

Report of RCNP International Joint Usage/Joint Research			
J019		PI: Natsuki Tomida	
1	Title of reserch		Additional beam test of Q051(Testing prototype multi-gap resistive plate chamber (MRPC) detectors)
2	List of collaborators		N. Tomida, Y. Hori (Kyoto univ.) Y. Uchida, T. Yamashina, M. Niiyama (Kyoto Sangyo univ.) S. Tanaka, K. Mizutani, T. Ishikawa (RCNP) H. Sako (JAEA) M. Inaba (Tsukuba Tech univ.) R. Sato (Tsukuba univ.) W. Jung (Korea univ.) Z. Ye (Thinghua univ.)
3	Period of research		2025.7.18-25
4	Publication list	Articles	
		Talks	佐甲 博之, "J-PARC E88実験の粒子識別検出器の開発状況", 日本物理学会第79回年次大会, 2025/9 富田 夏希, "時刻と二次元位置を同時に測定する高抵抗板検出器の開発", 宇宙線ミュオンを用いた革新的測位・構造物イメージング等応用技術 2025年度全体会議, 仙台, 2025/10
		Theses	山品 拓也, "時刻と二次元位置を同時に測定する高抵抗板検出器の開発と阿蘇山での観測", 京都産業大学 2025年度 卒業論文, 2026/3 内田 佑亮, "時刻と二次元位置を同時に測定する高抵抗板検出器の開発と誘起電荷のシミュレーション", 京都産業大学 2025年度 卒業論文, 2026/3
5	Description of the results and outputs		We have been developing Multi-gap Resistive Plate Chambers (MRPCs) for experiments at J-PARC and for muography. The main purpose of this test experiment is to evaluate the performance of new front-end electronics, namely a preamplifier and a discriminator. The new preamplifier uses a new chip with a stable supply; however, its gain is lower than that of the previous version. The new discriminator employs a much cheaper chip while maintaining performance comparable to the previous version. With tests using beam, we found that the gain of the new amp is too low and we cannot achieve required efficiency and time resolution. In contrast, the performance of the new discriminator was satisfactory. We also tested a tracker MRPC equipped with a lower-resistivity high-voltage electrode than that of the previous one. The time resolution measured with a conventional HR-TDC was as good as 70 ps. We found that modifications to the firmware of our streaming HR-TDC are necessary to handle narrow signals and to measure position resolution. The conventional E88 MRPC, equipped with fishing-line spacers and a conventional carbon high-voltage electrode, achieves a time resolution of around 100 ps. The time resolution shows slight improvement with increasing temperature. The new E88 MRPC suffered from a gas leak.