Neutron Activation Analysis (NAA) is a method for qualitative and quantitative determination of elements based on the measurement of characteristic radiation from radionuclides formed directly or indirectly by neutron irradiation of the material. It is an extremely useful technique in the determination of trace and minor elements in many disciplines. These include nutritional and health (toxicity and pharmaceutical) related studies, environmental analytical applications, forensics, archeological, geological as well as material sciences. The most suitable source of neutrons is usually a nuclear research reactor.

\[ \frac{2}{3}X + n \rightarrow \frac{4}{2}X^* \rightarrow \frac{4}{2}Y^* + \beta^- + \nu \]

Jordan Research and Training Reactor (JRTR) is a 5 MW{sub}th reactor (upgradable to 10 MW{sub}th). The core of the reactor contains 35 irradiation holes dedicated for a variety of applications including the production of radio-isotopes and NAA. Three of these holes are especially devoted to NAA work; namely the NAA1, NAA2 and NAA3 holes colored in magenta in the below figure.

Post-irradiation detection of the characteristic gamma rays is carried out using a High Purity Germanium (HPGe) detector (\( \epsilon_{\text{rel}} \sim 40\% \), FWHM for 1332 keV of 1.72 keV). A gamma spectrum taken for a multi-element sample is shown below.