



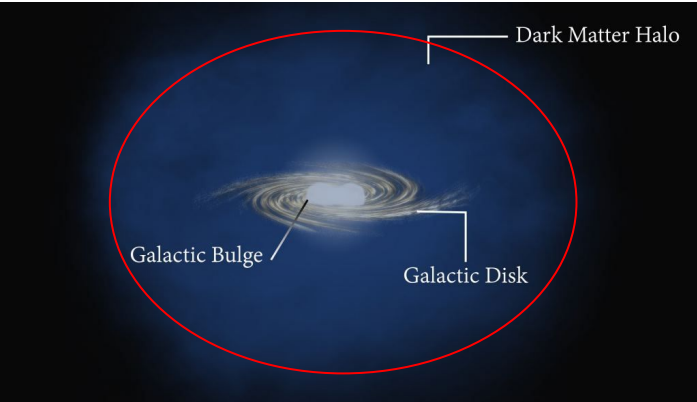
Direct dark matter searches with the DarkSide-20k TPC

Evi Nikoloudaki

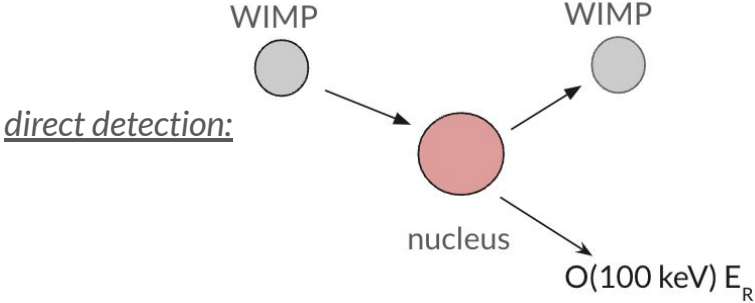
Biennale 22.05.2024



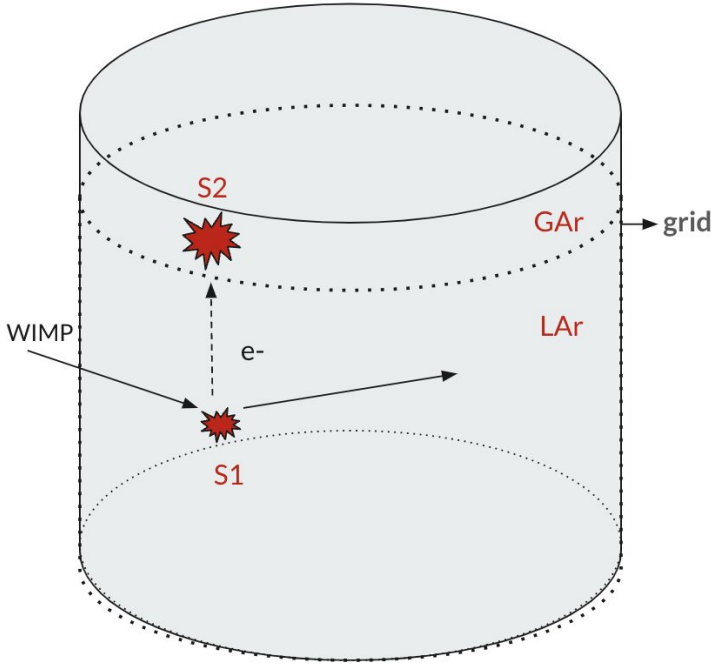
DarkSide-20k



WIMPs = Weakly Interacting Massive Particles



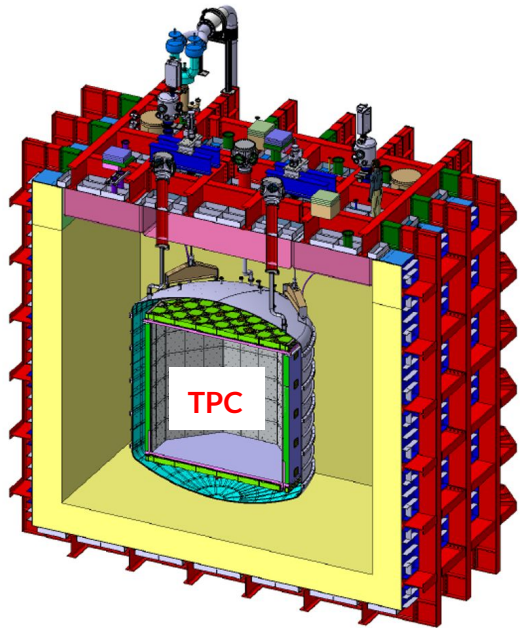
Liquid Argon dual phase time projection chamber (TPC)



- S1:** scintillation signal in liquid Ar
- S2:** scintillation from electroluminescence of electrons in gaseous Ar

