John P. Update 5/2/19

- Made progress on recreating Nicole's interference results.
- My result for isospin interference on operator 1 is roughly similar to hers
- My two operator interference results have some similar features but aren't quite the same.

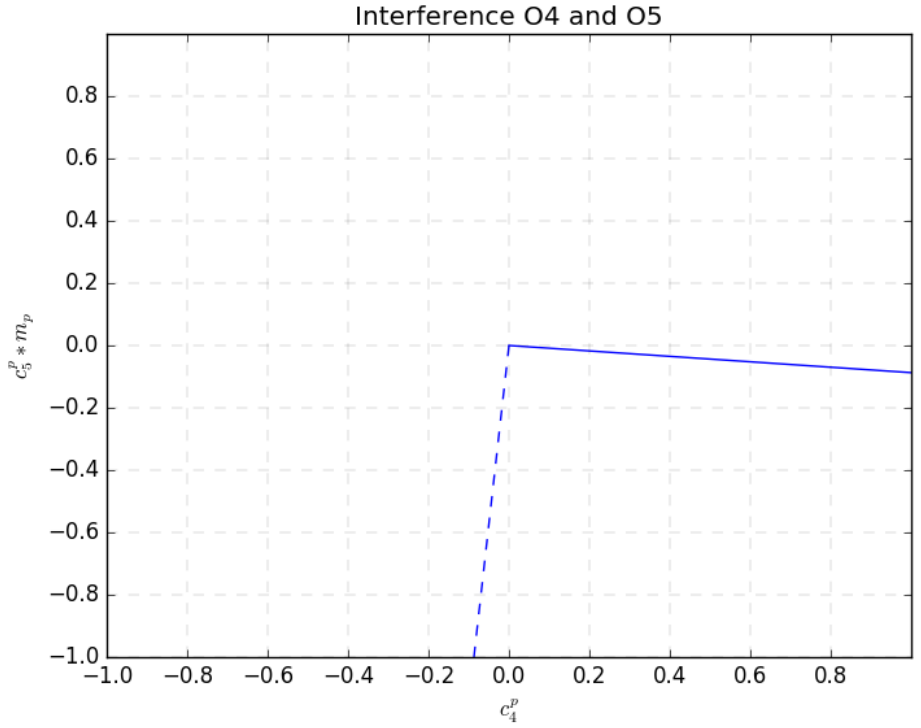
Isospin interference

- For isospin interference, I got destructive interference when
- $$\frac{C_1^n}{C_1^p} = -0.77$$
- Nicole reports destructive interference when

