

Thesis Title	Light Measurement by Time-Correlated Photon Counting Technique
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#### Abstract

Inorganic scintillators such as NaI(Tl), CsI(Na) and BGO are very popular for making gamma-ray detector. That is because when a scintillator absorbs the radiation, a high fluorescence is emitted with a short decay time of about  $10^{-8}$  s. This research aims to show the details of a fluorescence decay time measurement by Time-Correlated Photon Counting technique.

The fluorescence decay time measurement is done by Time Correlated Photon Counting (TCPC) technique. The TCPC system consists of a Photon Counting PMT, a Fast Amplifier, a Constant Fraction Discriminator (CFD), a Time to Amplitude Converter (TAC) and a Multichannel Analyzer (MCA). This technique was used to measure low level light at the single photoelectron state. This technique is based on a Poisson distribution. Time resolution of this system is 3.32 ns. This system can measure a fluorescence decay time of 3 scintillators, namely NaI(Tl), CsI(Na) and BGO. The fluorescence decay times of NaI(Tl) is  $232.97 \pm 5.18$  ns and CsI(Na) is  $632.84 \pm 5.20$  ns. For BGO, there are 2 components of decay time, one is slow component which is  $302.15 \pm 3.46$  ns and the other is fast component which is  $61.68 \pm 1.78$  ns. Error from the fluorescence decay time measurement when compared with an acceptable value is 1.29 percent for NaI(Tl), 0.45 percent for CsI(Na), and 0.72 percent and 2.8 percent for slow component and fast component of BGO respectively. According to the result of this measurement, it has been proved that the TCPC system is high accuracy.