

Report of RCNP International Joint Usage/Joint Research			
J016		PI: Natsuki Tomida	
1	Title of reserch		Supplements for an additional beam test of Q047(RPCs for the J-PARC MARQ experiment) : Proposal for the beam test of RPCs for the J-PARC E16, E50, Drell-Yan and EMPHATIC experiments
2	List of collaborators		N. Tomida, R. Koike (Kyoto University) K. Nishi, T. Murata, R. Tsunemitsu, M. Niiyama (Kyoto Sangyo University) A. Higashi, S. Tanaka, K. Mizutani, T. Ishikawa (RCNP) C. Hsieh (Academia Sinica, Taiwan) P. Lin (National Central University, Taiwan)
3	Period of research		2024/7/27-30
4	Publication list	Articles	Ming-Lee Chu et al., "Prototype of Carbonless MRPC for MARQ Experiment", NIM A, to be published N. Tomida et al., "Prototype TOF-tracker MRPC for timing and position measurement in the J-PARC MARQ experiment", NIM A 1077 170517
		Talks	Ryoaro Koike, "A TOF-tracker MRPC for simultaneous measurements of timing and position at the π 20 beamline of J-PARC", XVII Conference on Resistive Plate Chambers and Related Detectors (RPC2024), Spain, 2024/9, the 2nd best talk prize Chia-Yu Hsieh, "Carbonless and self-sealed MRPC for MARQ experiment in Japan", XVII Conference on Resistive Plate Chambers and Related Detectors (RPC2024), Spain, 2024/9 Ryotaro Koike, "Development of new High-Voltage Electrodes for Multi-gap Resistive Plate Chambers in the MARQ experiment", REIMEI workshop on phi meson, exotic hadrons, and related topics, Korea, 2025/2 Shintaro Tanaka, "Development of a multi-gap resistive plate chamber for muography", REIMEI Workshop on phi meson, exotic hadrons, and related topics, Korea 2025/2 Keigo Mizunitani (invited), Development of a TOF-tracker MRPC for High-Precision Timing and Position Measurement, REIMEI Workshop on phi meson, exotic hadrons, and related topics, Korea, 2025/2 小池諒太郎, "Multi-gap Resistive Plate Chamber に用いる新素材電極の開発", 日本物理学会第79回年次大会, 北海道大学, 2024/9 小池諒太郎, "MARQ実験用Multi-gap Resistive Plate Chamber のための新素材電極の開発 (II)", 日本物理学会2025 春季大会, オンライン, 2025/3
		Theses	小池諒太郎, "MARQ 実験用 Multi-gap Resistive Plate Chamber のための新素材高圧印加電極の開発" 京都大学 2024年度 修士論文, 2025/3
5	Description of the results and outputs		Multi-gap resistive plate chamber (MRPC) is a gas detector with a good timing resolution. A high voltage is applied across gas gaps between resistive glasses. A large problem of recent MRPC development was the end of production of a carbon tape which has been used for high voltage electrodes of MRPCs. The purpose of this test experiment is to study performance of new alternative materials for high voltage electrodes. We prepared 20 cm x 20 cm MRPCs with three different kinds of resistive inks : graphit33, KP-8348-1 Black and CS-6301. In addition, we prepared pad-type electrodes consisting of 100 MΩ chip resistors and 10 mm x 7 mm copper pads. We examined the efficiencies and time resolutions of the MRPC detectors with those different high voltage electrodes using positron beams at the SPring-8/LEPS2 beamline. We found that all three inks work well as electrodes. The resistive pads also worked as electrodes but the detector performance was inferior compared with inks. Based on these results, we examined the mass productivity of candidate inks and found that KP and CS series are good candidates. Those inks are tested in the beam test in 2024/12 with larger (25 mm x 1000 mm) MRPCs (J017).
6	Requests or comments for improvement of the RCNP KK Project *For Internal Use only		