

John P. Update

10/18/19

Currently Working on:

- Learning statistics
- Thinking about how to display results clearly
- Generating “heat map” plots with ratios and efficiencies for Isospin interference and for individual isotopes.
- Working with Baha’s student Michael to double check my work up to now.

John P. Update

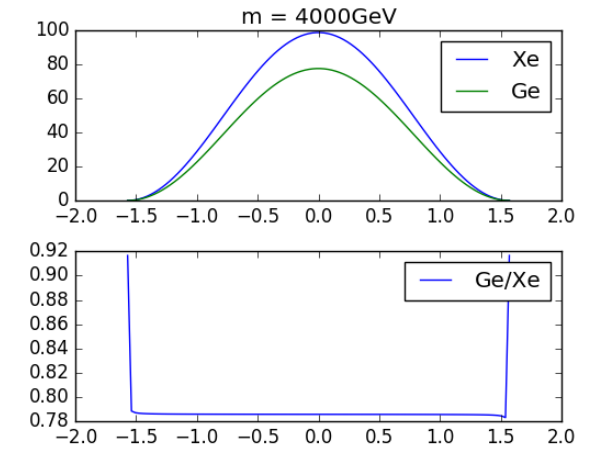
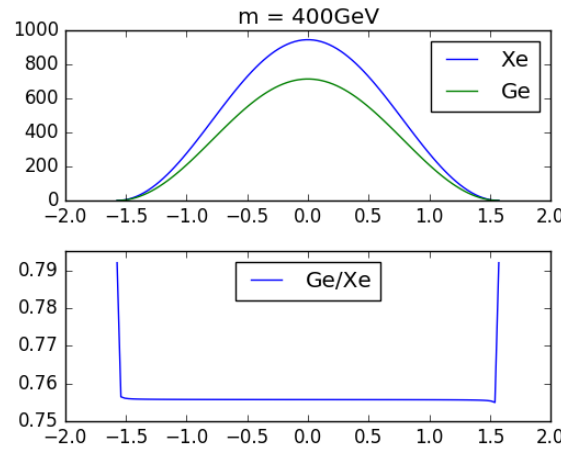
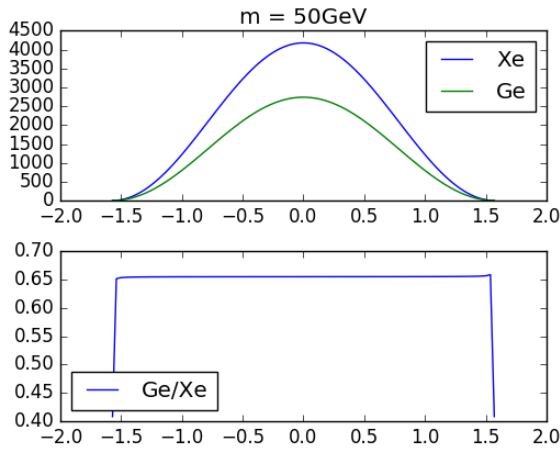
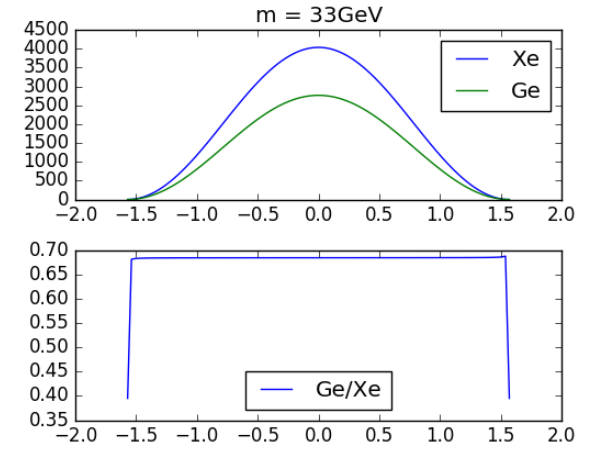
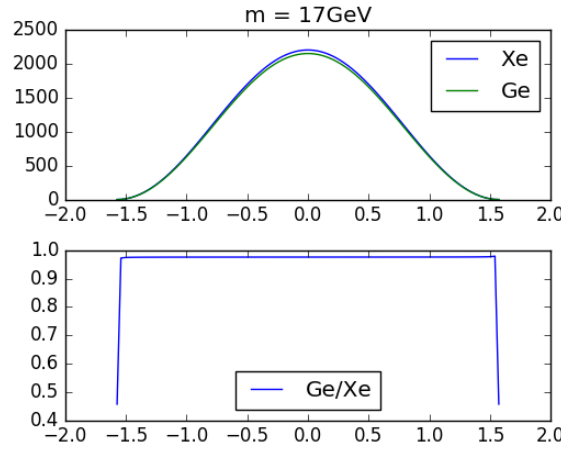
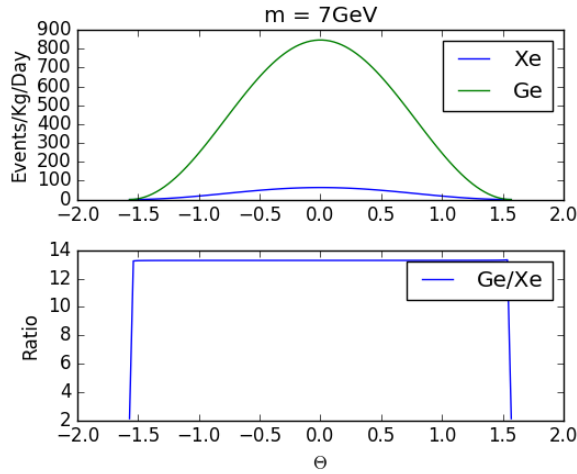
10/11/19

