Various X-ray apparatuses are employed in educational institutes such as university, and they are classified into five categories according to their grade on safety mechanism and shielding of equipment. The category managements have been discussed for safety control of X-ray apparatus used for researches\(^1\). Handheld X-ray fluorescence spectrometers are classified in “Mobility type”, and have the highest potential risk of accident exposure to users. Therefore, the radiation exposure risks during measurement with mobility type apparatus have to be considered. In this study, we proposed the safety handling of handheld X-ray fluorescence spectrometer based on two-dimensional imaging of scattering radiation.

The X-rays were irradiated to acrylic plate and several kinds of metal plate using handheld X-ray fluorescence spectrometer. Scattered and transmission radiation intensities were determined with imaging palates, electronic dosimeters and ionization chamber survey meter. The radiation intensity and distribution of X-ray scattering were observed around the X-ray irradiation point of handheld X-ray fluorescence spectrometer in measurements of all materials used in this study. The two-dimensional imaging of scattering radiation is effective to understand the shielding design and safety mechanism of handheld X-ray fluorescence spectrometer. Therefore, we propose the procedure of safety education and training using imaging palates and survey meter for safety handling of handheld X-ray fluorescence spectrometer used for researches and students.

References