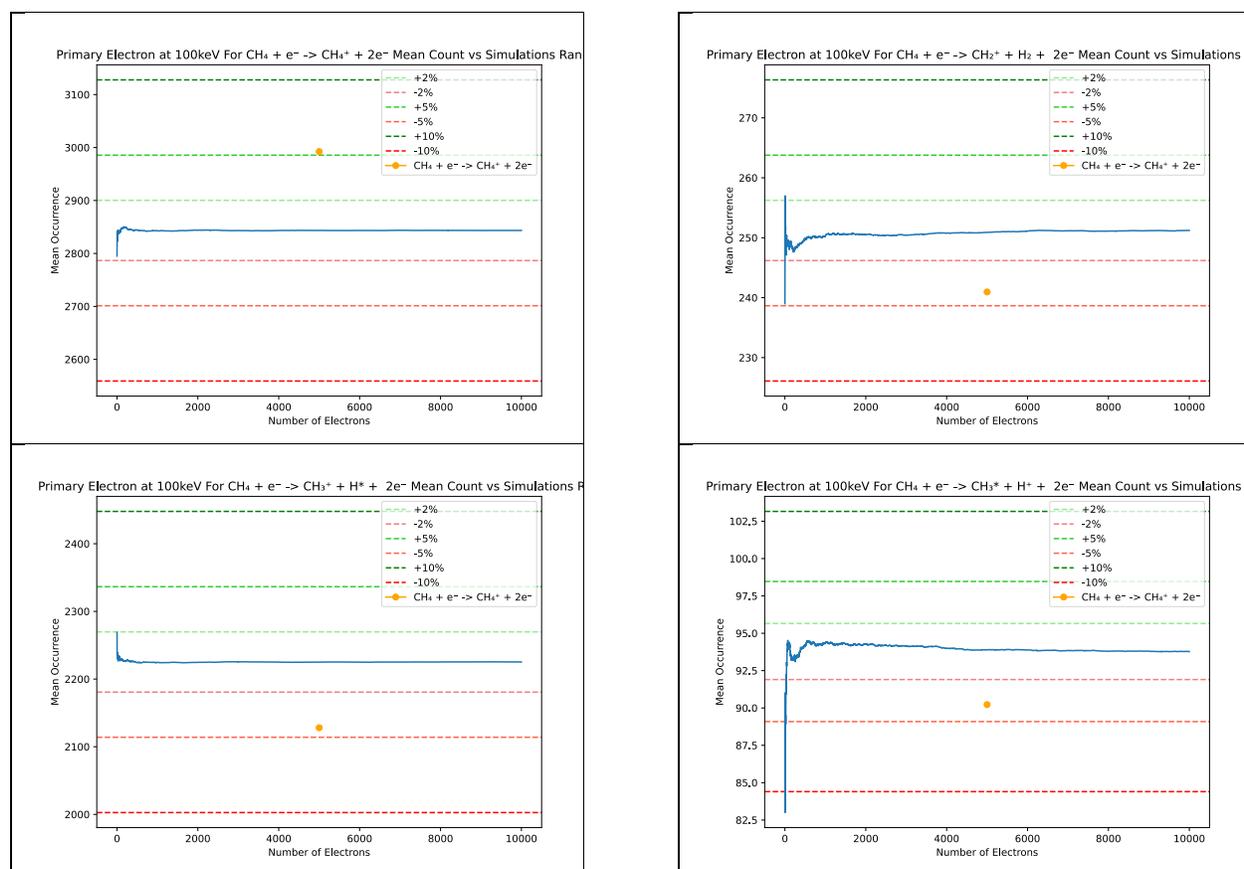


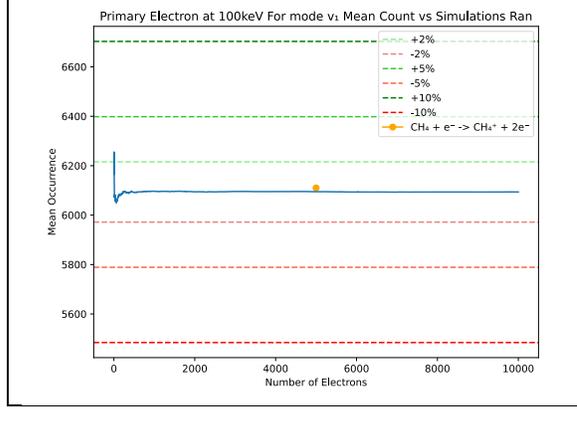
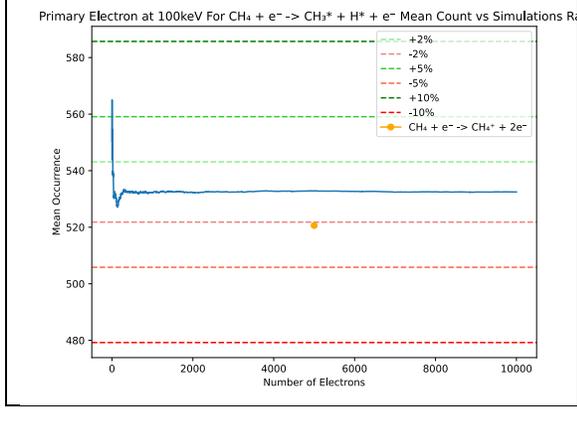
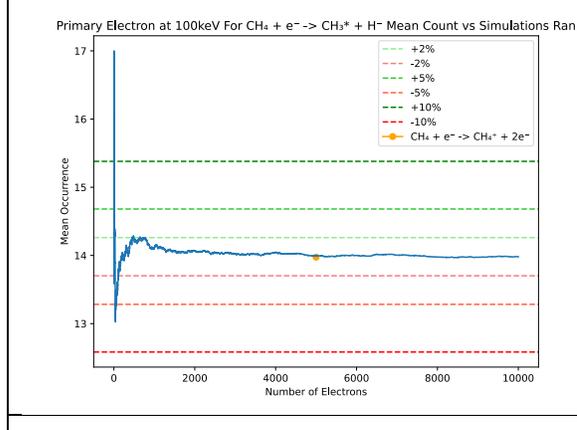
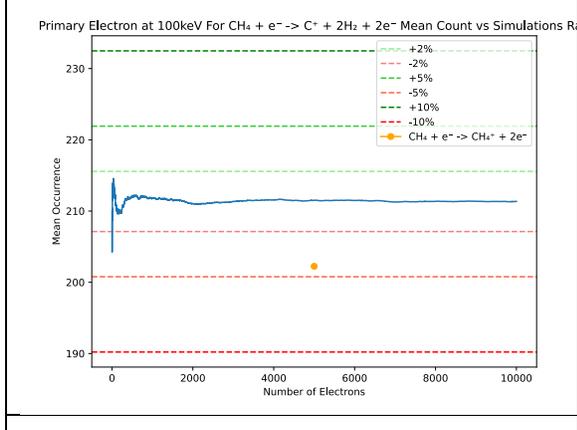
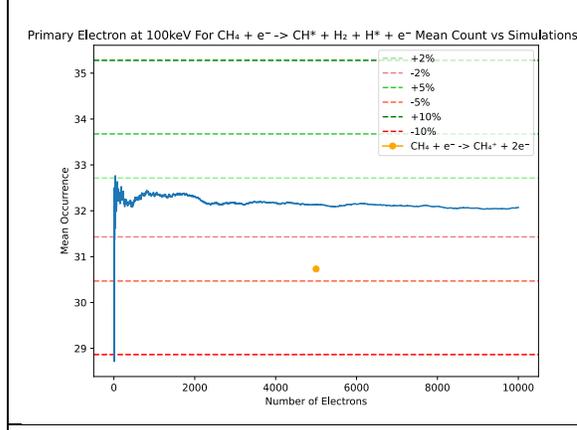
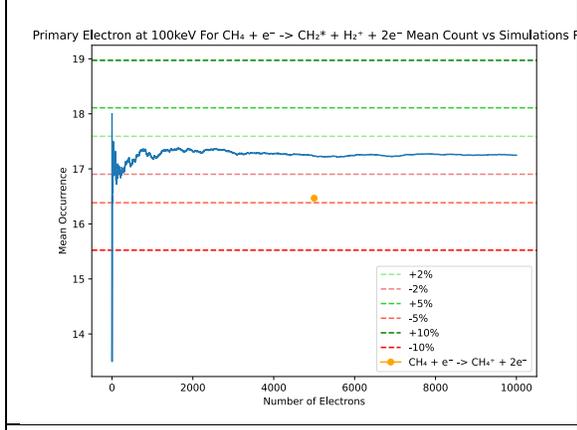
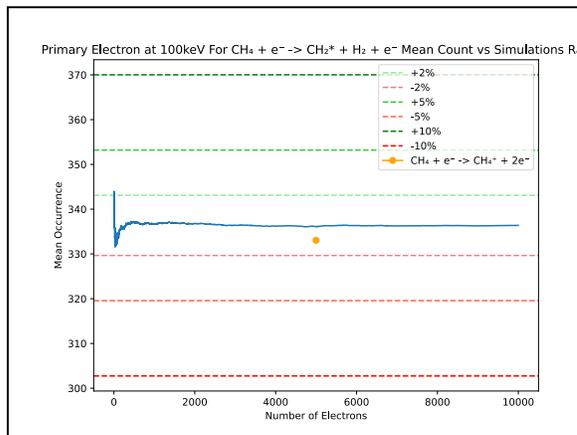
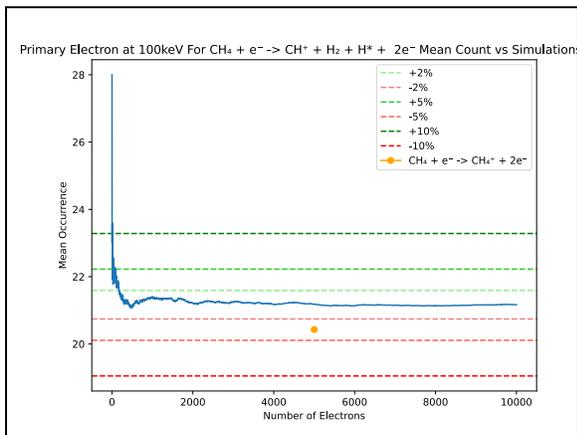
## Appendix D: Sensitive Analysis

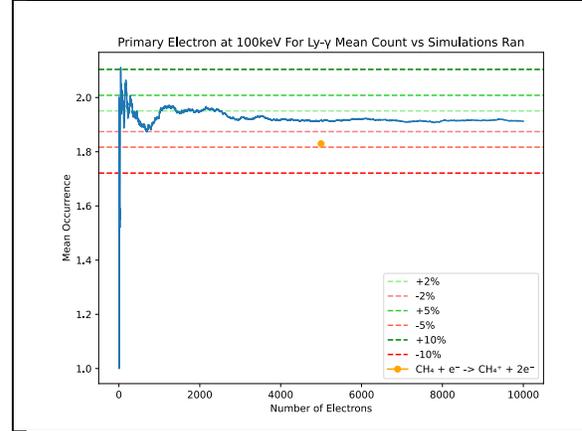
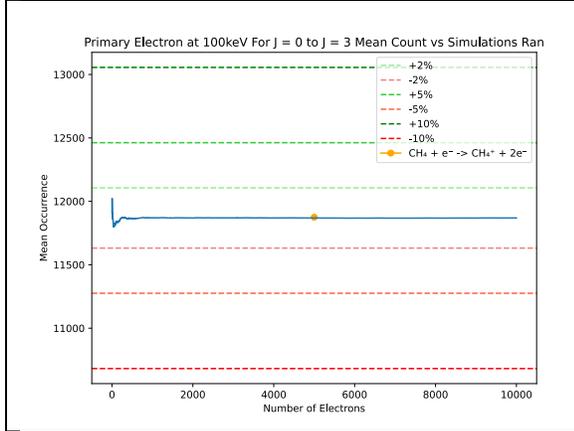
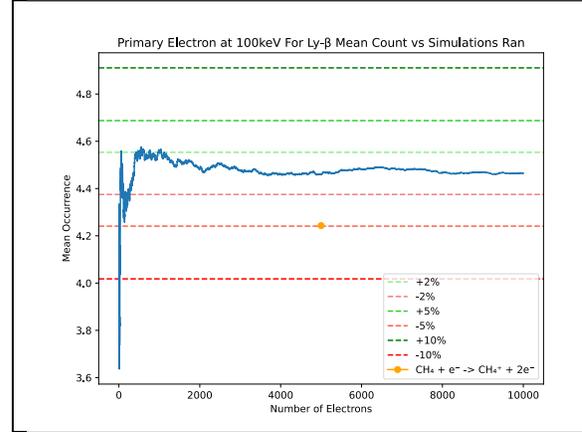
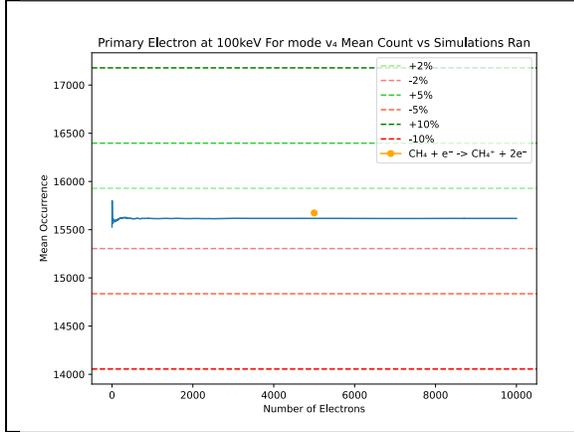
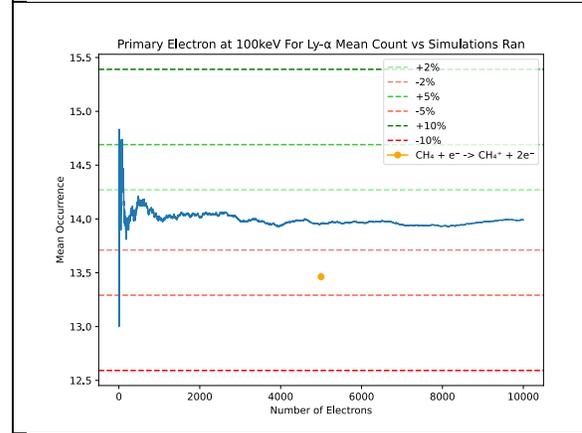
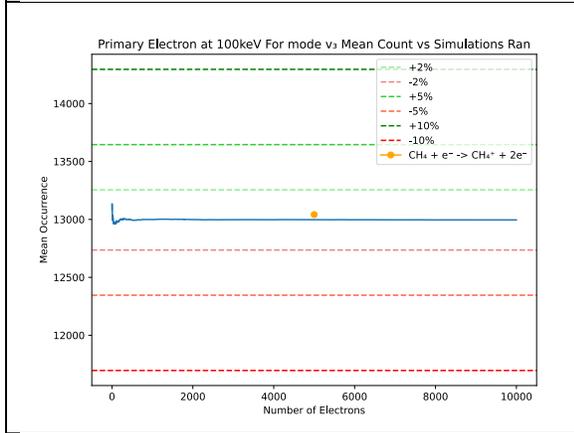
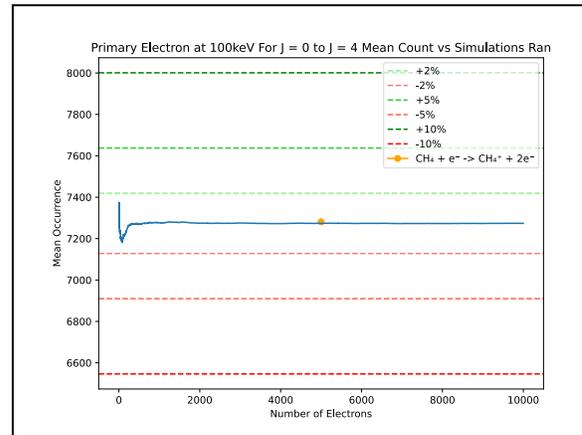
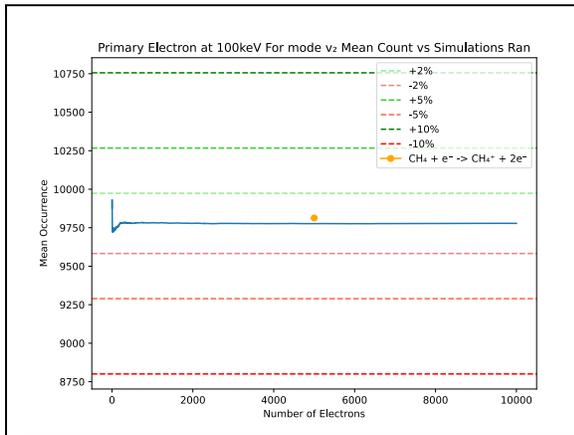
