

## Simulate neutron fluence spectra

I'm using FLUKA to simulate the Neutron fluence or flux spectra from lead target bombarded by 600MeV Proton. I considered several SCORE methods of Fluka, such as USRBIN, USRYIELD, however, they all seem unsuitable. The following is a description of my problems.

1. The result I need is neutron fluence,  $\phi(\vec{r}, E_{kinetic})$  or neutron density  $n(\vec{r}, E_{kinetic})$ . or neutron flux  $\mathbf{J}(\vec{r}, E_{kinetic})$ . The coordinate system may be Cylindrical, Spherical or Cartesian, but a Cylindrical is better.
2. I noticed that the USRBIN card can be used to estimate  $\phi(\vec{r})$ , but it lose the Energy distribution. The USRYIELD card may estimate  $\mathbf{J}_{surface}(E, \theta)$  from one region to the other, but what I need is  $\mathbf{J}_{surface}(E, \theta, \varphi)$ , in which  $\theta, \varphi$  identify the position in a spherical surface. It seems: 
$$\mathbf{J}_{surface}(E, \theta) = \int_0^{2\pi} \mathbf{J}_{surface}(E, \theta, \varphi) d\varphi.$$
3. My questions are: Is there any card can solve the problem? Or how can I solve the problem?
4. Another problem: Could I get  $\phi(\vec{r}, E_{kinetic}, t)$  if I knew the time information of Proton beam, such as that the energy of Proton beam varies with time?