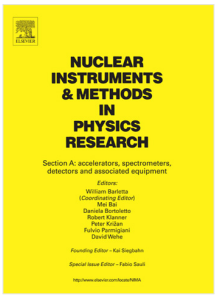
Accepted Manuscript



A technique for estimating the absolute gain of a photomultiplier tube

M. Takahashi, Y. Inome, S. Yoshii, A. Bamba, S. Gunji, D. Hadasch, M. Hayashida, H. Katagiri, Y. Konno, H. Kubo, J. Kushida, D. Nakajima, T. Nakamori, T. Nagayoshi, K. Nishijima, S. Nozaki, D. Mazin, S. Mashuda, R. Mirzoyan, H. Ohoka, R. Orito, T. Saito, S. Sakurai, J. Takeda, M. Teshima, Y. Terada, F. Tokanai, T. Yamamoto, T. Yoshida

PII: S0168-9002(18)30370-X
DOI: https://doi.org/10.1016/j.nima.2018.03.034
Reference: NIMA 60676

To appear in: *Nuclear Inst. and Methods in Physics Research, A*

Received date : 31 August 2017
Revised date : 5 March 2018
Accepted date : 10 March 2018

Please cite this article as: M. Takahashi, Y. Inome, S. Yoshii, A. Bamba, S. Gunji, D. Hadasch, M. Hayashida, H. Katagiri, Y. Konno, H. Kubo, J. Kushida, D. Nakajima, T. Nakamori, T. Nagayoshi, K. Nishijima, S. Nozaki, D. Mazin, S. Mashuda, R. Mirzoyan, H. Ohoka, R. Orito, T. Saito, S. Sakurai, J. Takeda, M. Teshima, Y. Terada, F. Tokanai, T. Yamamoto, T. Yoshida, A technique for estimating the absolute gain of a photomultiplier tube, *Nuclear Inst. and Methods in Physics Research, A* (2018), https://doi.org/10.1016/j.nima.2018.03.034

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

*Manuscript
Click here to view linked References

A Technique for Estimating the Absolute Gain of a Photomultiplier Tube

M. Takahashi[a,*], Y. Inome[b], S. Yoshii[b], A. Bamba[c], S. Gunji[i], D. Hadasch[a], M. Hayashida[a], H. Katagiri[f], Y. Konno[g], H. Kubo[g], J. Kushida[h], D. Nakajima[a], T. Nakamori[i], T. Nagayoshi[j], K. Nishijima[h], S. Nozaki[g], D. Mazin[a], S. Mashuda[g], R. Mirzoyan[d], H. Ohoka[a], R. Orito[1], T. Saito[a], S. Sakurai[a], J. Takeda[i], M. Teshima[a], Y. Terada[j], F. Tokanai[i], T. Yamamoto[b,*], T. Yoshida[f]

[a] *Institute of Cosmic Ray Research, University of Tokyo, Kashiwa, Chiba 277-8582, Japan*
[b] *Faculty of Science and Engineering, Konan University, Kobe 658-8501, Japan*
[c] *Department of Physics, University of Tokyo, Bunkyo-ku, Tokyo 113-0033, Japan*
[d] *Max Planck Institute for Physics, D-80805 Munich Germany*
[e] *Institute of Socio- Arts and Science, Tokushima University, Tokushima 770-8502, Japan*
[f] *College of Science, Ibaraki University, Mito 310-8512, Japan*
[g] *Department of Physics, Kyoto University, Kyoto 606-8502, Japan*
[h] *Department of Physics, Tokai University, Hiratsuka, Kanagawa 259-1292, Japan*
[i] *Department of Physics, Yamagata University, Yamagata 990-8560, Japan*
[j] *Department of Physics, Saitama University, Saitama 338-8570, Japan*

Abstract

Detection of low-intensity light relies on the conversion of photons to photoelectrons, which are then multiplied and detected as an electrical signal. To measure the actual intensity of the light, one must know the factor by which the photoelectrons have been multiplied. To obtain this amplification factor, we have developed a procedure for estimating precisely the signal caused by a single photoelectron. The method utilizes the fact that the photoelectrons conform to a Poisson distribution. The average signal produced by a single photoelectron can then be estimated from the number of noise events, without requiring analysis of the distribution of the signal produced by a single photoelectron. The signal produced by one or more photoelectrons can be estimated experimentally without any assumptions. This technique, and an example of the analysis of a signal from a photomultiplier tube, are described in this study.

Keywords: Photomultiplier, PMT, photoelectron, photon detector

*Corresponding author
Email address: tokonatu@konan-u.ac.jp (T. Yamamoto)

Download English Version:

https://daneshyari.com/en/article/8166278

Download Persian Version:

https://daneshyari.com/article/8166278

Daneshyari.com