The sensitivity of results associated with changing one of the cross sections by increasing it for all energies by 10% is shown below in terms of the number of occurrences of each of the events in Tables 1 – 3. Each figure shows the mean occurrence convergence from 1 to 10,000 incoming electrons. Based on the observation that all outcomes have become almost constant by 5000 incoming electrons it was decided to use that many electrons to explore the sensitivity of the different cross sections. On each of the convergence figure a single point in yellow at 5000 electrons show how the number of occurrences of all the events would be affected by changing just one cross section. Shown are only data for changing the cross sections of:

Events	Type	Energy (eV)
$\text{CH}_4 + e_a^- \rightarrow \text{CH}_4^+ + e_a^- + e_b^-$	ION	12.60
$\text{CH}_4 + e_a^- \rightarrow \text{CH}_3^+ + \text{H}^* + e_a^- + e_b^-$	IOND	14.52
$\text{CH}_4 + e_a^- \rightarrow \text{CH}_3^* + \text{H}^+ + e_a^- + e_b^-$	IOND	18.28
Vibrational excitation, mode $\nu_4$	EIE	0.162
Rotational excitation, $J = 0$ to $J = 3$	EIE	0.0078
Rotational excitation, $J = 0$ to $J = 4$	EIE	0.0130

Table D1: Sensitivity of all event occurrences to increasing the cross section of  $\text{CH}_4 + e_a^- \rightarrow \text{CH}_4^+ + e_a^- + e_b^-$  by 10%







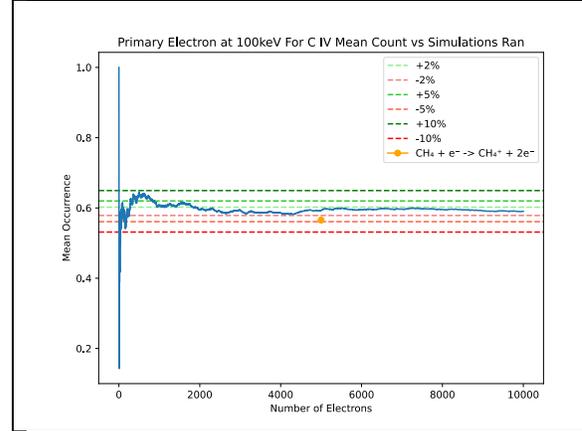
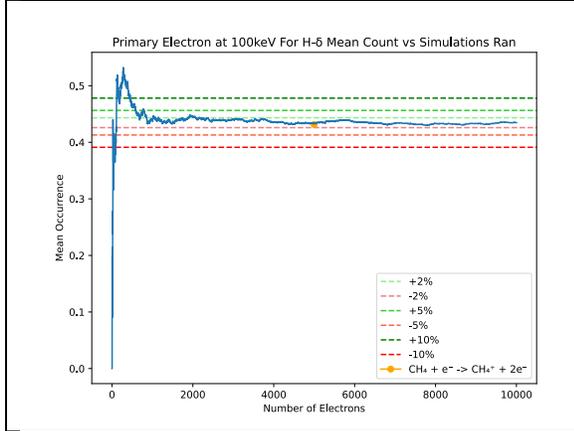
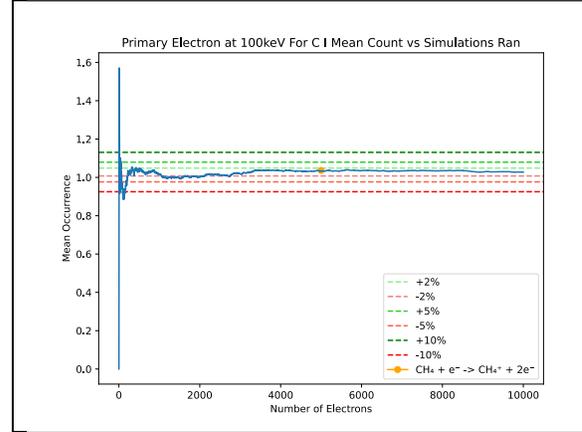
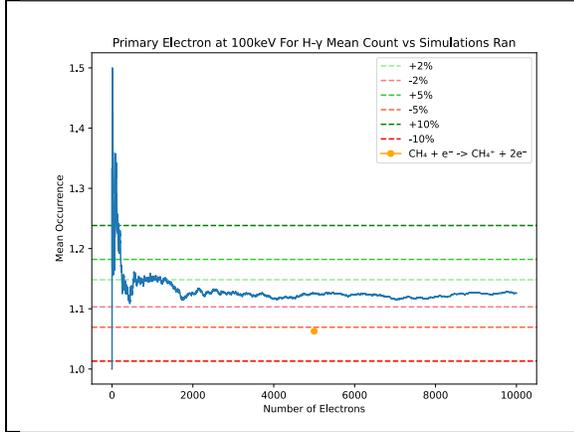
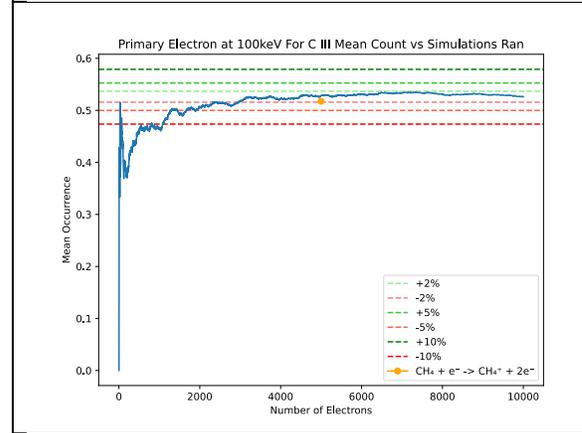
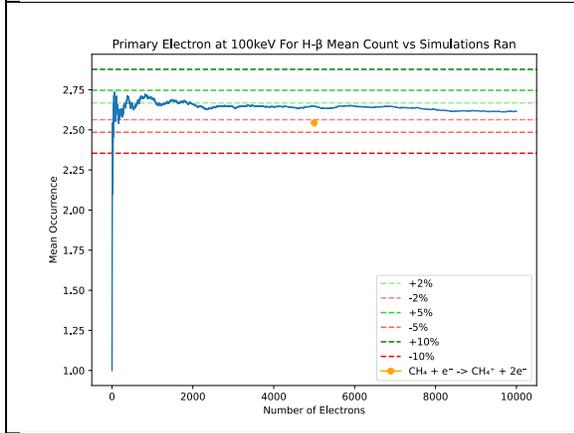