DarkSide-20k

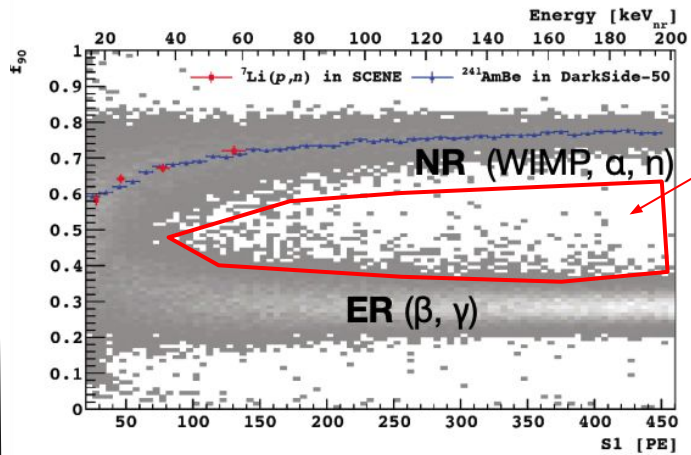
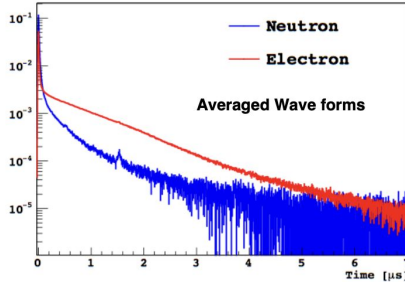
The DarkSide-20k detector at Gran Sasso, Italy:



- TPC with **50 tons** of underground liquid Ar
- inner and outer veto
- ~ 261k SiPMs (2720 channels)

Main backgrounds

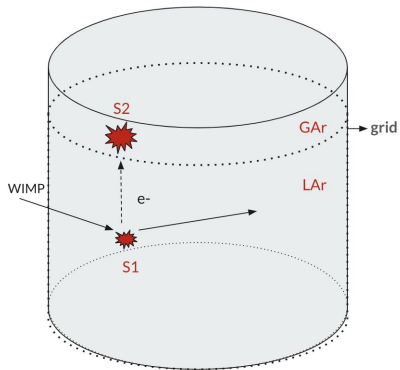
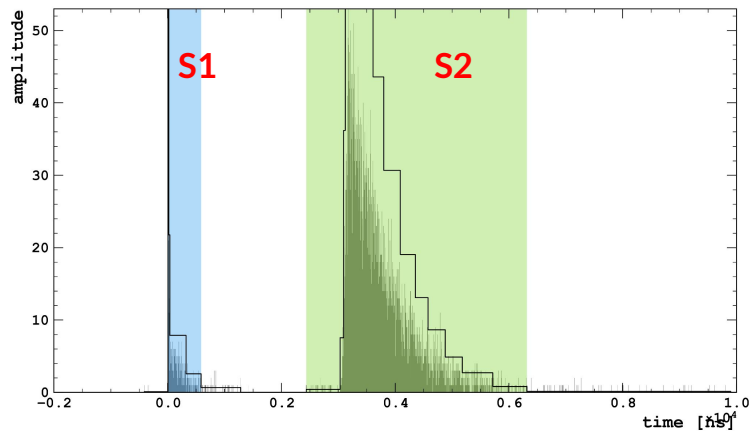
- NR
- radiogenic and cosmogenic neutrons
 - alphas
- ER
- β and γ decays



