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Pb-210 and Po-210 as a background source in the DarkSide Experiment

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The quest of the existence of dark matter is one of the most exciting topics in modern particle physics and astrophysics. The DarkSide experiment has been designed to search for direct interactions of the cold dark matter particles using argon depleted in Ar-39. This special gas is sourced from an underground reservoir of carbon dioxide. Due to expected extremely low signal different techniques have been implemented to minimize the background. Currently the DarkSide-20k (DS-20k) detector is under construction in the underground laboratory at Gran Sasso (LNGS) in Italy.
One of the most important background sources in dark matter searches are neutrons, especially those produced in the (alpha, n) reactions. This is because signals generated by neutrons are indistinguishable from those expected from dark matter particles. Alpha particles can be produced for example by 210Po, a daughter of the long-lived 210Pb (T1/2 = 22.3 years), which can be present in the detector materials (belongs to the U-238 chain). Techniques developed to detect Pb/Po-210 at very low concentrations will be presented. They allow for proper analysis and selection of various materials to be used in the experiment. It has been also shown that Po may diffuse metals from the bulk towards the surface. This effect can cause underestimation of the neutron background at material interfaces (for example: copper – Teflon, copper - argon). This „new type" of background may be important not only for DarkSide but also for other experiment searching for direct dark matter interactions. A method and tools developed to study Po diffusion in various metals will discussed.

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