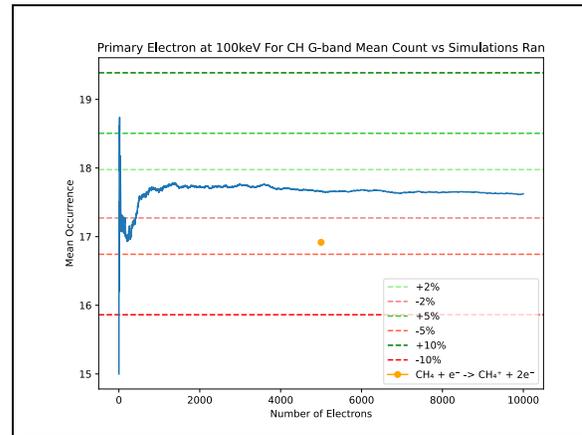
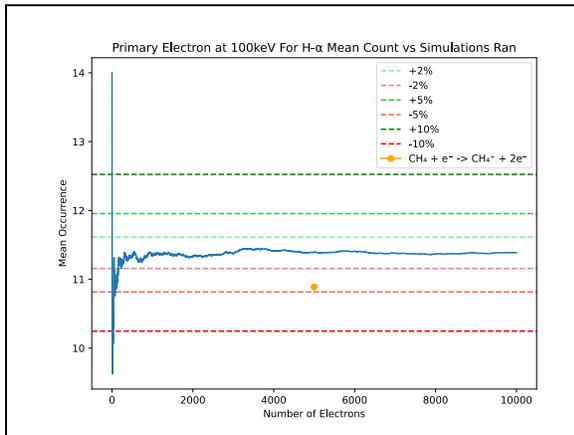
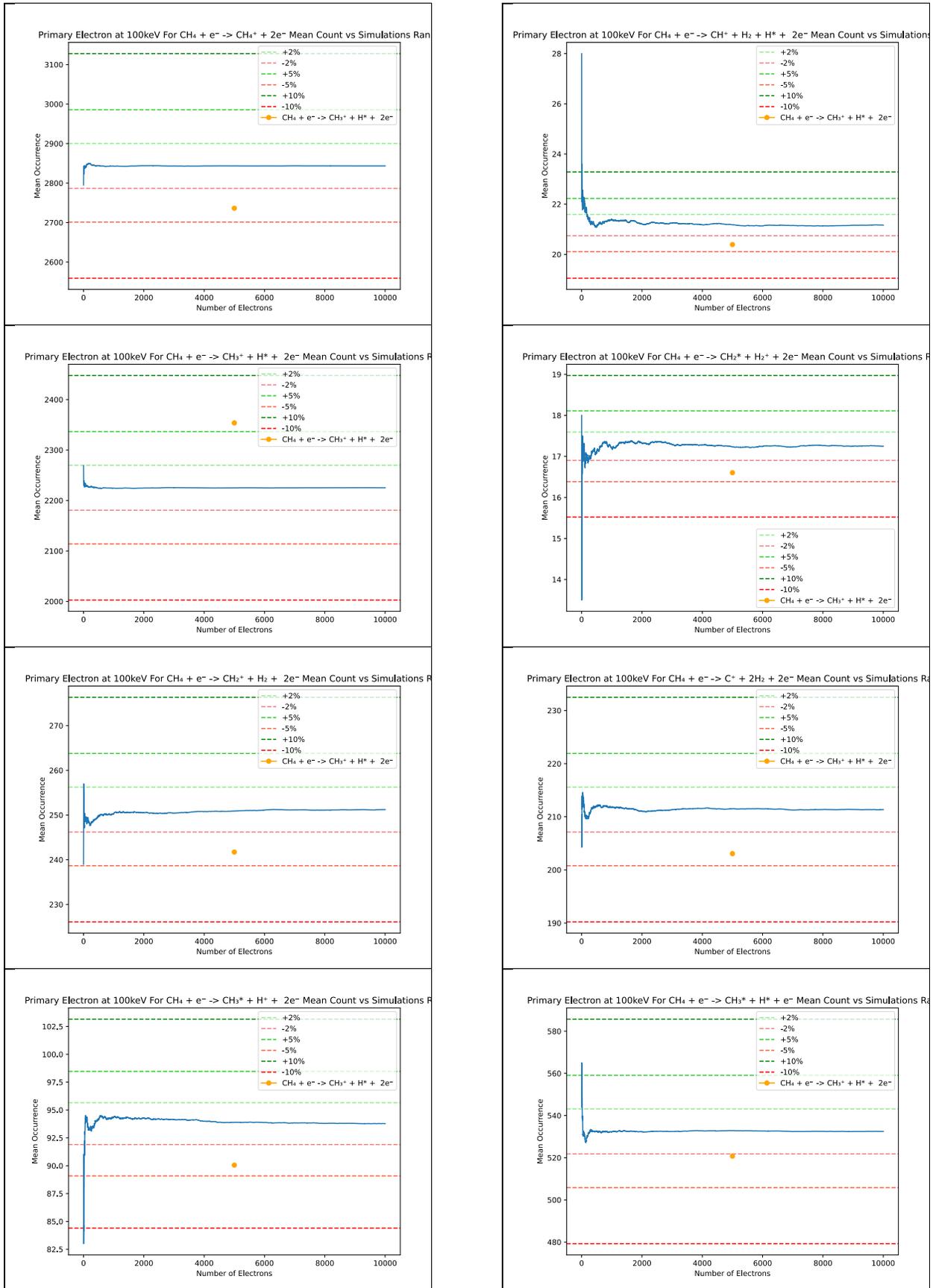
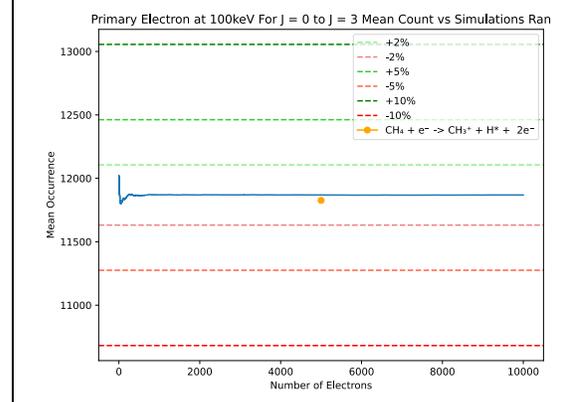
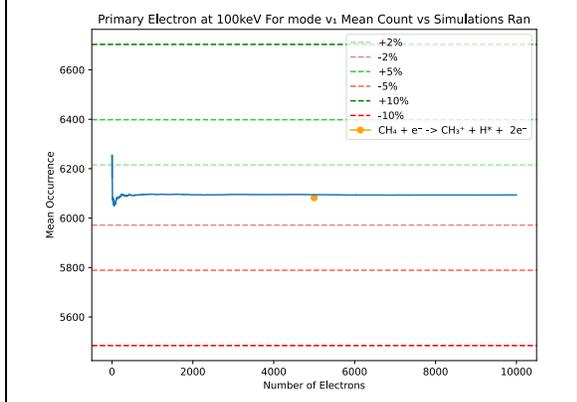
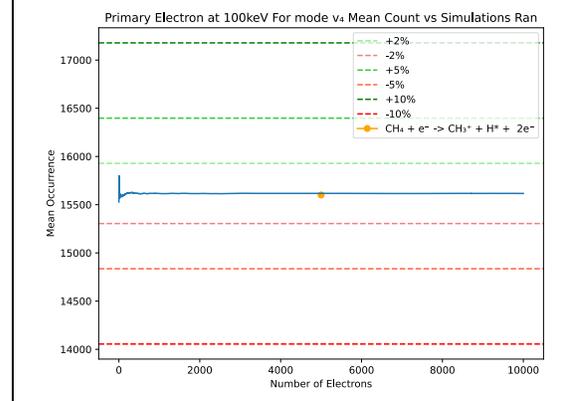
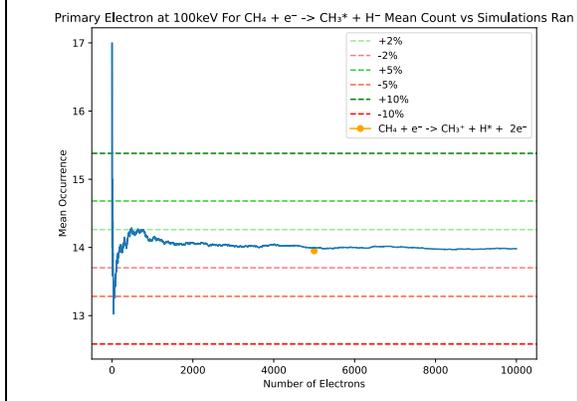
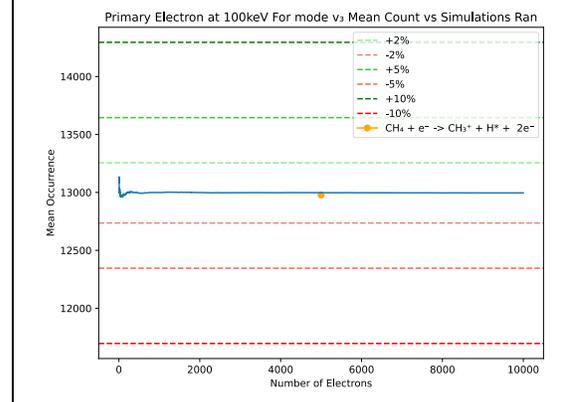
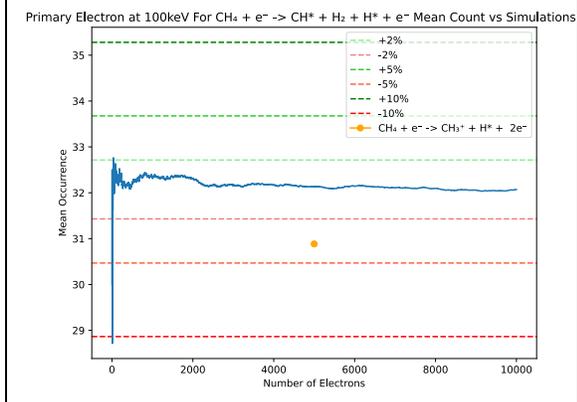
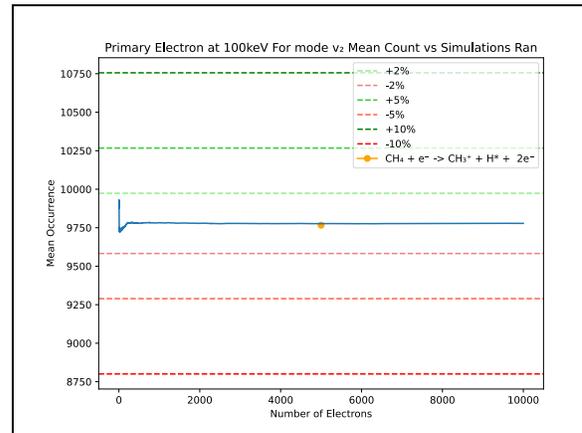
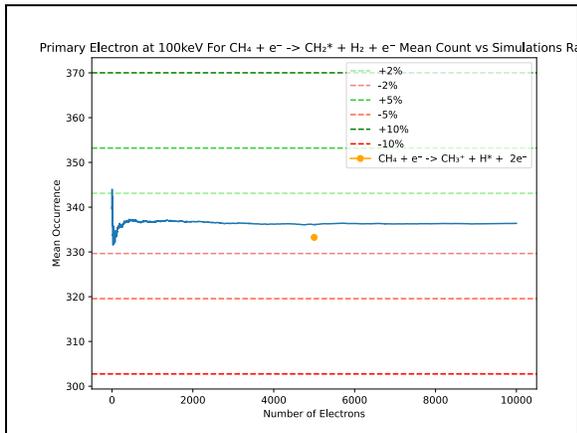
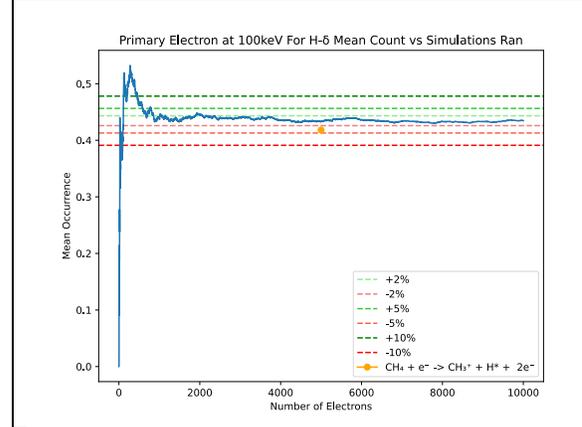
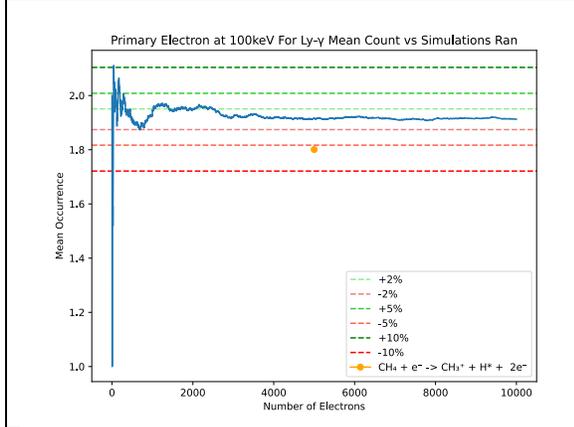
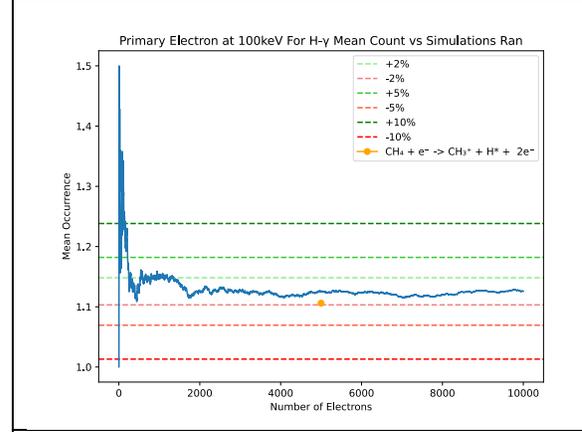
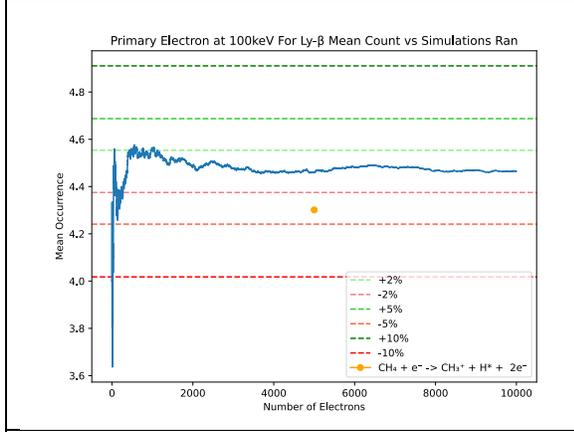
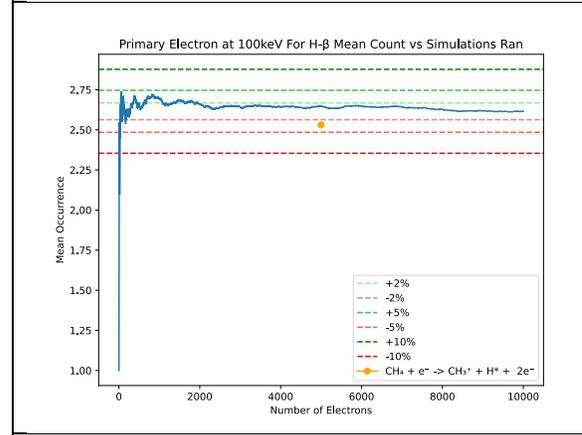
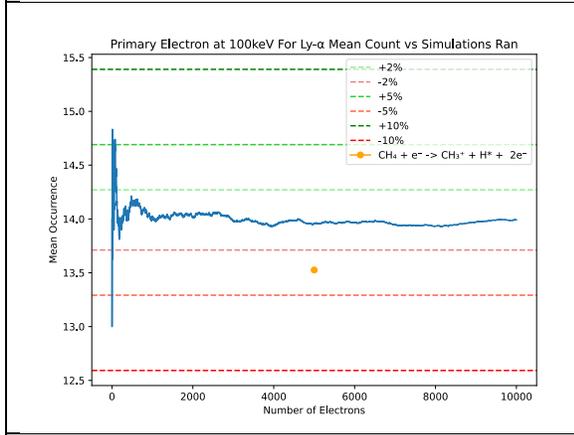
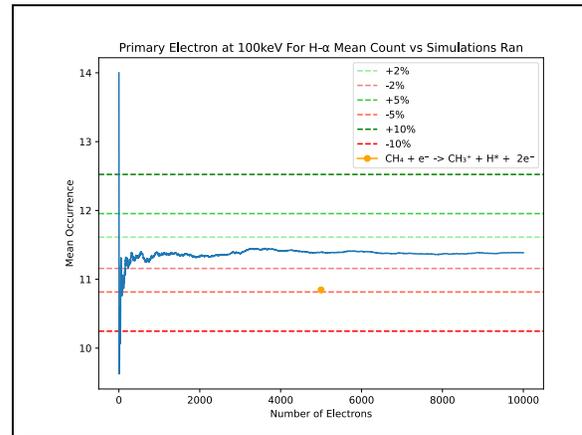
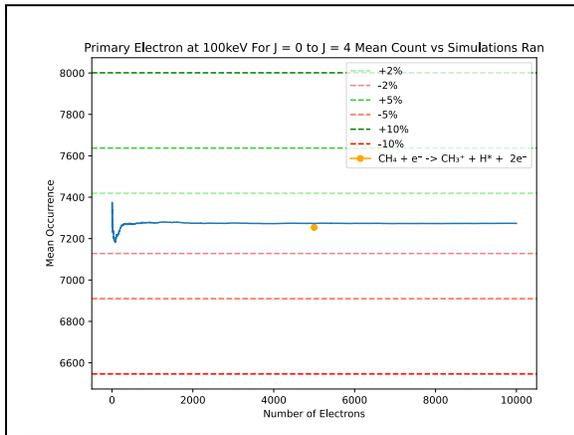


