Contribution ID: 6 Type: 海报展示

# 基于高纯锗探测器的反应堆中微子 CEνNS 探测实验


## 摘要

中微子-原子核相干弹性散射 (CEνNS) 是标准模型中一种基本的中微子-物质相互作用。在该相互作用中，原子核作为一个整体与中微子发生弹性散射。CEνNS 探测实验将帮助研究人员检验标准模型和研究超越标准模型的新物理。CEνNS 探测还可能成为实时监测反应堆功率和探测太阳与超新星中微子的新方法。此外，CEνNS 将会成为下一代暗物质直接探测实验的重要本底来源。因此，CEνNS 探测已成为近年来中微子物理领域的一个重要前沿课题，国际上有大量的 CEνNS 探测实验正在运行或建设中。但是，CEνNS 极低的截面对 CEνNS 探测器的阈值和本底提出了极高的要求。中国的 CDEX-RECODE 实验是一个基于高纯锗探测器的反应堆中微子 CEνNS 探测实验，实验将在中国浙江三门核电站进行。CDEX-RECODE 实验预计将拥有大约 160eVee (1keVnr) 的能量阈值、小于 2cpkkd 的低能区本底和极好的长时间稳定性，在同类型实验中拥有较大的优势。本文对 CDEX-RECODE 实验进行了介绍，并对该实验的未来进行了展望。



## 关键词

中微子-原子核相干弹性散射；反应堆中微子；CDEX-RECODE 实验；高纯锗探测器



## Abstract

Coherent elastic neutrino-nucleus scattering (CEνNS) is a fundamental neutrino-matter interaction predicted by the Standard Model, in which neutrinos elastically scatter off entire atomic nuclei. Detection of CEνNS not only enables researchers to verify the Standard Model but also provides opportunities to explore physics beyond it. Furthermore, CEνNS measurements could potentially offer new approaches for real-time reactor monitoring and detection of solar and supernova neutrinos. CEνNS will also emerge as a significant background source for next-generation dark matter direct detection experiments. Given its importance, CEνNS detection has become a frontier topic in neutrino physics, with numerous detection experiments currently operating or under development worldwide. However, the extremely low cross section of CEνNS poses significant challenges for detector threshold and background requirements. The CDEX RECODE experiment, a reactor neutrino CEνNS detection experiment utilizing high purity germanium detectors, is scheduled to operate at the Sanmen Nuclear Power Plant in Zhejiang, China. With its projected energy threshold of approximately 160 eVee (1 keVnr), the low-energy background of less than 2 cpkkd, and exceptional long-term stability, CDEX-RECODE holds significant advantages among similar experiments. This paper introduces the CDEX-RECODE experiment and discusses the future prospects of this experiment.



## Keywords

coherent elastic neutrino-nucleus scattering; reactor neutrinos; CDEX-RECODE experiment; high purity germanium detector



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**Session Classification:** 海报展示

**Track Classification:** 02 海报展示: 海报展示