

博士論文公聴会の公示（物理学専攻）

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論文題目： New cylindrical gamma-veto detector for the J-PARC KOTO experiment
(J-PARC KOTO 実験のための新たな円筒型光子検出器)

日時：2017年 2月 7日 (月) 14:40-16:10

場所：理学研究科H棟7階7階セミナー室 (H701号室)

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論文要旨：

The KOTO experiment searches for new physics beyond the Standard Model that breaks the CP symmetry by observing the $KL \rightarrow \pi^0 \nu \bar{\nu}$ decay and measuring its branching ratio. The $KL \rightarrow \pi^0 \nu \bar{\nu}$ decay is identified by detecting only two gammas from the π^0 with a finite π^0 transverse momentum. A set of hermetic veto detectors is used to confirm that there are no other observable particles.

We developed a new cylindrical gamma veto detector called Inner Barrel to improve the overall gamma veto efficiency to further suppress background from the $KL \rightarrow \pi^0 \pi^0$.

The Inner Barrel also aimed at good timing resolution to reduce acceptance loss due to accidental hits. The Inner Barrel is placed inside an existing cylindrical gamma veto detector called Main Barrel. We evaluated the timing resolution for both the Inner Barrel and the Main Barrel and improved analysis methods to recover acceptance.

By installing the Inner Barrel and improving the analysis for both the Inner Barrel and the Main Barrel, the $KL \rightarrow \pi^0 \pi^0$ background was estimated to be suppressed by a factor of 3, and the total number of background events was estimated to be reduced to less than the number of signal events predicted by the Standard Model.