Table D2: Sensitivity of all event occurrences to increasing the cross section of  $\text{CH}_4 + e^- \rightarrow \text{CH}_3^+ + e^- + e^- + e^-$  by 10%







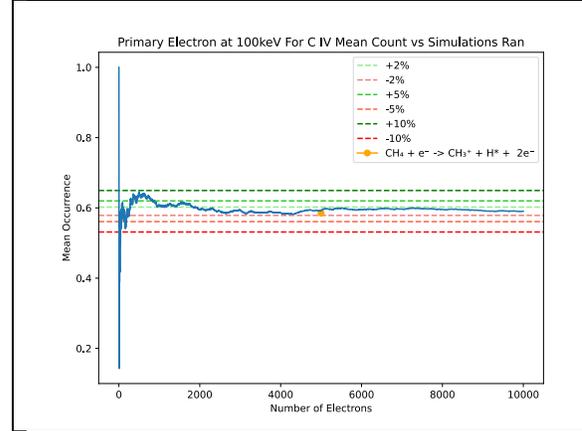
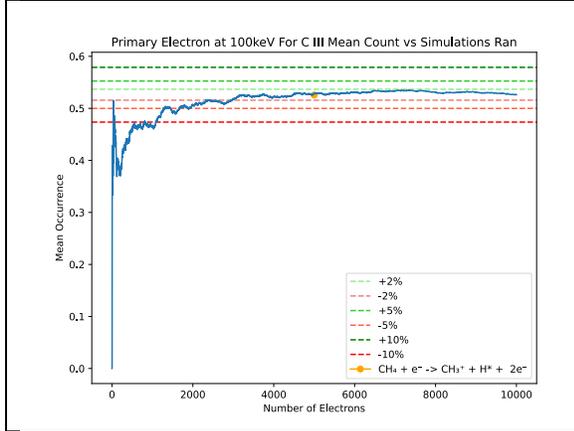
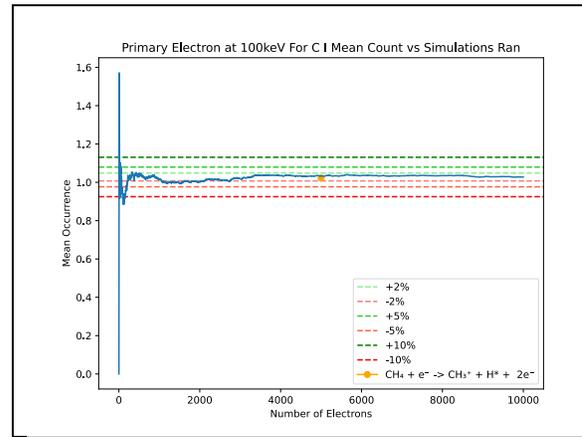
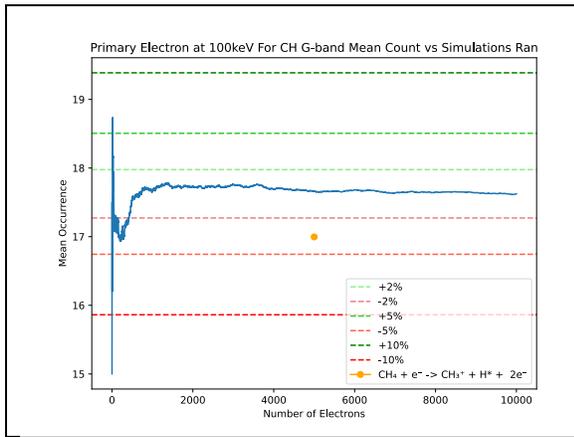
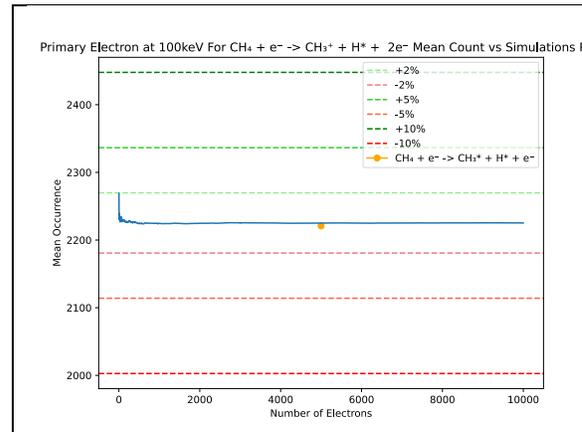
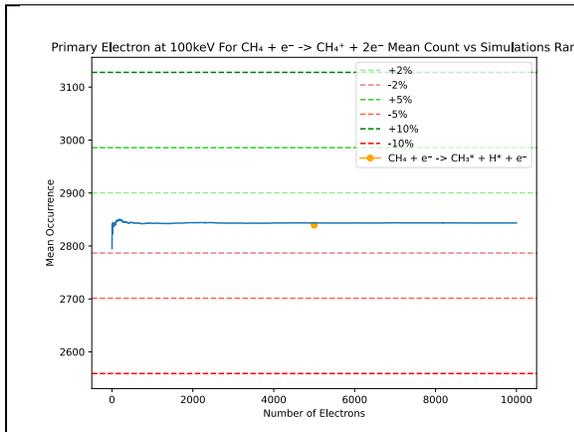
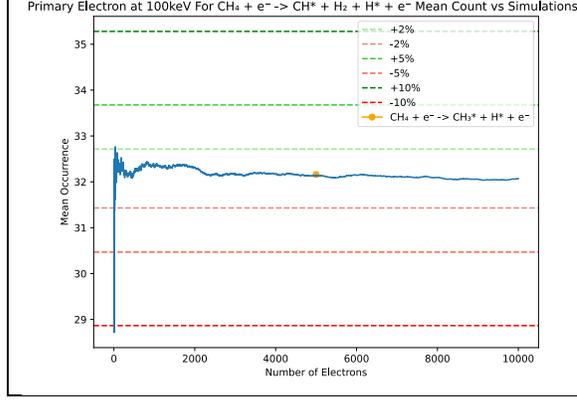
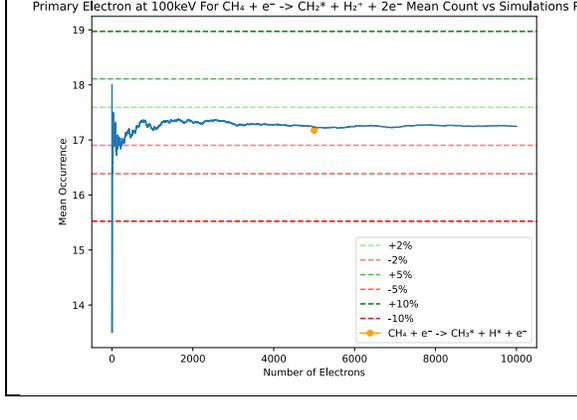
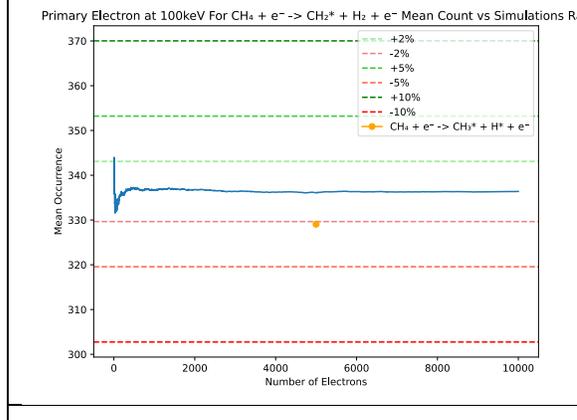
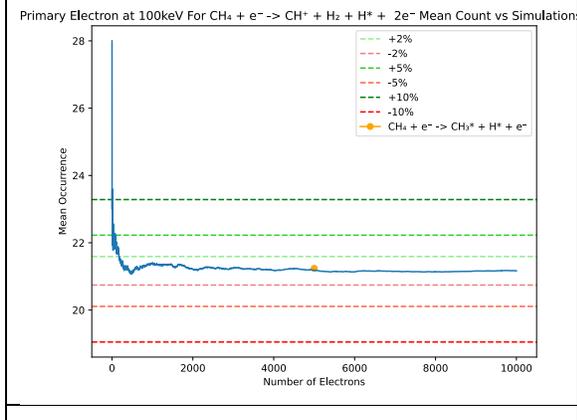
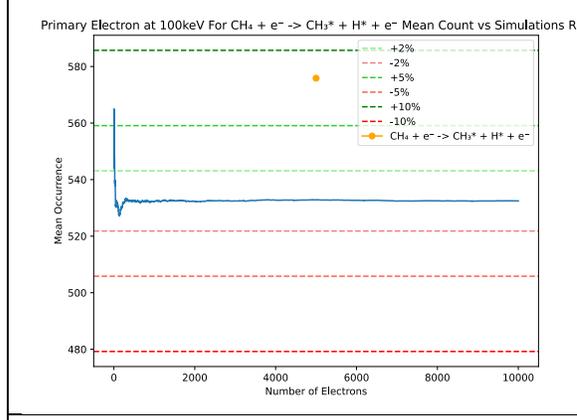
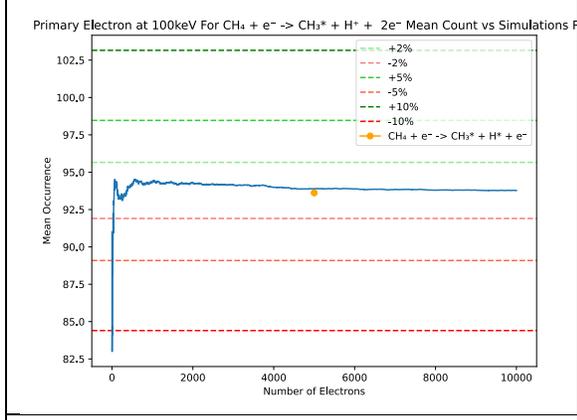
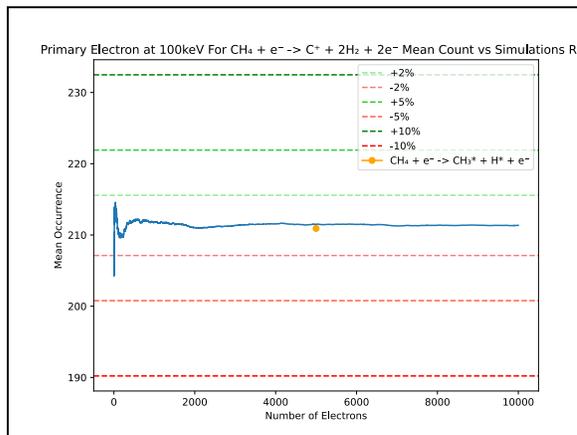
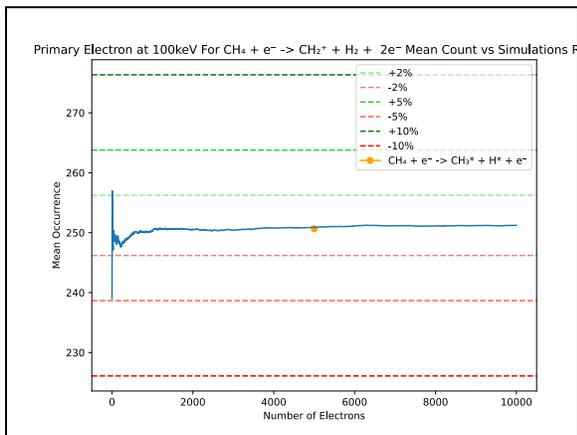