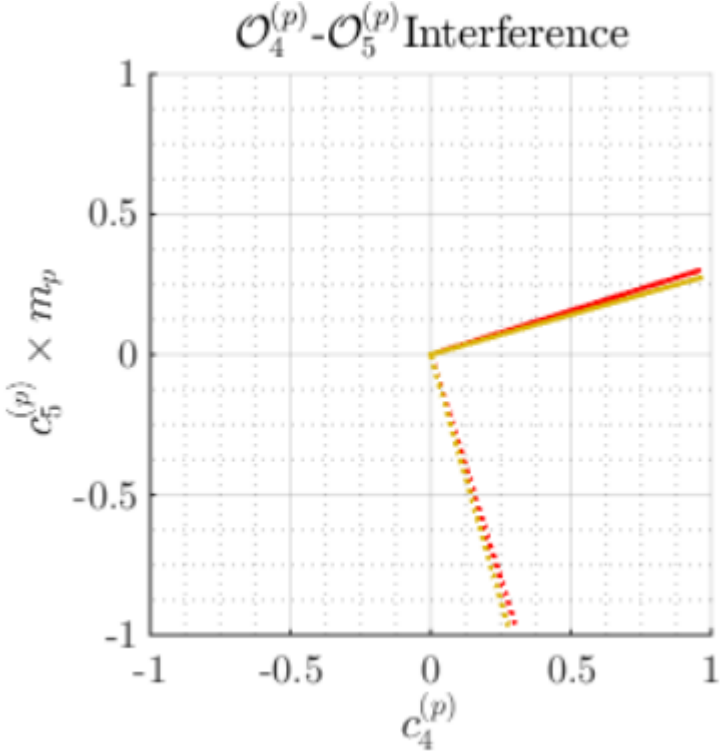
$$\frac{C_1^n}{C_1^p} = -0.74$$

Two Operator interferences

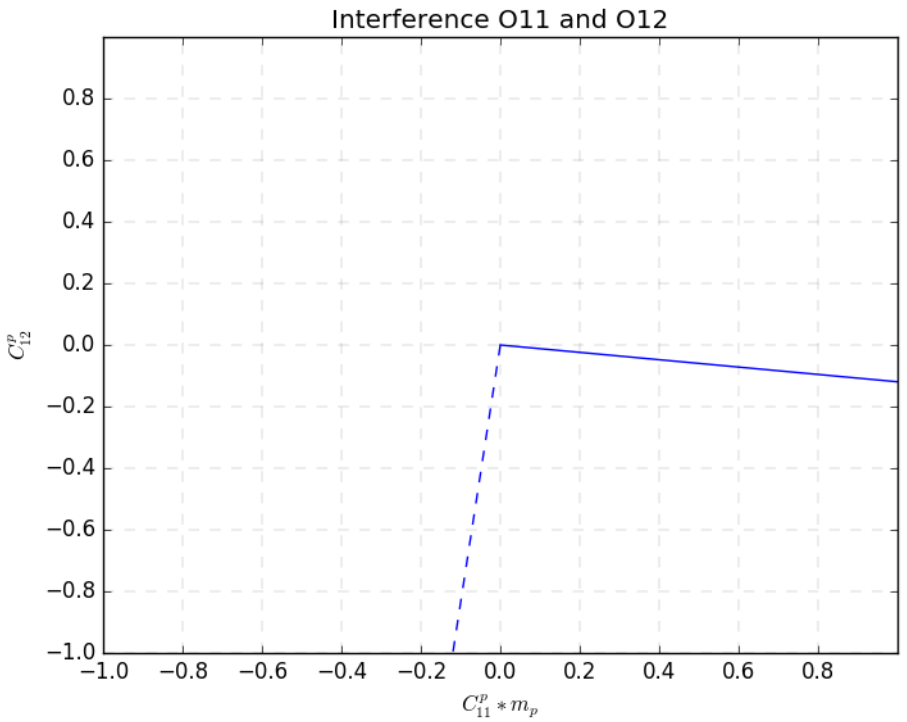
My result:

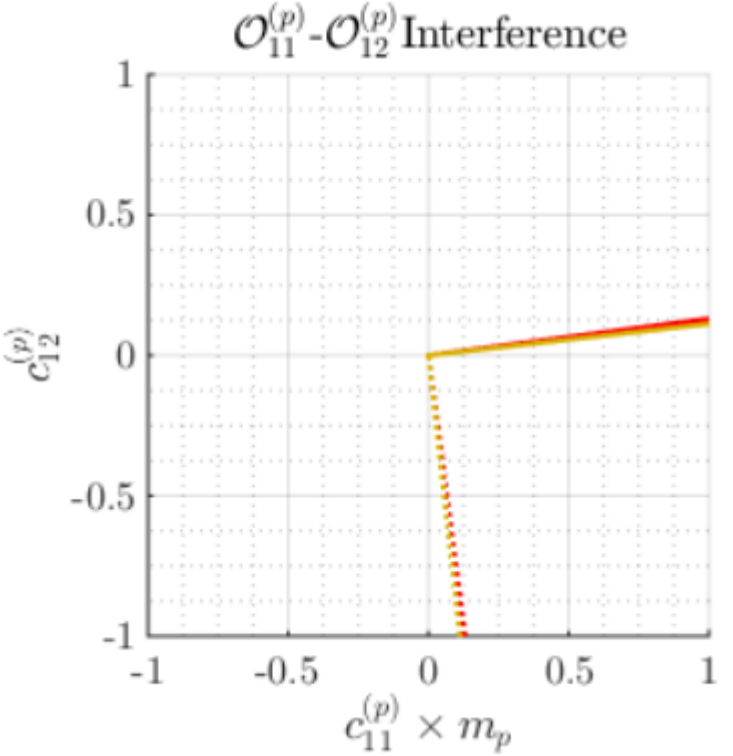


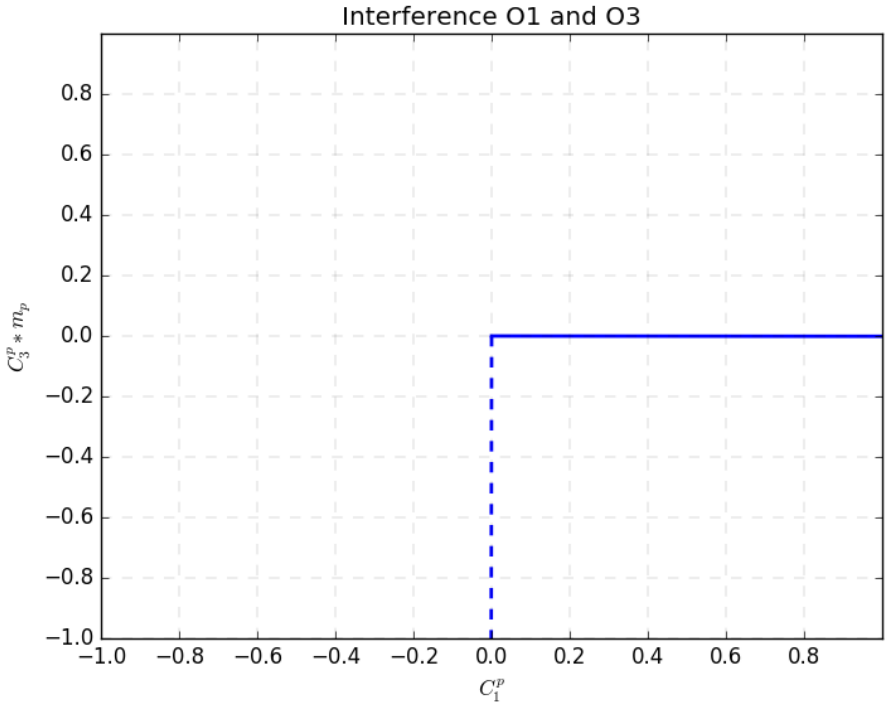
Nicole's result

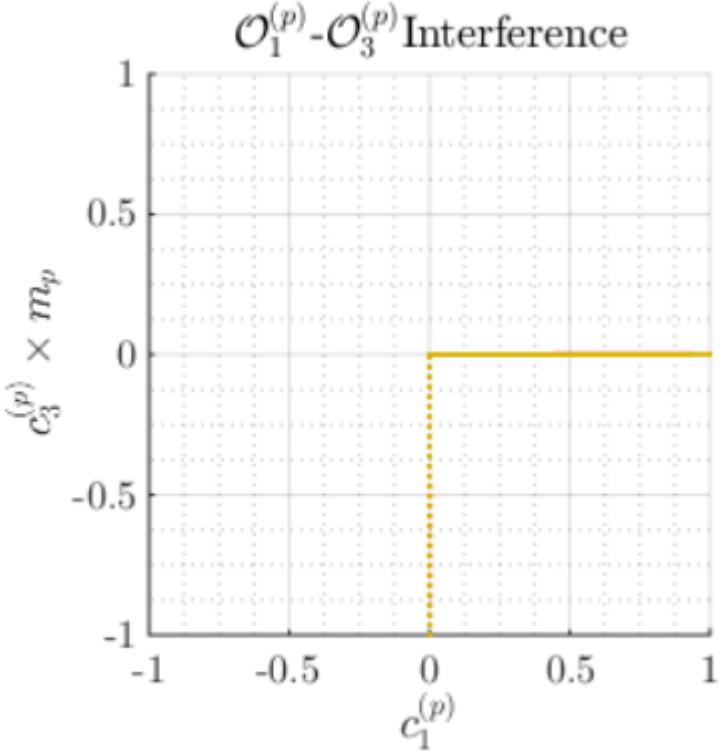


Dashed line indicates destructive interference. Solid indicates constructive
On Nicole's plot, the yellow line gives the result for Xenon.


