Results from the ORPHEUS dark matter detector


University of Bern, Switzerland

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A superconducting Sn granule detector

An energy deposition of 1 keV produces a temperature increase of 100 mK.
(bath temp. =110 mK, gran. diam= 35 µm)

$T_c = 3.72$ K

Results from the ORPHEUS dark matter detector
Energy threshold

Results from the ORPHEUS dark matter detector

Superheating field distribution:
The experiment

56 pick-up coils: half with granules with 24-32 \( \mu m \) diameter and half with 34-39 \( \mu m \)

Total mass=450 g

Inside each coil, there is a mixture of Tin with dielectric Teflon (with a volume filling factor of 10 % of Tin).

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Experimental setup

ORPHEUS is located in the underground laboratory of the University of Bern (70 m.w.e)

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Amplitude distributions

Big granules

The amplitude of the pulses allows to distinguish the single granule flip.

Small granules

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**Muons**

**Front view of one module**

Muon counting rates:

Simulation (GEANT4)

A muon event

2 gran. flip

1 gran. flip

2 gran. flip

Pick-up coil
Results from the ORPHEUS dark matter detector

Single rates

The small granules have better discrimination power than the big granules
Preliminary results

\[ \rho_{\text{halo}} = 0.3 \text{ GeV cm}^{-3} \]

\[ V_E = 243.5 \text{ km s}^{-1} \]

\[ v_{\text{esc}} = 570 \text{ km s}^{-1} \]

\[ \sigma_v = 270 \text{ km s}^{-1} \]

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Flip multiplicity in the detector

The small granules have more discrimination power than the big ones.

Data at $\Delta H/H = 0.075\%$

With $^{57}$Co source:

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