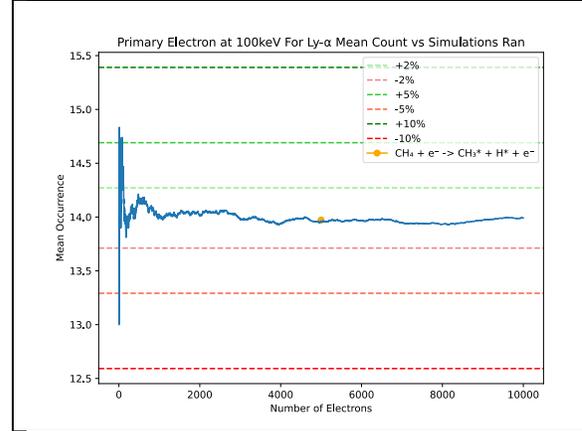
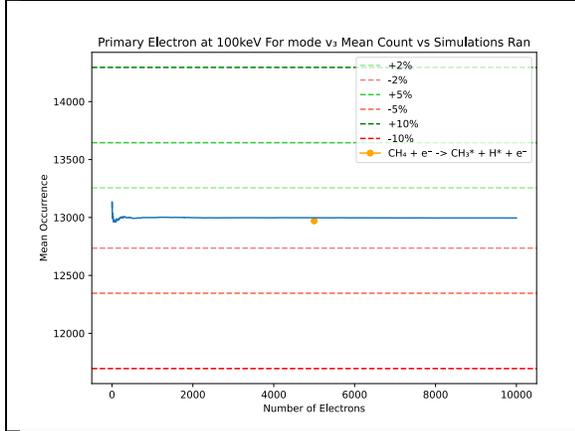
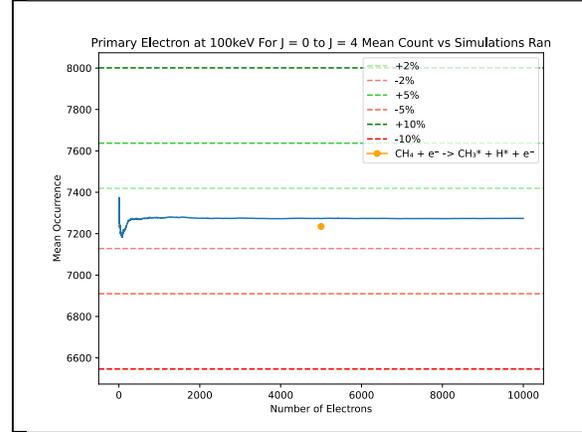
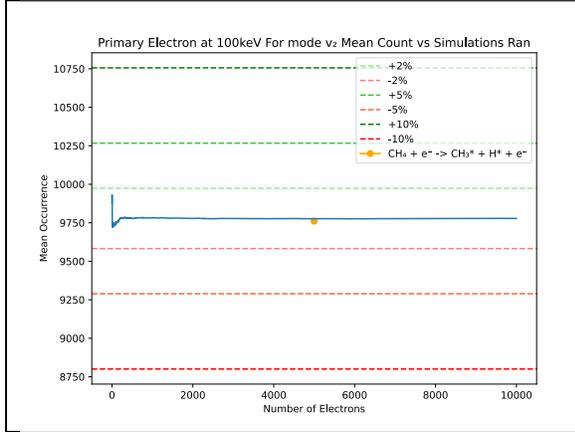
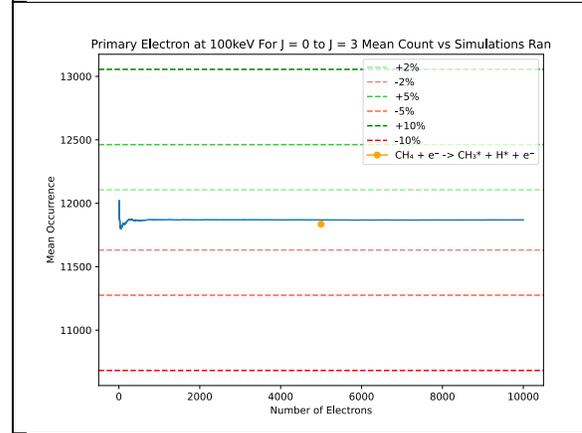
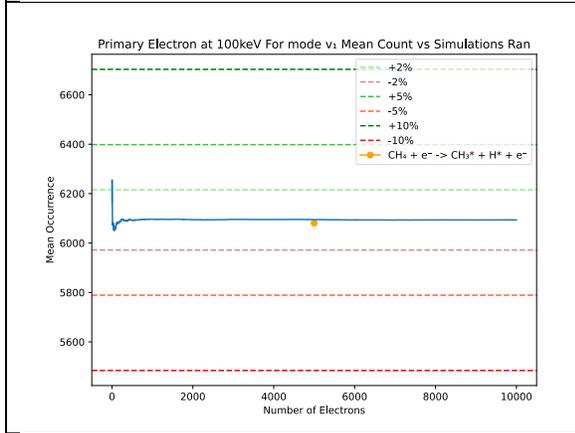
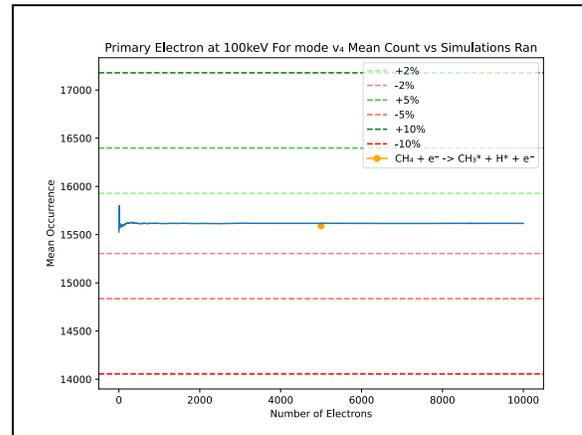
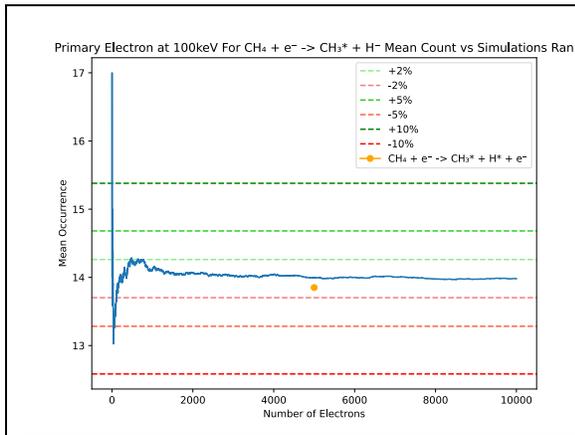
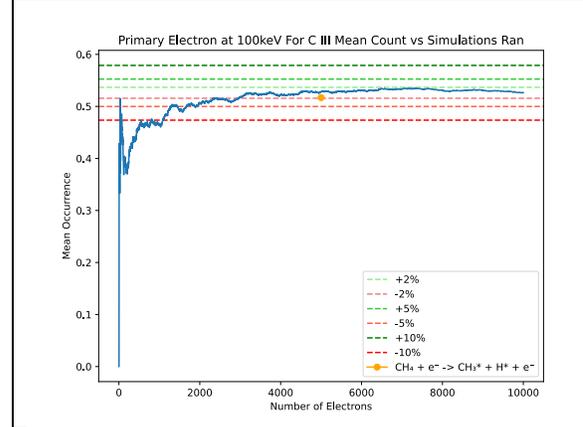
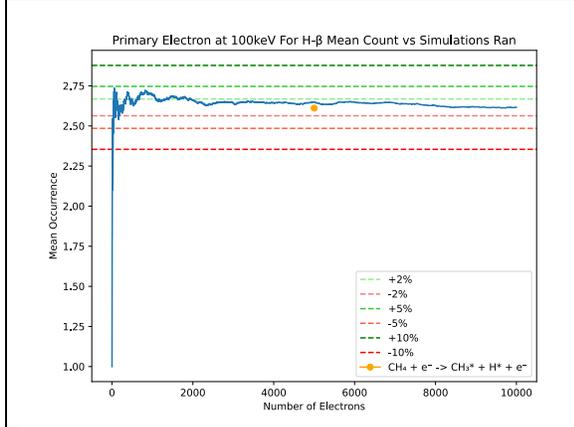
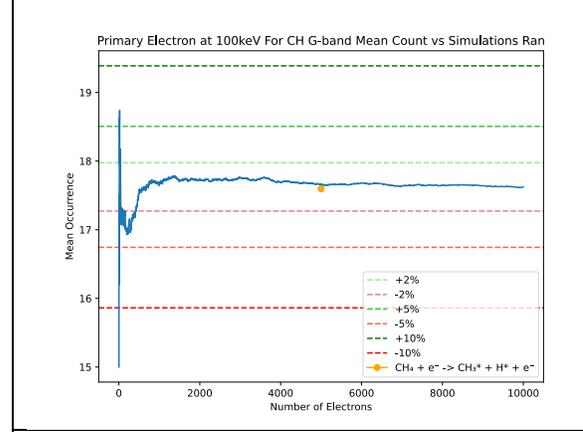
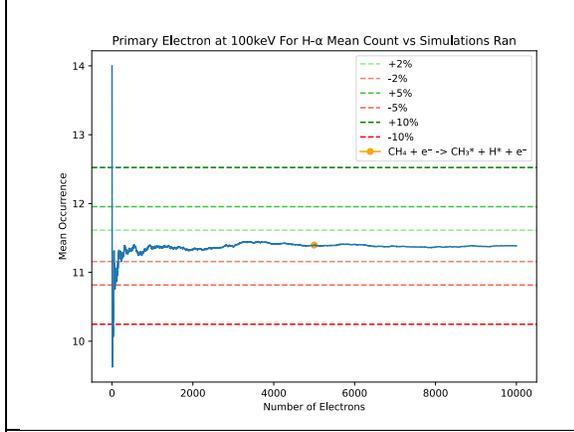
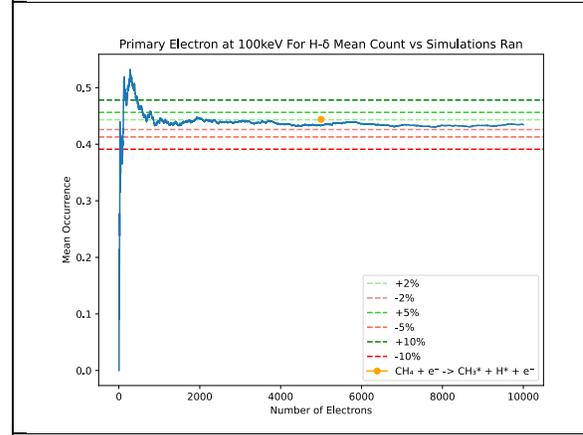
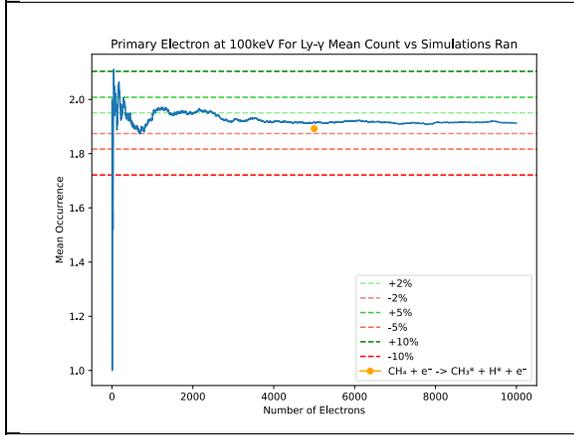
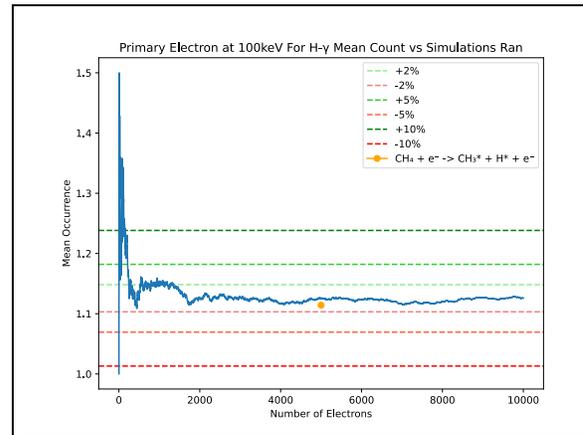
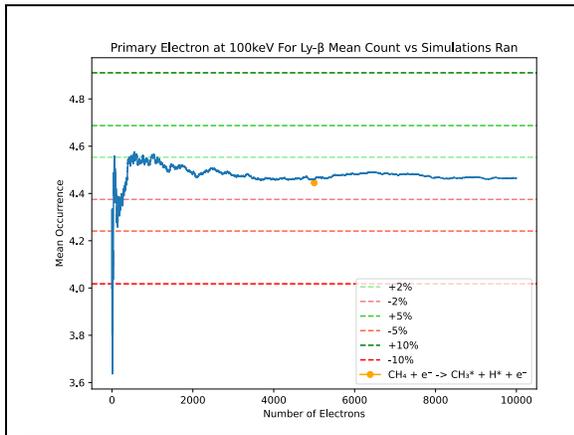


Table D3: Sensitivity of all event occurrences to increasing the cross section of  $\text{CH}_4 + e^- \rightarrow \text{CH}_3^+ + e^- + e^-$  by 10%









