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Single Cell Irradiation Nuclear Microscopy Using a Radioactive Source

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Irradiation of a single biological cell, instead of a whole tissue, with ions in a known number and position, is a powerful means to study very low dose biological effectiveness. Present methods employ accelerated ion beams which are 1) either collimated with micro-apertures and affected by a halo of 3–5 μ m at best, or 2) focused to a sub-micron spot, whose resolution is degraded when extracted into air. We have studied the efficacy of a new micro-radiobiological method, originally developed for materials research. This new approach uses an IPEM, Ion Photon Emission Microscope, which employs a specially shaped Po-210 alpha particle source for in-air irradiation. Alpha particles strike the cells, which are previously grown directly on a 10–20 μ m thick scintillating plastic blade and placed in the focal plane of a conventional optical microscope. Photons produced at the single ion impact point are projected at high magnification onto a single-photon position sensitive detector, which provides the position of each ion that hits the cells. Adequacy of this setup for Single Cell Radio-Biology will be discussed. ©2003 American Institute of Physics

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