Differential Specs

- Last week, I mentioned scaling the SI curves in order to get them to match the y-intercepts on the Operator 1 curves.
- I recalculated the differential spectra for both using the same coupling constant and got matching y-intercepts.

$$\mathcal{O}_3 = i\vec{S}_N \cdot (\vec{q} \times \vec{v}^\perp) \quad \mathcal{O}_1 = 1$$

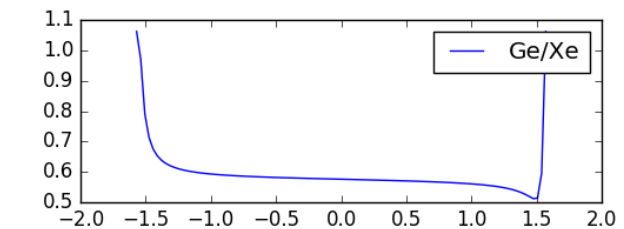
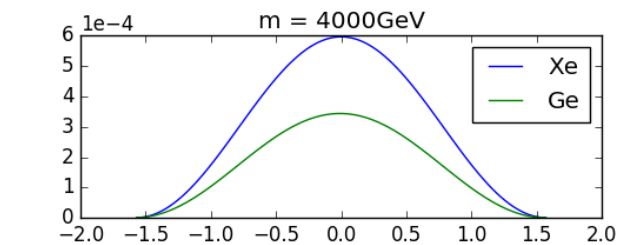
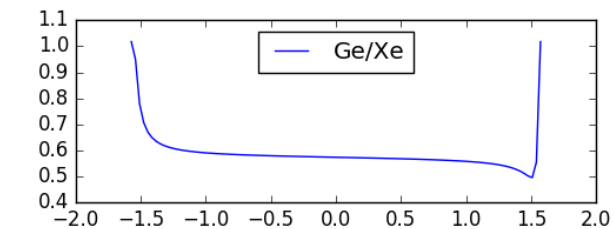
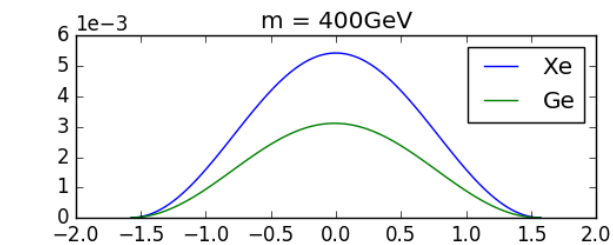
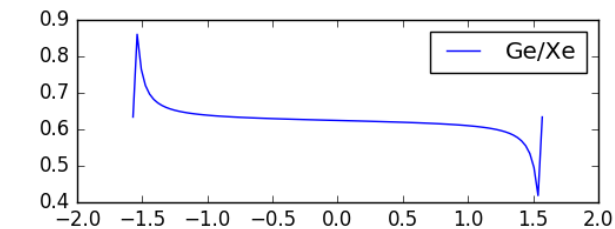
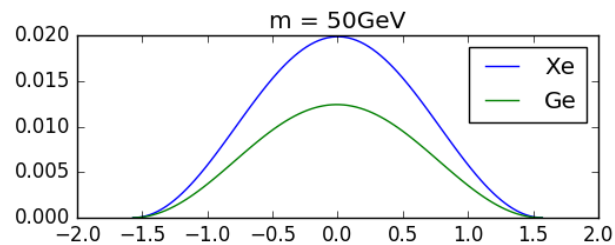
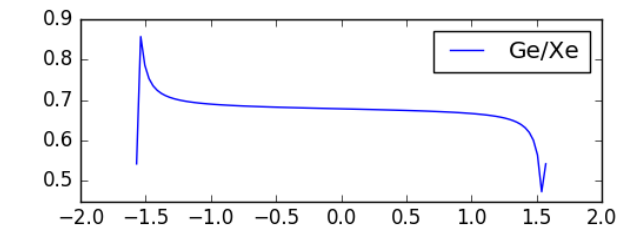
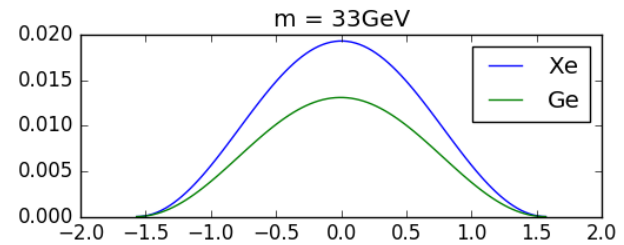
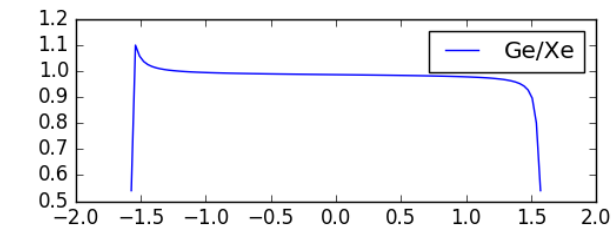
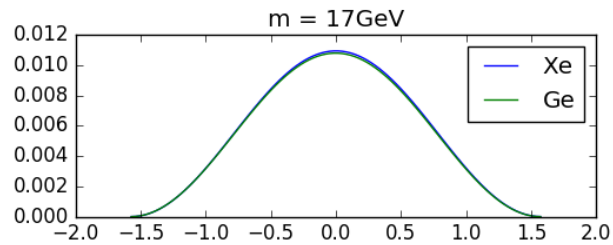
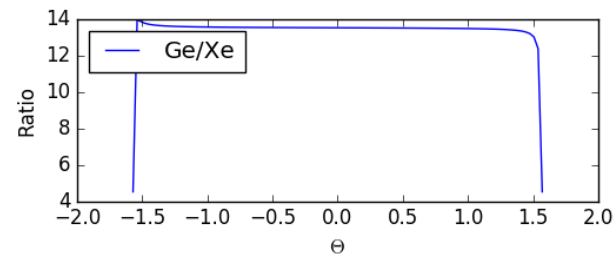
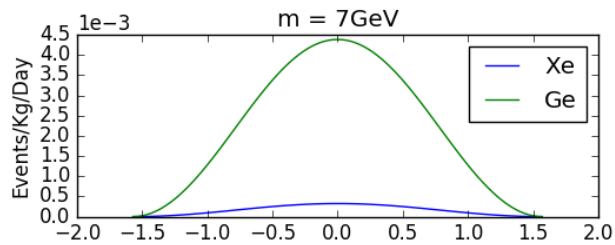
$$d1p = \cos(\theta) \quad d3p = \sin(\theta)$$



