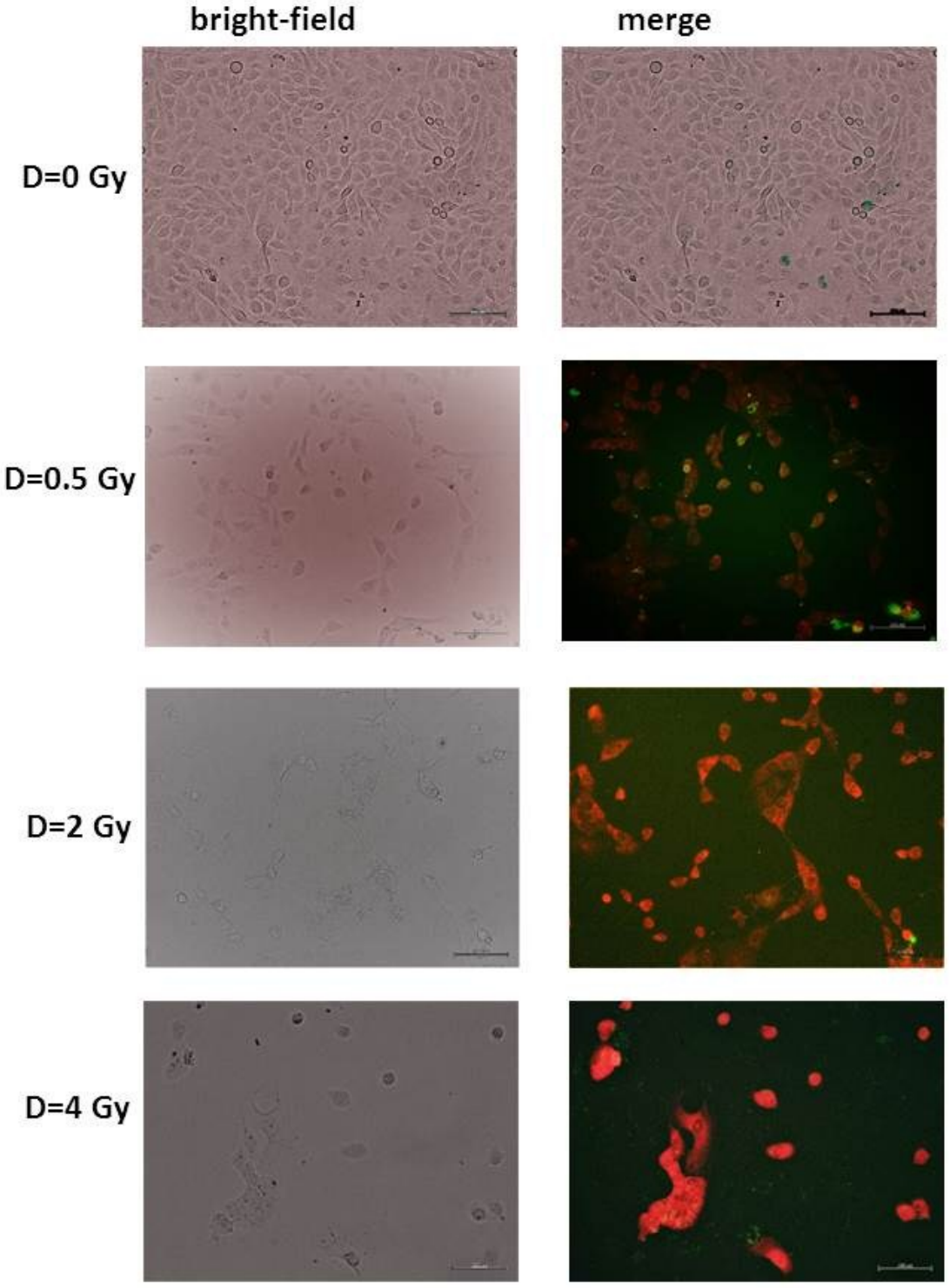
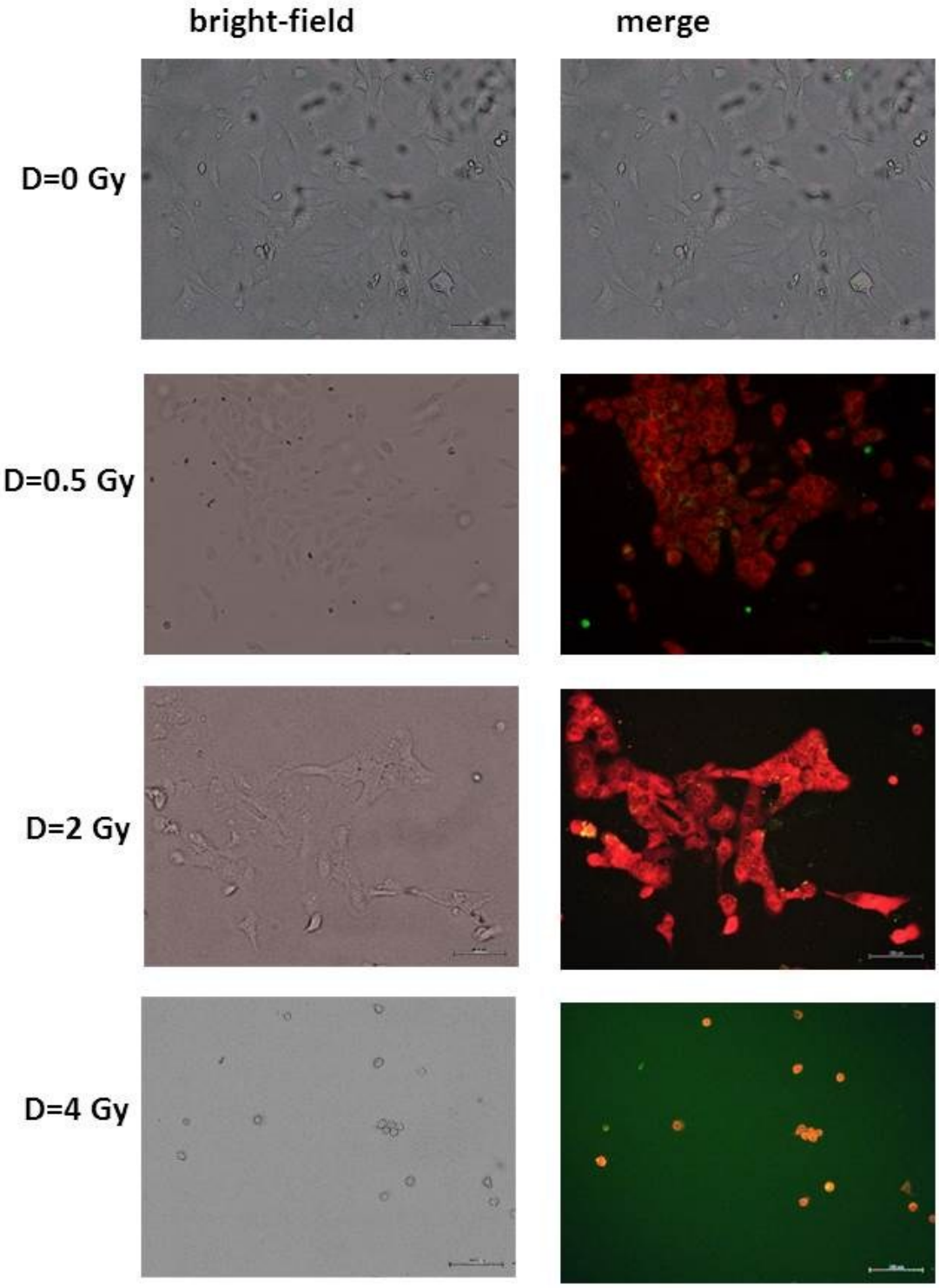
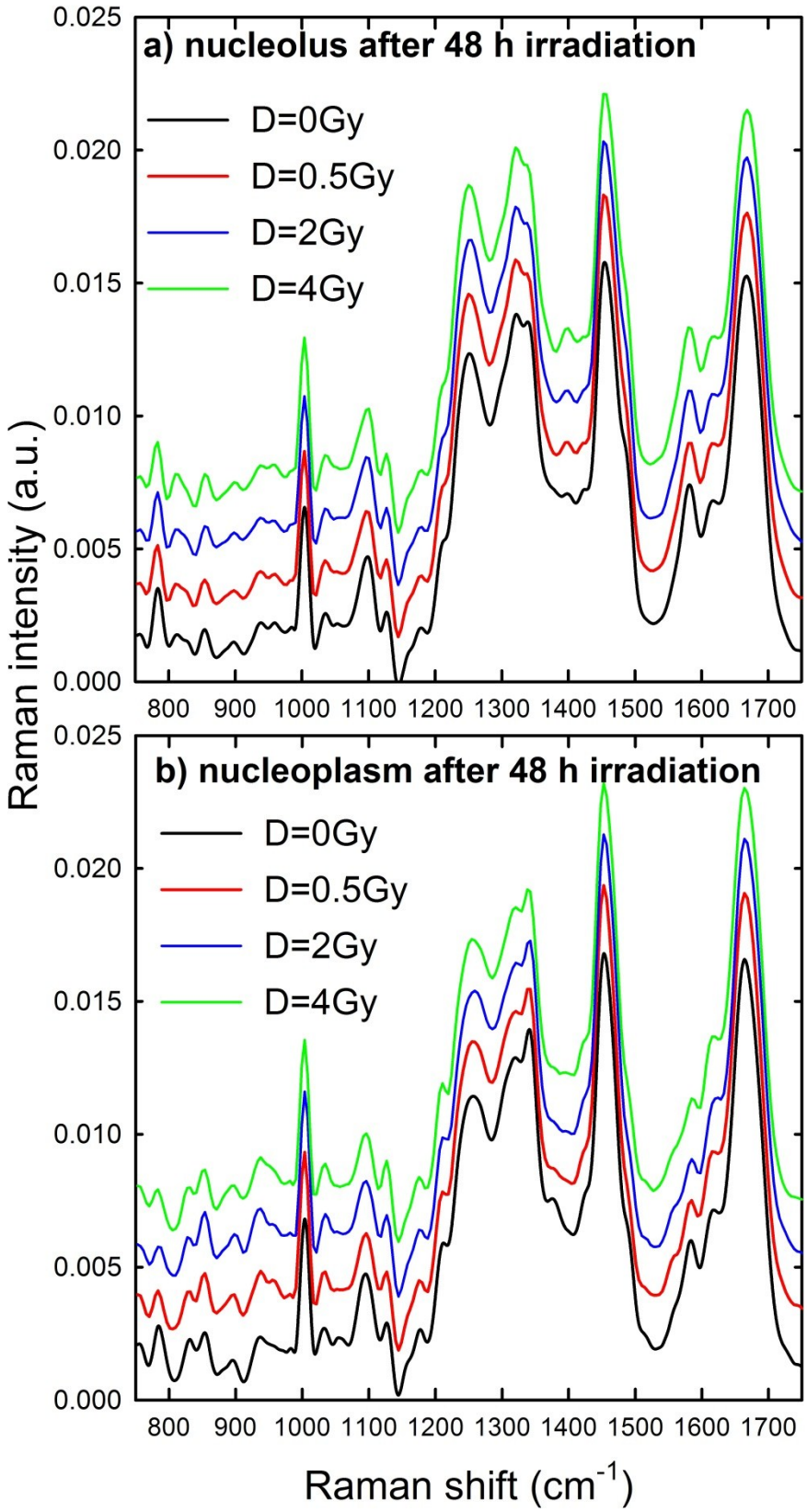
Electronic Supplementary Material (ESI) for Analyst.



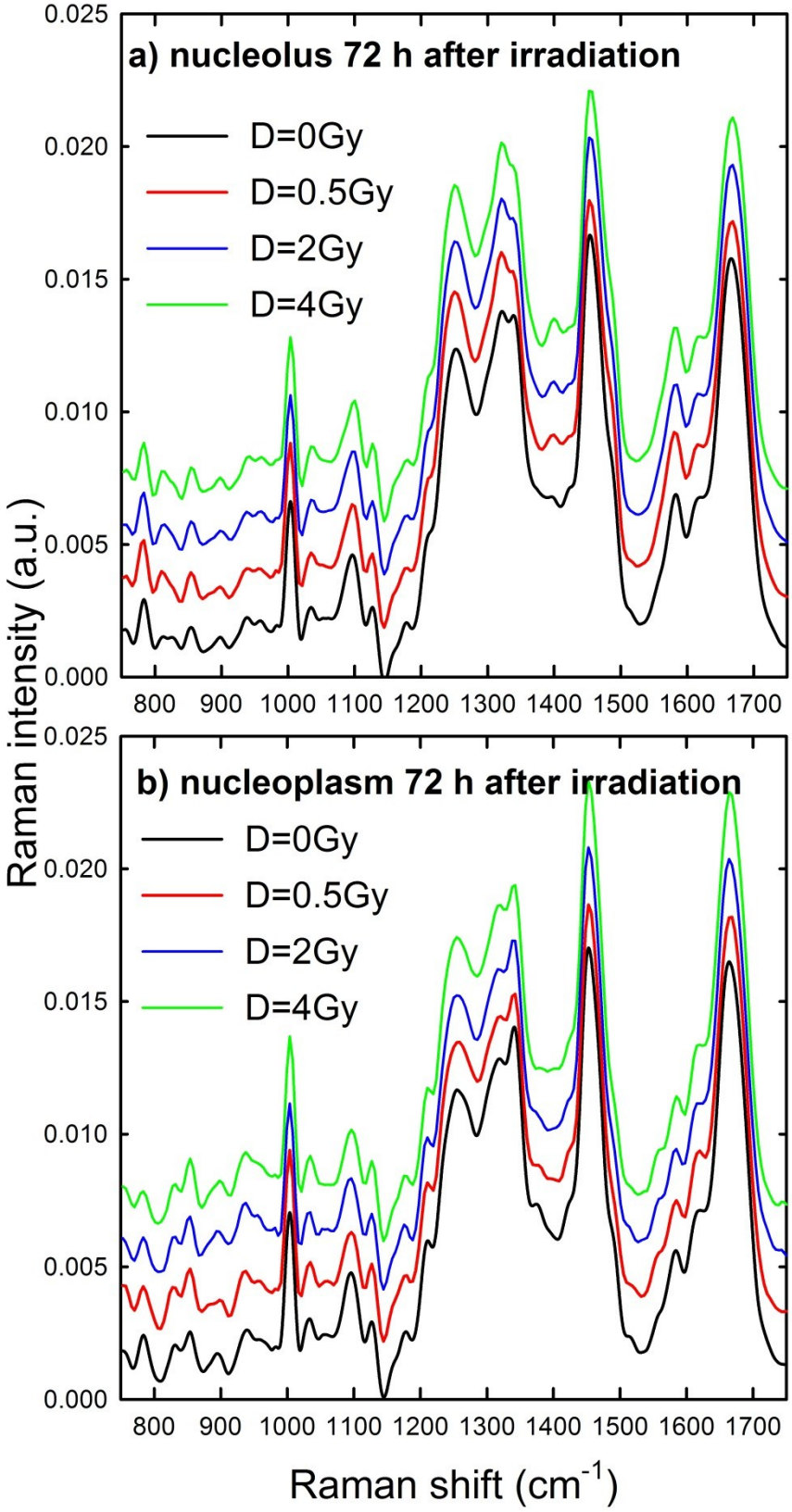
Supplementary Fig. 1. Representative bright-field (left column) and bright-field and fluorescence merged (right column) images of apoptotic and necrotic cells labeled with Annexin V-FITC Apoptosis Kit, fixed 48 h after irradiation at different doses of a proton beam. Cells were visualized byan inverted fluorescence