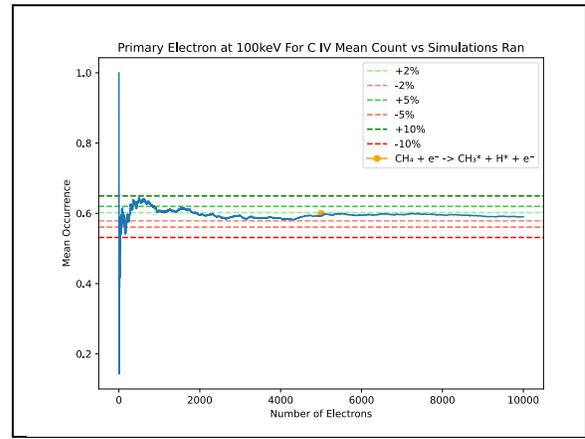
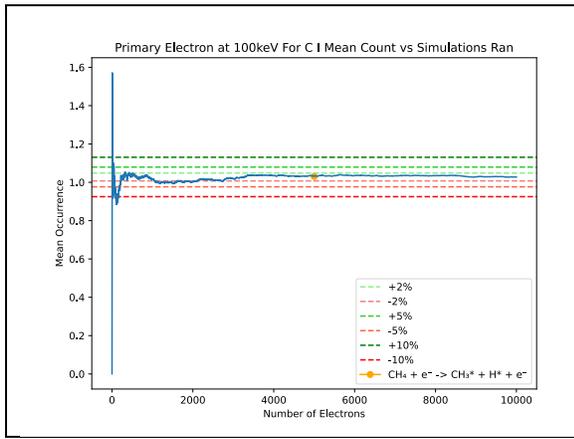
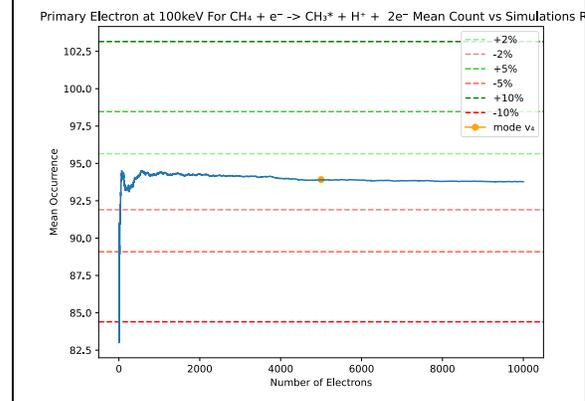
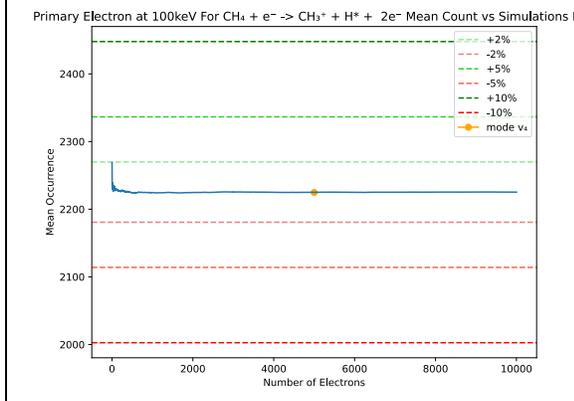
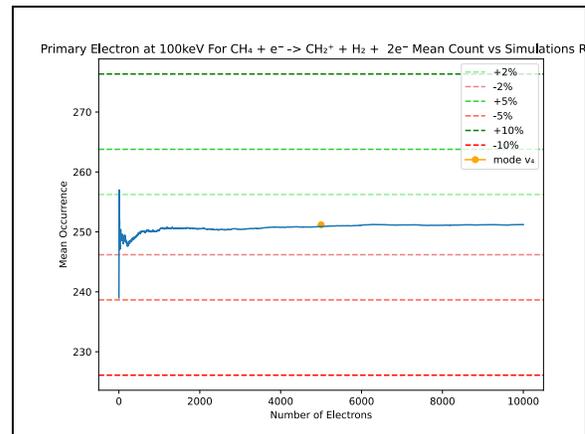
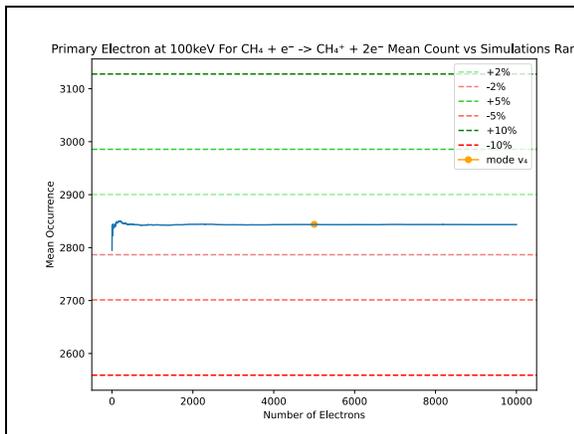
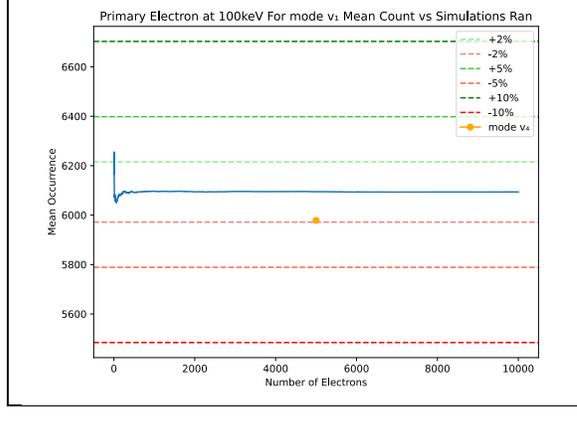
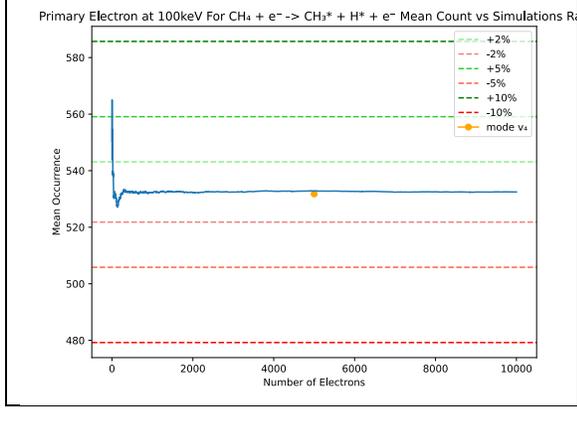
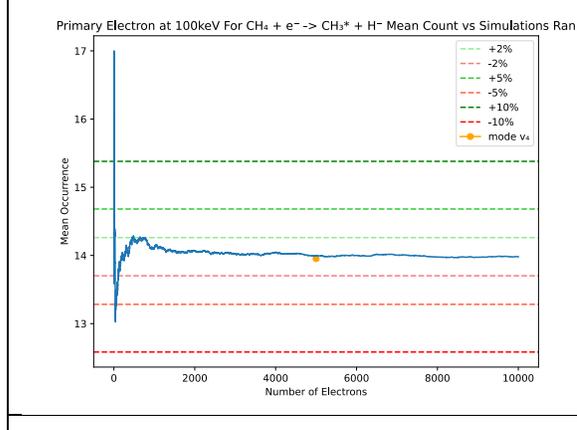
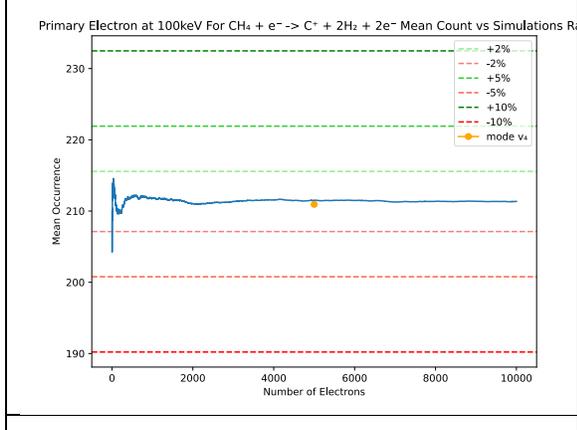
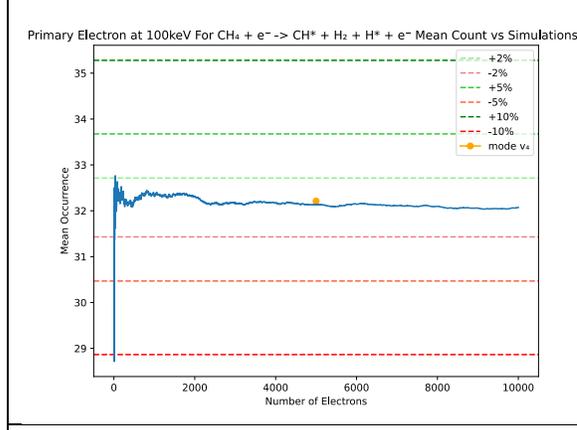
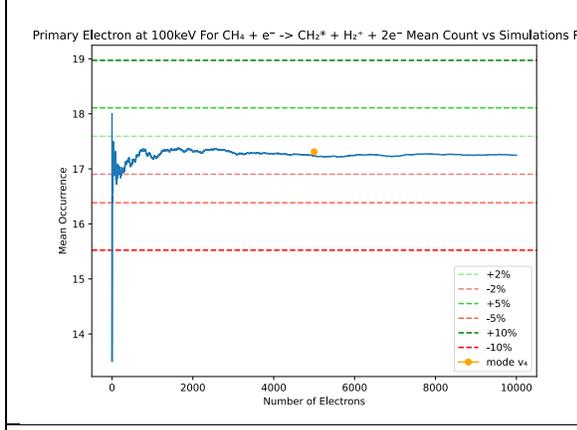
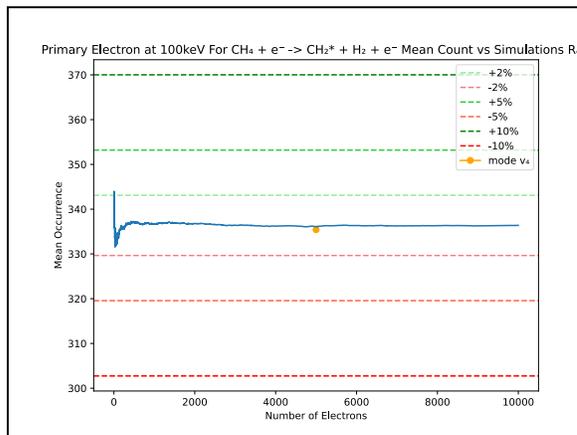
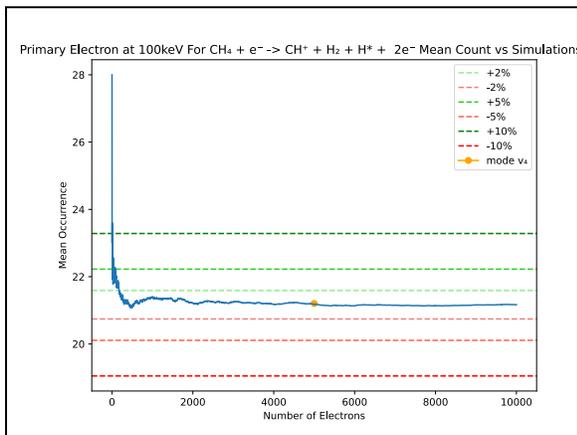
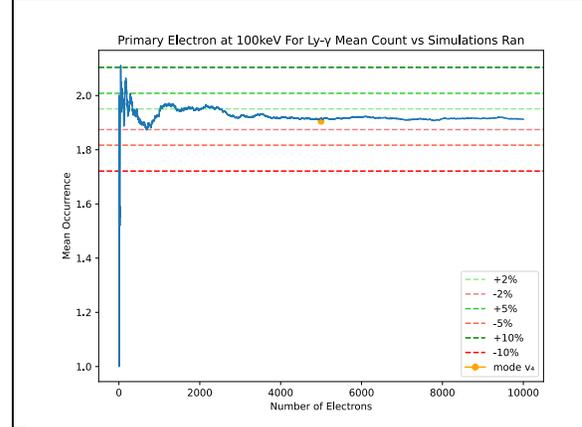
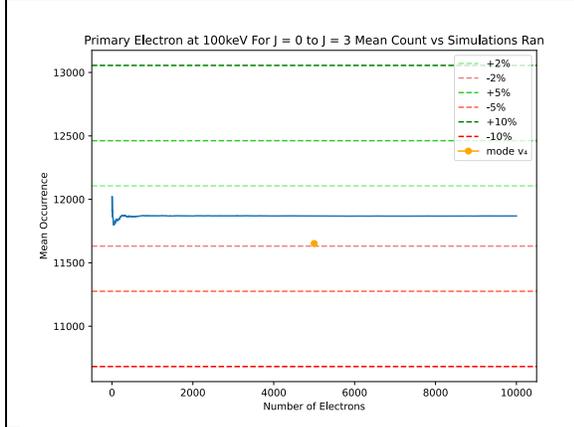
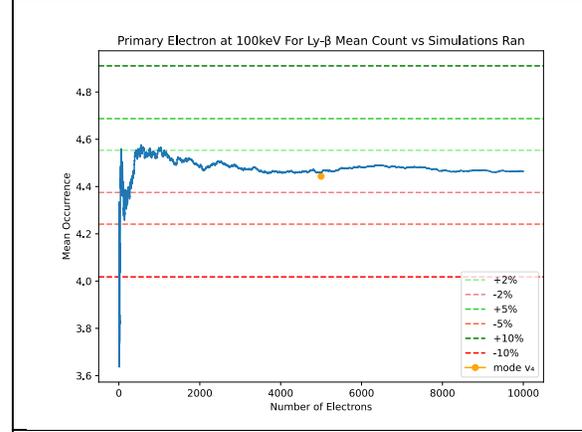
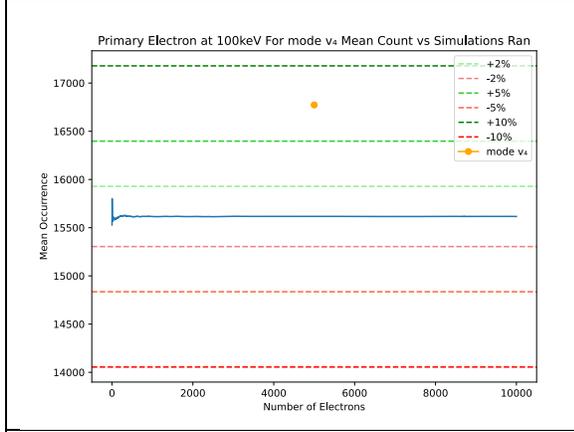
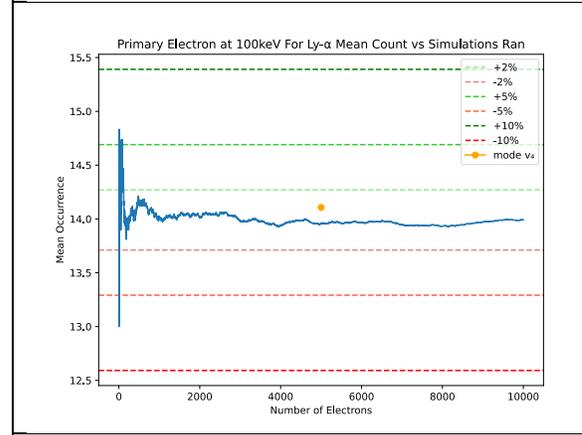
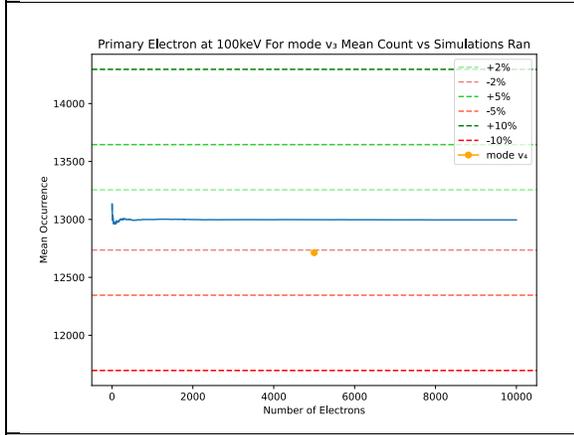
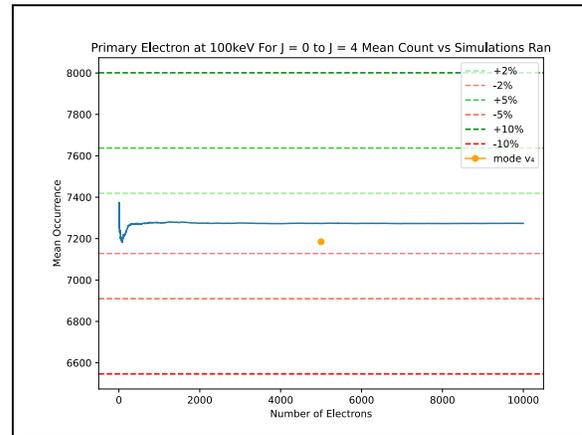
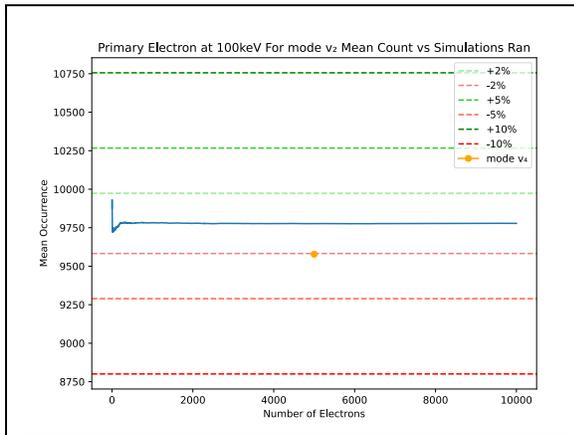


Table D4: Sensitivity of all event occurrences to increasing the cross section of Vibrational excitation, mode  $\nu_4$  by 10%







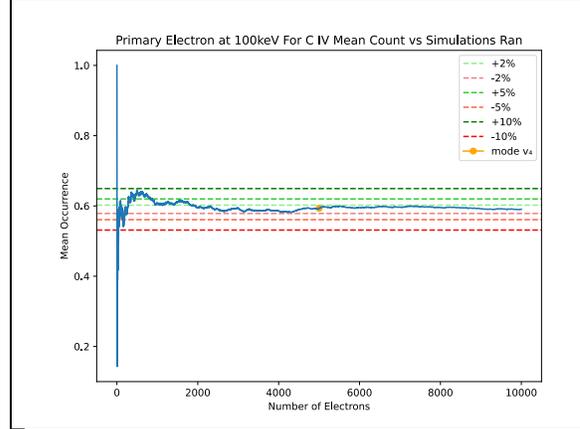
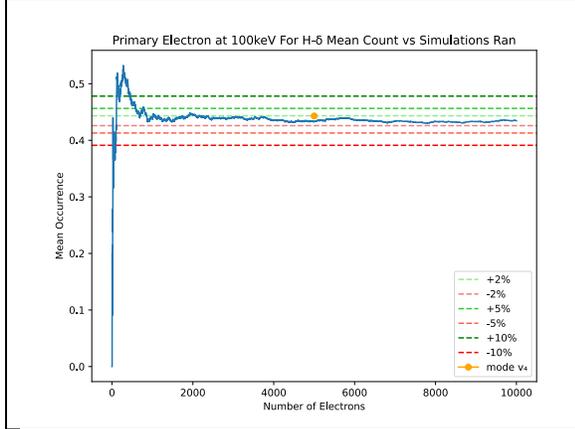
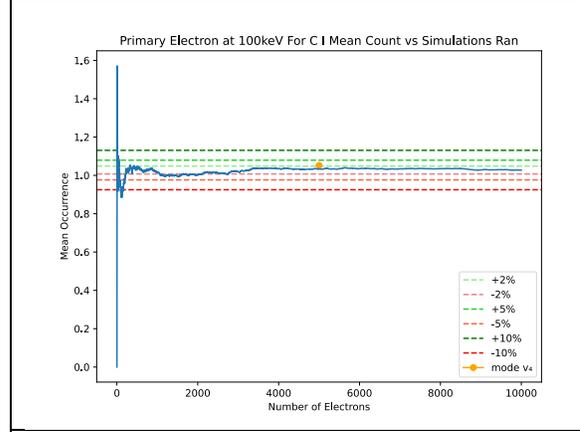
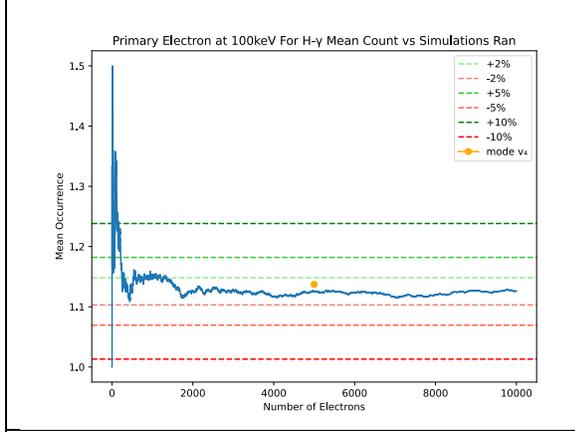
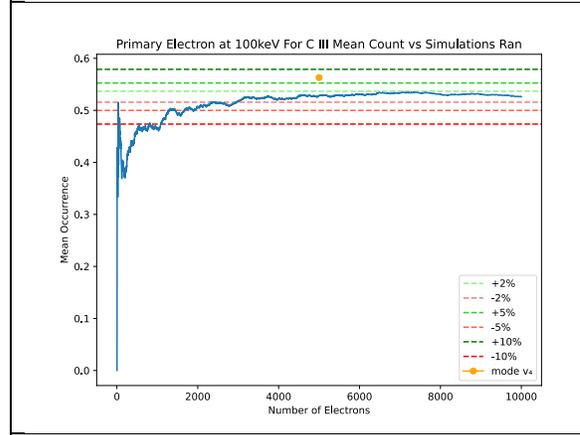
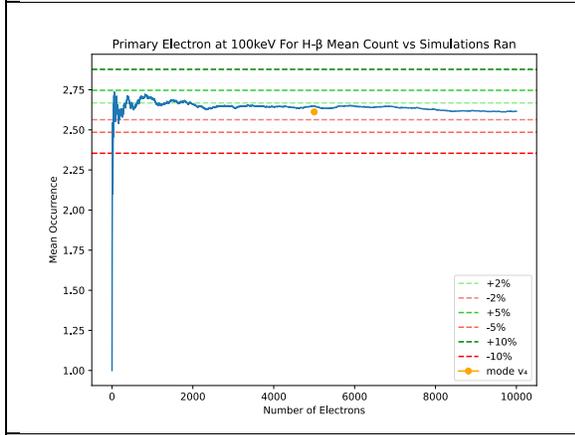
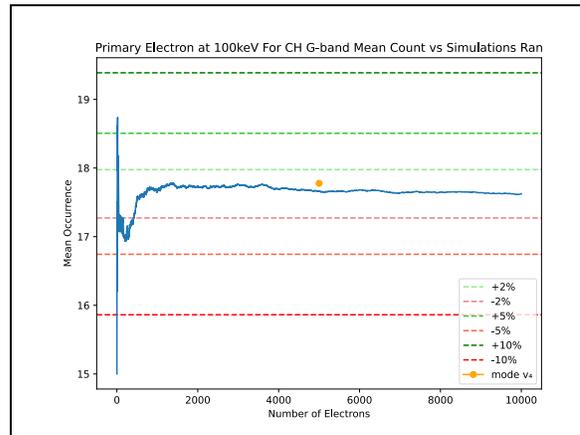
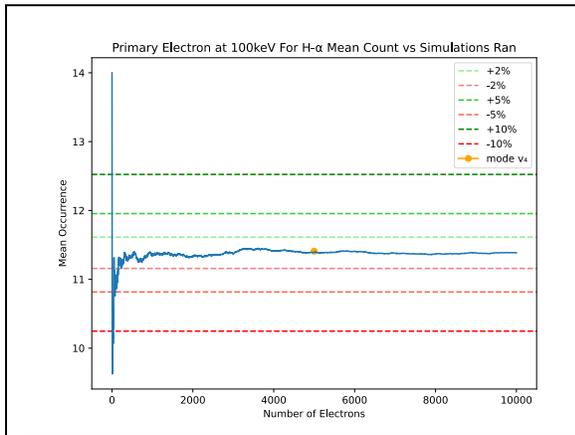


Table D5: Sensitivity of all event occurrences to increasing the cross section of Rotational excitation,  $J = 0$  to  $J = 3$  10%