$$\mathcal{O}_4 = \vec{S}_\chi \cdot \vec{S}_N$$

$$\mathcal{O}_5 = i\vec{S}_\chi \cdot (\vec{q} \times \vec{v}^\perp)$$

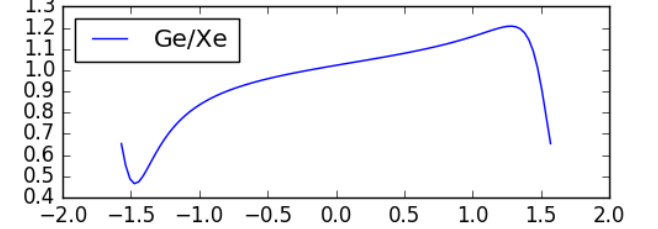
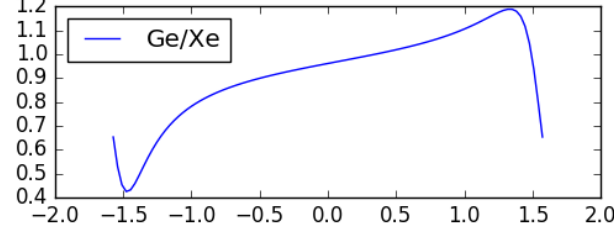
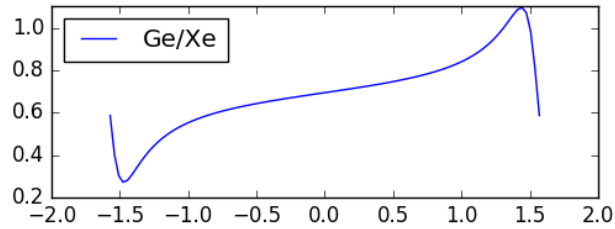
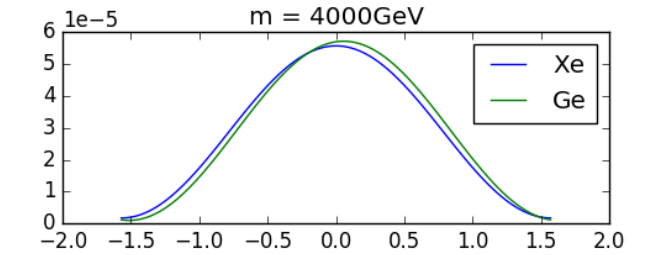
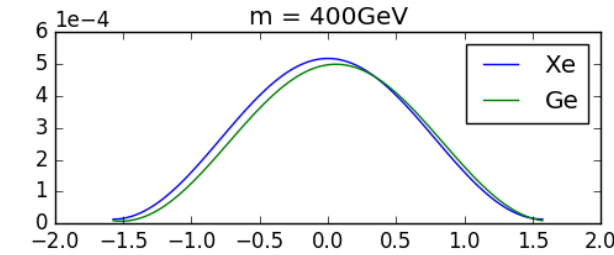
