A measurement system of the KIRAMS microbeam irradiation system

G.M. Sun[1], J.W. Jung[2], K.B. Song, S.W. Park[3], D.H. Lee, E.H. Kim and H.D. Choi[2]

[1]*Korea Institute of Radiological and Medical Sciences, Gongneung-dong, Nowon-gu, Seoul, Korea*
[2] *Seoul National University, Sillim-dong, Gwanak-gu, Seoul, Korea*
[3]*Inha University, Yonghyeon-dong, Nam-gu, Incheon, Korea*

Microbeam irradiation facilities, which enable cells *in vitro* to be irradiated individually, have been utilized for investigating the cellular effects of radiation. In the facilities operating now for routine biological experiments, charged particle beams such as protons and alphas and x-ray beam are available. The observations of the bystander effect of radiation and the genomic instability of survival cells call a strong demand for new microbeam facilities that provide a very low-LET radiation beam. A new microbeam irradiation system utilizing electrons has been under development at Korea Institute of Radiological and Medical Science (KIRAMS) since 2002. The KIRAMS microbeam irradiation system is designed to provide a 5 μm-diameter electron beam of energy up to 100 keV. The system is going to be devoted to the low-dose (less than 0.2 Gy) radiation effect studies. In this paper, we introduce two experimental methods for monitoring the electrons that enter the target cells. One is to make repetitive direct detections of the electron beam that enters a target cell by locating a semiconductor detector at the target cell position before and after cell irradiation. The other is to measure the secondary electrons that are produced by the material attached to the inside surface of the vacuum window structure through its interactions with primary electrons. A micro-channel plate with a center hole aligned in the source beam direction was utilized as a real-time monitor of the electron beam by permitting the primary electrons arriving the inside surface of vacuum window with no disturbance. The advantages and the shortcomings of these two methods have been investigated.

1. e-mail : suncult@snu.ac.kr