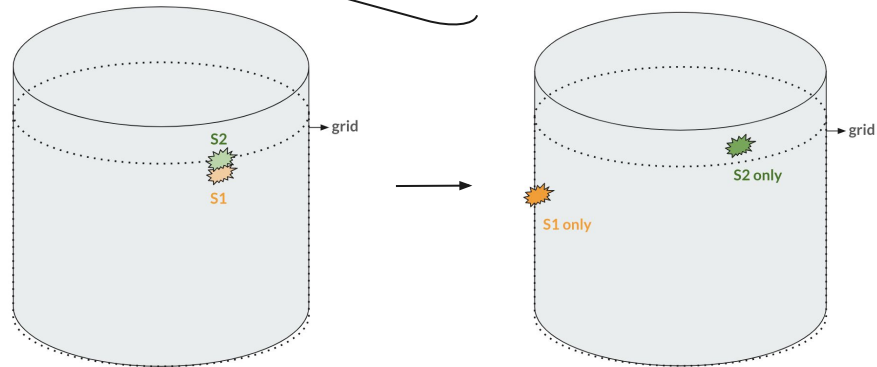
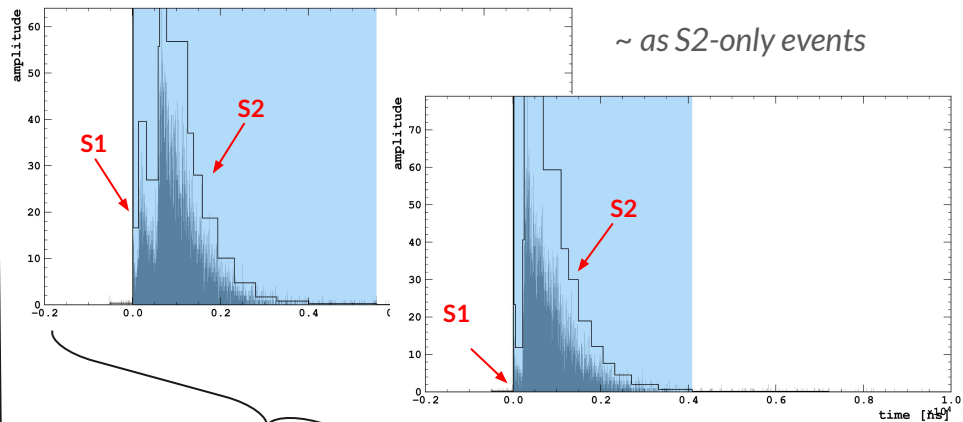
outliers
e.g. S1-only + S2-only events

Background studies

standard event:



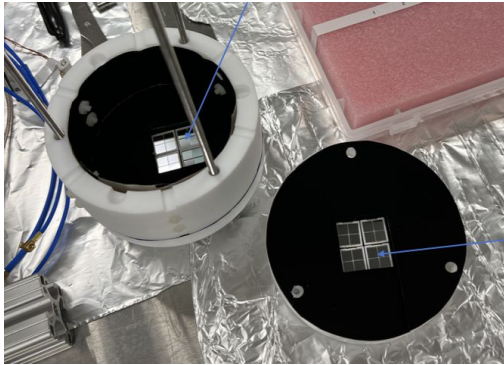
unresolved events:



X-ArT: Xenon-Argon Technology

Ar-Xe mixture:

- + no wavelength shifter
- + faster scintillation response
- + higher light yield



4 channels detect only Xe light (**175 nm**)

4 channels detect both Ar and Xe light (**128 and 175 nm**)

characterization of the Ar-Xe scintillation