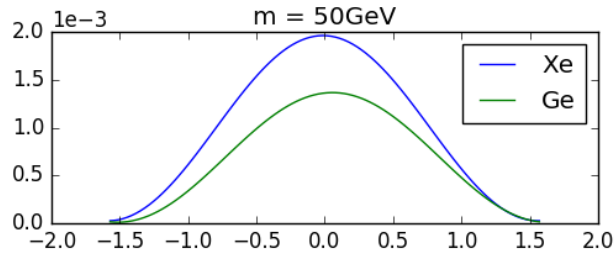
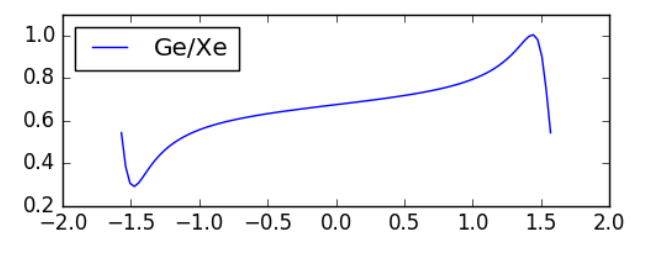
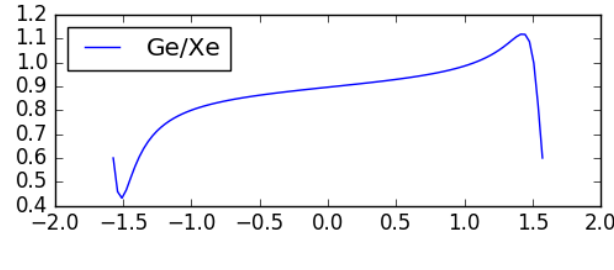
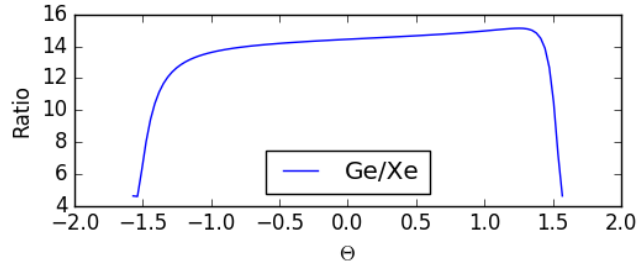
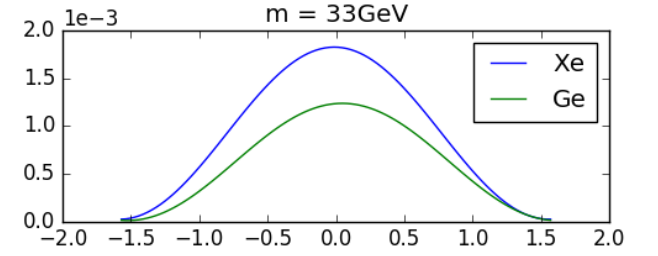
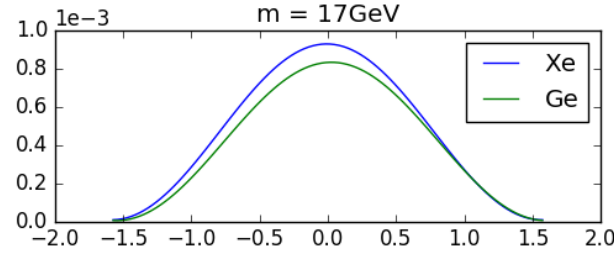
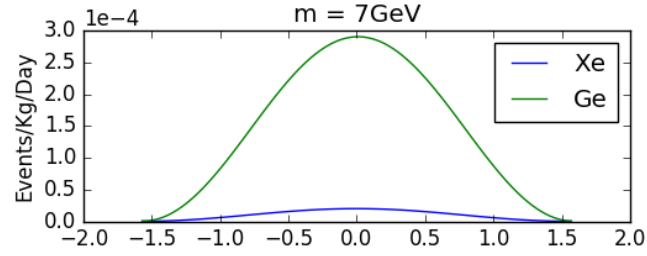
$$d4n = \cos(\theta) \quad d5n = \sin(\theta)$$