Interference O11 and O12
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.0
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6
0.8
C_{12}^p
$C_{11}^p * m_p$

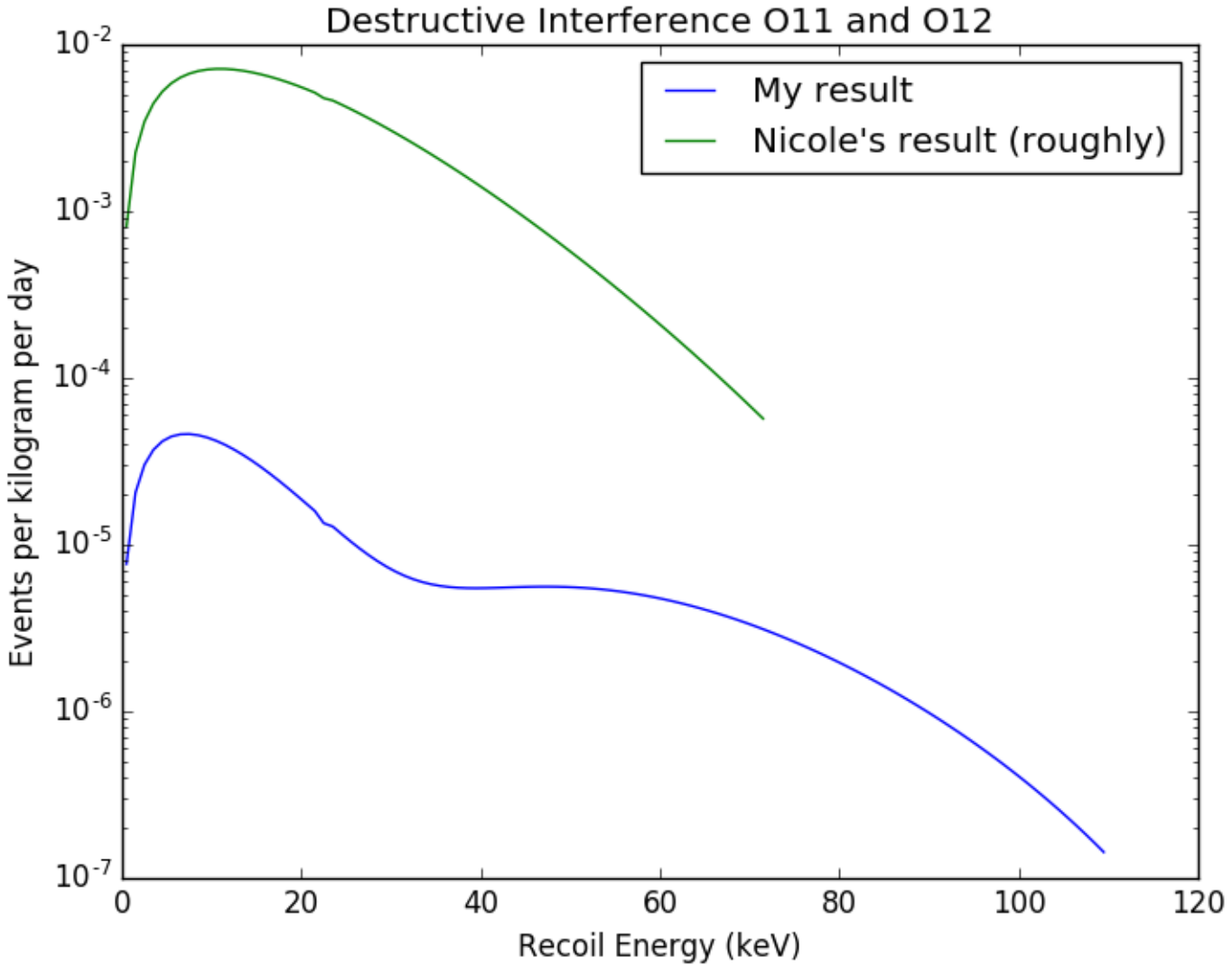

$\mathcal{O}_{11}^{(p)}$-$\mathcal{O}_{12}^{(p)}$ Interference
1
0.5
0
-0.5
-1
-1
-0.5
0
0.5
1
$c_{12}^{(p)}$
$c_{11}^{(p)} \times m_p$


Interference O1 and O3
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.0 −0.8 −0.6 −0.4 −0.2 0.0 0.2 0.4 0.6 0.8
$C_3^p * m_p$
C_1^p