microscope (Olympus IX 71) using a X10 objective. Scale bar is 100 μm. Apoptotic cells (Annexin V conjugated) appear green, necrotic cells (propidium iodide coniugated) appear red. Merged = overlay of propidium iodide and Annexin V coniugated.



Supplementary Fig. 2. Representative bright-field (left column) and brigh-tfield and fluorescence merged (right column) images of apoptotic and necrotic cells labeled with Annexin V-FITC Apoptosis Kit, fixed 72 h after irradiation at different doses of a proton beam. Cells were visualized by an inverted fluorescence microscope (Olympus IX 71) using a X10 objective. Scale bar is 100 μm. Apoptotic cells (Annexin V conjugated) appear green, necrotic cells (propidium iodide coniugated) appear red. Merged = overlay of propidium iodide and Annexin V coniugated.



Supplementary Fig. 3. Average Raman spectra of single control (black line), 0.5 Gy (red line), 2 Gy (blue line) and 4 Gy (green line) exposed MCF10A cells (about 30 for each dose), fixed 48 h after irradiation. The spectra have been measured by focusing the exciting laser spot above the nucleolus (a) and nucleoplasm (b) domains and the average signals have been intensity-shifted for clarity purpose.



Supplementary Fig. 4. Average Raman spectra of single control (black line), 0.5 Gy (red line), 2 Gy (blue line) and 4 Gy (green line) exposed MCF10A cells (about 30 for each dose), fixed 72 h after irradiation. The spectra have been measured by focusing the exciting laser spot above the nucleolus (a) and nucleoplasm (b) domains and the average signals have been intensity-shifted for clarity purpose.