$$\mathcal{O}_8 = \vec{S}_\chi \cdot \vec{v}^\perp$$

$$\mathcal{O}_9 = i\vec{S}_\chi \cdot (\vec{S}_N \times \vec{q})$$

$$d8n = \cos(\theta) \quad d9n = \sin(\theta)$$



A note on 8,9 and 4,5 interferences for neutrons.

$$y = (qb/2)^2, \quad F_{4,5}^{(N,N')} = -C(j_\chi) \frac{q^2}{8m_N} F_{\Sigma'\Delta}^{(N,N')}$$

$$b \approx \sqrt{41.467/(45A^{-1/3} - 25A^{-2/3})} \text{ fm.}$$

$$F_{8,9}^{(N,N')} = C(j_\chi) \frac{q^2}{8m_N} F_{\Sigma'\Delta}^{(N,N')}$$

Ge73: $F_{\Sigma',\Delta}^{(n,n)} = e^{-2y} (-1.5 + 6.5y - 10.y^2 + 7.1y^3 - 2.6y^4 + 0.49y^5 - 0.048y^6 + 0.0019y^7)$

Xe131: $F_{\Sigma',\Delta}^{(n,n)} = e^{-2y} (0.31 - 1.9y + 3.8y^2 - 4.1y^3 + 2.5y^4 - 0.87y^5 + 0.15y^6 - 0.011y^7)$

Xe129: $F_{\Sigma',\Delta}^{(n,n)} = e^{-2y} (0.015 + 0.012y - 0.13y^2 + 0.11y^3 + 0.018y^4 - 0.030y^5 + 0.0050y^6 + 0.00051y^7 - 0.00012y^8)$

Note that these terms have opposite signs, hence why we see spikes in the regions of the heat maps where the interference terms become more appreciable.

New “Heat Maps”

- Remade heat maps using simple efficiency functions.
- Estimated minimum detectable recoil energy using

$$E_{min}(keV) = \frac{16 * M_{\chi}(GeV)^2}{A}$$

- Said efficiency is 1 for $E \geq E_{min}$ and 0 for $E < E_{min}$.
- Got $E_{min} = 2keV$ for Xenon and $E_{min} = 0.5keV$ for Germanium.
- Also included the ratio of rates for each “heat map”

Currently Working on

- Learning statistics
- Making similar “heat maps” for individual isotopes.

Previous Slides: