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Radiopure crystal scintillators for rare-event searches: my PhD work recognized by the SIF "Ettore Pancini" Prize

I present the core results of my PhD research - recognized with the SIF "Ettore Pancini" Prize for Nuclear and Subnuclear Physics - on the development and characterization of highly radiopure scintillating crystals for rare-event searches. At the DAMA low-background facilities (LNGS), I conducted calibration campaigns, data taking, and analyses with enriched $^{106}\text{CdWO}_4$ and next-generation Cs_2ZrCl_6 (and related A_2MX_6) scintillators to search for double-beta decay modes in ^{106}Cd and $^{94,96}\text{Zr}$. I will discuss crystal selection and radiopurification; detector performances (energy resolution, long-term stability), and analysis techniques (PSD, time-amplitude analysis) that yielded new and more stringent half-life limits in several decay channels. I will then outline how these methods inform my current work within a national PRIN project and the CUPID and GAIAS collaborations, highlighting ongoing detector R&D, background mitigation, and sensitivity projections toward next-generation searches.

Session Classification: Radiopure crystal scintillators for rare-event searches: my PhD work recognized by the SIF "Ettore Pancini" Prize