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By the energy-momentum conservations, there are $9-4=5$ independent variables of a three-body final state of a reaction. For $\gamma(\vec{q})+d(\vec{P}_d=0)\to J/\Psi(\vec{k})+p(\vec{p})+n(\vec{n})$ in the Lab frame, we generate the following differential cross section :

$$crst-cos(nb/GeV-sr.)=\frac{d\sigma}{dk\,d\Omega_k\,d\,cos_p}=\int_0^{2\pi}\frac{d\sigma}{dk\,d\Omega_k\,d\,cos_p d\phi_p}d\phi_p \tag{1}$$

$$crst-t(nb/GeV^3)=\frac{d\sigma}{dk\,dt\,d\,cos_p}=\frac{\pi}{qk}\frac{d\sigma}{dk\,d\Omega_k\,d\,cos_p} \tag{2}$$

For a given $k=|\vec{k}|$, $\Omega_k=(\theta_k,\phi_k)$, and $\Omega_p=(\theta_p,\phi_p)$, the magnitude $p=|\vec{p}|$ is determined by solvig the energy-conservation equation

$$\begin{aligned} q+m_d &= E_{J/\Psi}(\vec{k})+E_p(\vec{p})+E_n(\vec{n}) \\ &= E_{J/\Psi}(\vec{k})+E_p(\vec{p})+E_n(\vec{q}-\vec{k}-\vec{p}) \end{aligned} \tag{3}$$

The photon $\vec{q}$ is chosen as the z-axis and $\vec{k}$ is on the $x-z$ plane with $\Omega_k=(\theta_k,0)$. By rotational invariance, the solution of Eq.(3) $p=|\vec{p}|$ is independent of the angle ϕ_p (comfirmed numerically). Therefore, for each proton angle θ_p, there is only one p which is the solution of Eq.(3).

We generate three files:

1. jpsi-7p2.out : $q=7.2GeV$
2. jpsi-7p7.out : $q=7.7GeV$
3. jpsi-8p2.out : $q=8.2GeV$
4. Each file covers $\theta_k=0^0,2^0,4^0...10^0$, $\theta_p=6^0,7^0,8^0.....30^0$
5. Note that each θ_p has only one p, and not all θ_p are allowed by the condition Eq.(3).

The format of output is:

- q(GeV), θ_k(degrees) k (GeV), θ_p(degrees), p(GeV), $crst-ang$(nb/GeV-sr.) -t (GeV^2) $crst-t$ (nb/GeV^3)
- output for each new angle θ_k is marked by 'new theta-k', and for each new k is marked by 'new k'.

While $|\vec{p}|$ is independent of ϕ_p, the differential cross section $\frac{d\sigma}{dk\,d\Omega_k\,d\,cos_p d\phi_p}$ depends on ϕ_p. We thus also generate output for these five-fold differential cross sections for simulation. We generate three set of output:

1. 7p2-phip.tar.gz: $q=7.2GeV$
2. 7p7-phip.tar.gz : $q=7.7GeV$
3. 8p2-phip.tar.gz : $q=8.2GeV$
4. In each case, there are 19 output files:
   (a) fort.900x, x=1,2...19, for $\phi_p=0^0,20^0....360^0$
   (b) Each file covers $\theta_k=0^0,2^0,4^0...10^0$, $\theta_p=6^0,7^0,8^0.....30^0$