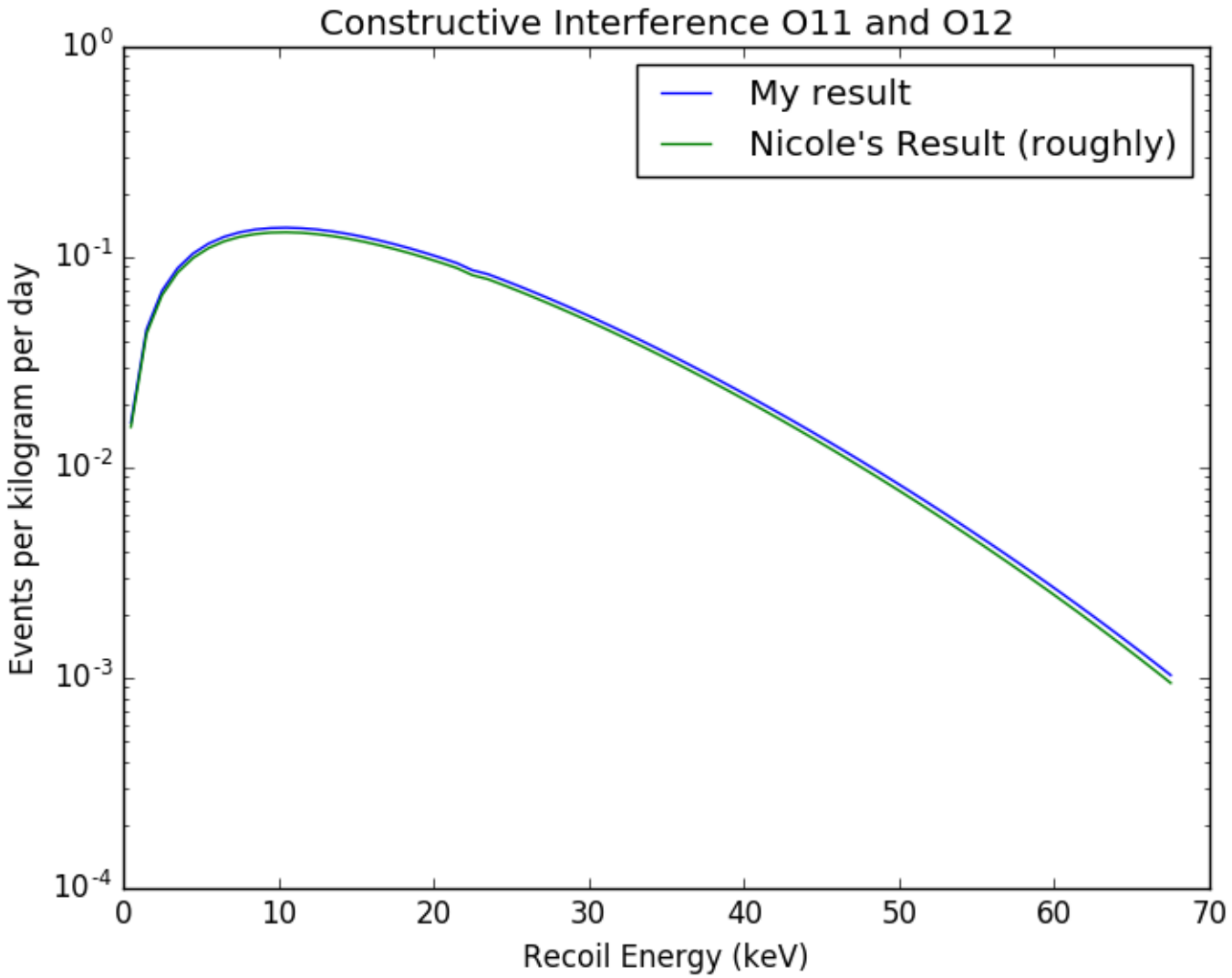

$\mathcal{O}_1^{(p)}$-$\mathcal{O}_3^{(p)}$ Interference
1
0.5
0
-0.5
-1
-1 -0.5 0 0.5 1
$c_3^{(p)} \times m_p$
$c_1^{(p)}$

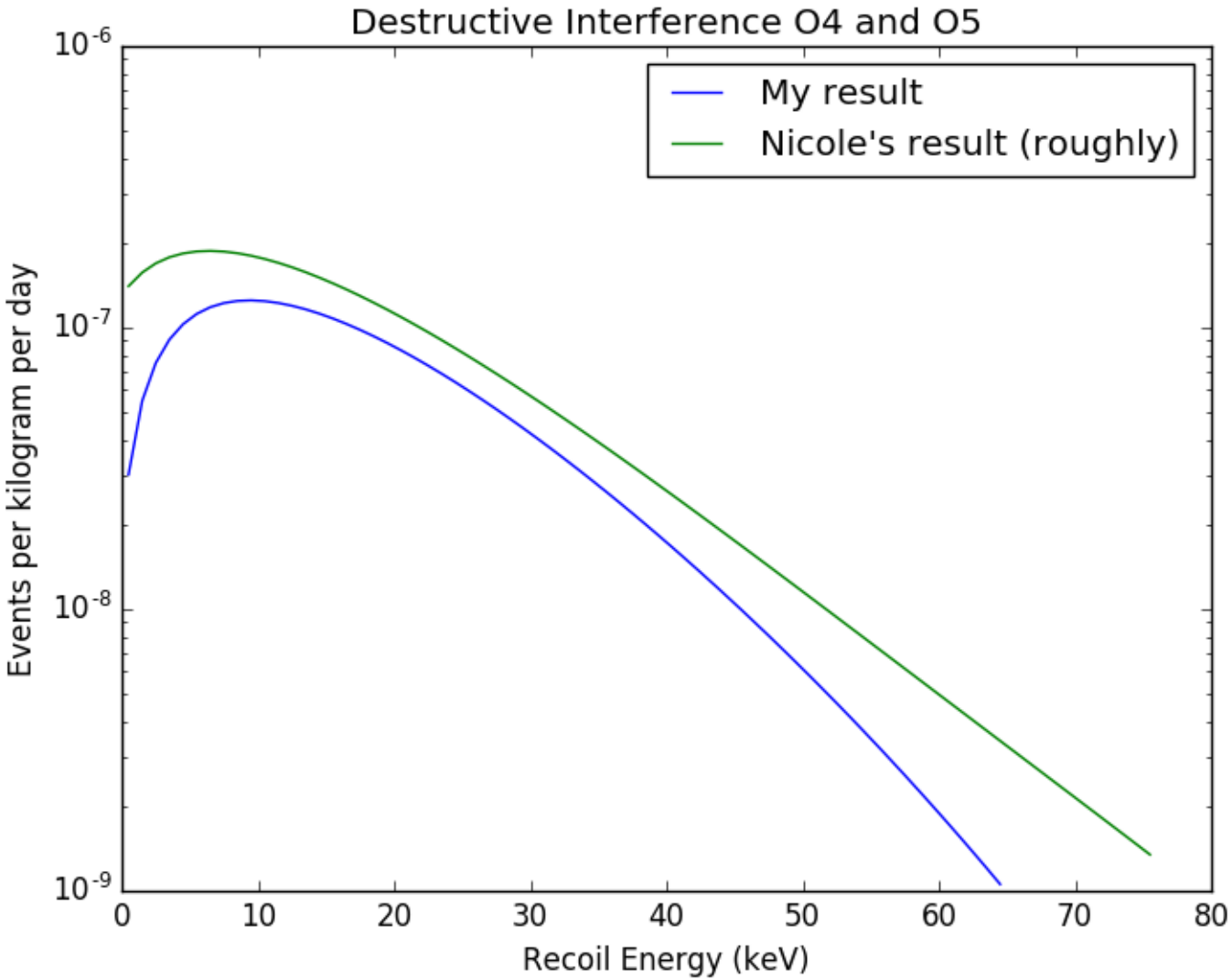
Destructive interference comparison

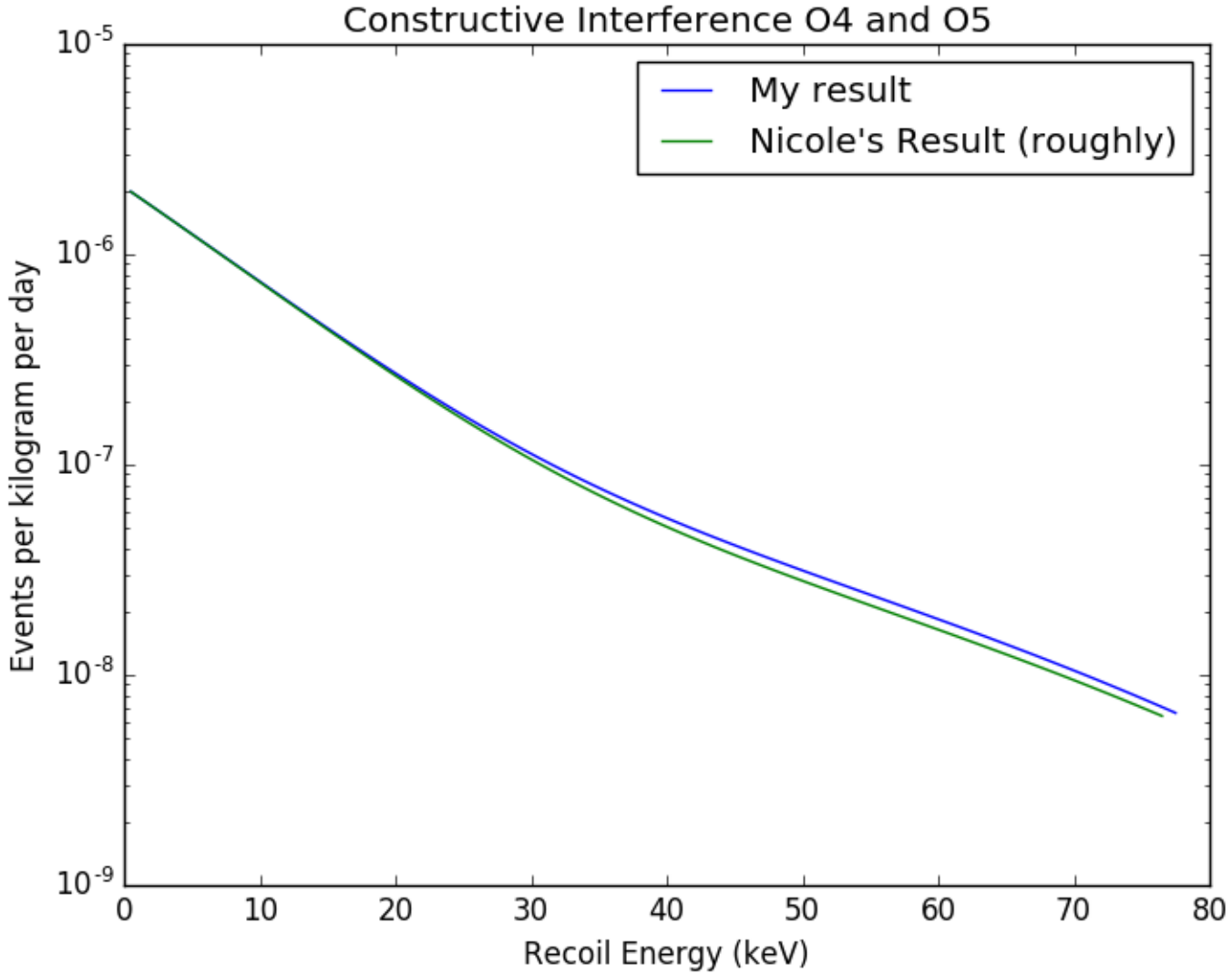
Note: These plots are for protons only, so no isospin interference involved.



Constructive Interference




Destructive Interference O4 and O5
My result
Nicole's result (roughly)
Events per kilogram per day
Recoil Energy (keV)
10^-6
10^-7
10^-8
10^-9
0
10
20
30
40
50
60
70
80


Constructive Interference O4 and O5
My result
Nicole's Result (roughly)
Events per kilogram per day
Recoil Energy (keV)
10^-5
10^-6
10^-7
10^-8
10^-9
0
10
20
30
40
50
60
70
80

Goals

- Short term: figure out why my results look different from Nicole's.
- Add spectrum without interference to each figure.

- Longer term:
- Investigate coefficient combinations in between the maxima that Nicole found.
- Run Shaun's code using Calvin's density matrices for Argon