FIG. 106. **Left:** Distribution of f_{200} as a function of S1 for ^{39}Ar betas. The red line on the left plot shows the leakage curve for β 's generated from the requirement of 0.005 events/(5-PE bin). **PDM: Is the energy scale messed up? YES**

Right: Distribution of f_{200} as a function of S1 for NRs. The blue curve delimits the 90% NR acceptance region. The WIMP search region is the region above both curves, red and blue.

what cuts are applied to obtain such a sensitivity? fiducial cuts? Definition of fiducial? how precisely is fiducial defined?

how does S2 perform?