

Status of the dark matter search in the COSINE-100 experiment



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The DAMA/LIBRA Puzzle

- DAMA/LIBRA observation : significance $> 13\sigma$ over 20+ years of running

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- DAMA's claim contradicts findings from other experiments
- Is the NaI(Tl) target itself the key to the DAMA/LIBRA signal?

COSINE-100 Experiment @ Y2L, Korea

106kg NaI(Tl) detector

Lifetime (years): 6.12 years (95.65%)
Good Data: 5.84 years (91.39%)
Calibration

6.4-year data taking

Event Selection | JINST 19 (2024) P12013

Analysis threshold for 3-year data : 0.7keV

Accumulated waveform

PSD parameters

Multi-layer perceptron (MLP)

Cut decision

Annual Modulation Search | Model-independent

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No modulation in COSINE-100 6-year data

No modulation in COSINE-ANAIS combined data

We ruled out DAMA with 3.57σ (COSINE-100 6-year data), 4.68σ (COSINE-ANAIS combined data)

Background Understanding

Counts/day/kg/keV

Single-Hit Events

- Data
- Total
- Internal
- Cosmogenic
- External
- Surface

WIMP Search | Model-dependent

WIMP-nucleon σ_N (pb)

WIMP-proton σ_p (pb)

WIMP Mass (GeV/c^2)

WIMP Mass (MeV/c^2)

Lowering Threshold to 0.49keV

How is it possible?

- Signal generation by Waveform simulation *NIMA* **1065** 169489 (2024)
- Individual training per number of clusters (NC)

Cluster

Isolated pulse that over threshold

In case of 5 NC

WIMP search with the full 6-year data is ongoing

WIMP search sensitivity for COSINE-100 6-year data

WIMP-proton SD cross section (pb)

WIMP Mass (GeV/c^2)