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# Low radioactivity argon for rare event searches

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$^{39}\text{Ar}$  and  $^{42}\text{Ar}$  are irreducible backgrounds for several argon-based dark matter and neutrino experiments. The use of low-radioactivity underground argon (UAr) could be a solution to the problem. The DarkSide-50 experiment demonstrated that argon derived from underground sources can be highly depleted of  $^{39}\text{Ar}$ . Following this success, the Global Argon Dark Matter Collaboration (GADMC) is procuring hundreds of tons of UAr for the DarkSide-20k detector. However, there is a broader community need, making it increasingly important to identify new sources of low-radioactivity argon. In addition, understanding the underground production mechanisms of argon radioisotopes and devising methods to measure them at ultra-low levels is necessary.

In this talk, I will discuss how the use of low-radioactivity argon could be crucial to expanding the physics goals and sensitivity of next-generation large-scale argon-based experiments. The underground production mechanisms of  $^{39}\text{Ar}$  and  $^{42}\text{Ar}$  will be discussed.  $^{42}\text{Ar}/^{42}\text{K}$  decay backgrounds and an estimate of  $^{42}\text{Ar}$  production in the continental crust will be presented in some detail. Finally, the prospects of a kilo-ton scale UAr experiment will be discussed.

**Primary author:** SHARMA POUDEL, Sagar

**Presenter:** SHARMA POUDEL, Sagar

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