

Report of RCNP International Joint Usage/Joint Research		
J014		PI: Natsuki Tomida,Kotaro Shirotori
1	Title of reserch	
		Proposal for evaluating timing resolution of a plastic scintillation counter with the Time-Over-Threshold method
2	List of collaborators	
		N. Tomida (Kyoto Univ.), K. Shirotori (RCNP), F. Hayashi (Osaka Univ.), K. Kishino (Osaka Univ.), K. Miyamoto (RCNP), H. Noumi (RCNP), S. Suzuki (Kyoto Univ.), and R. Uda (Osaka Univ.)
3	Period of research	
		2023/2/11-2/12
4	Publication list	Articles
		Talks
		Theses
		K.Kishino, "Evaluation of the time resolution of TOF detector for the J-PARC E50 experiment using Time-Over-Threshold method", Graduate Defense, Osaka University, 2023
5	Description of the results and outputs	
		We carried out a beam test to study a time resolution of Time-Of-Flight (TOF) detector for the J-PARC E50 experiment. The E50 TOF detector is made of a 180 cm x 3 cm x 4 cm plastic scintillator and two HAMAMATSU/11934-100 PMTs. It has 60 ps time resolution when a time-walk correction is carried out using charge information obtained with an ADC (T. Ishikawa et al., NIM A 1039 (2022) 167164). However, only TDCs will be used in the E50 experiment because it uses a streaming DAQ system. In this beam test, we evaluated the time resolution when we carry out time-walk corrections using Time-Over-Threshold (TOT) measured with a TDC. We measured time resolutions at different threshold levels and found that the time resolutions are ~20 ps worse when we use TOT for the time-walk correction. We concluded that we need a proper shaping amplifier to measure the charge using TOT information. We also measured time resolutions of different plastic scintillators, Saint-Gobain BC-400 and BC-420. We found that the BC-420 has ~10 ps better time resolutions than the BC-400.
6	Requests or comments for improvement of the RCNP KK Project *For Internal Use only	
		Please notify the deadline of report when we submit a proposal