

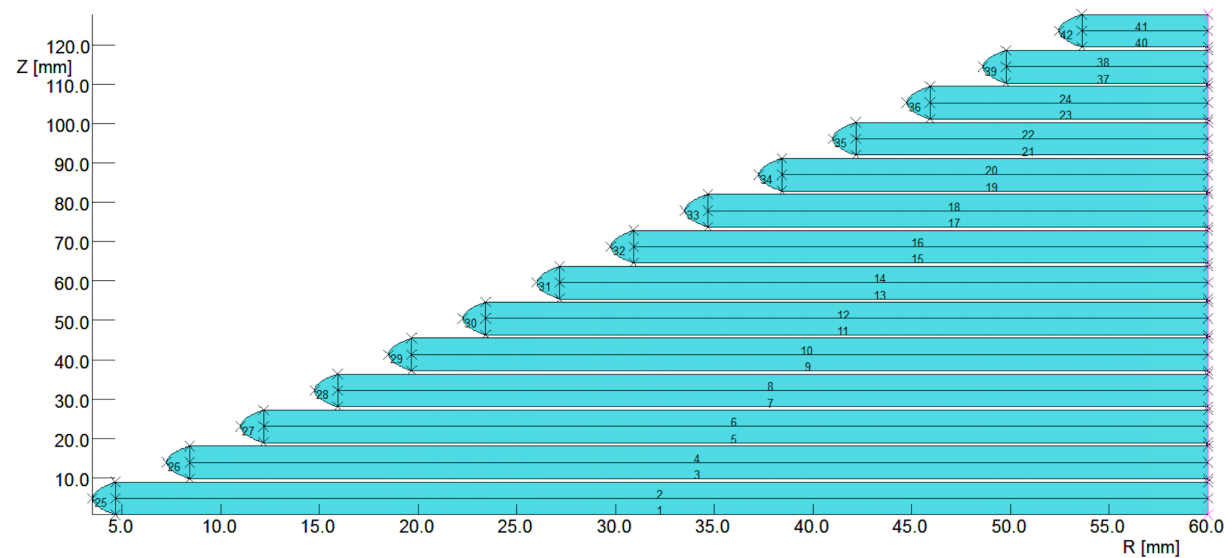
Positron source discussion

Yongke
26/3/2020

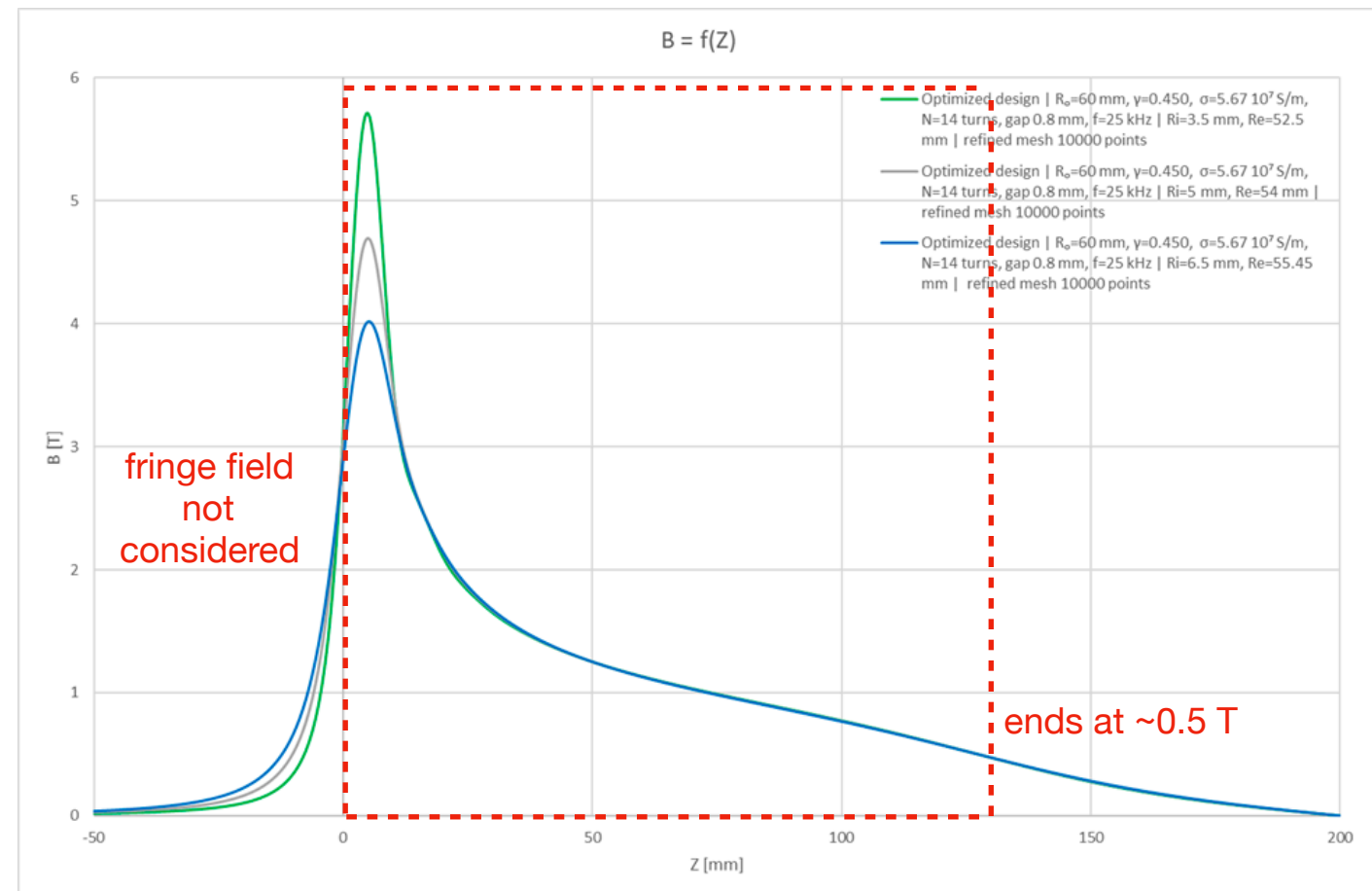
AMD design

Field map

- Optimised 2D Opera field map from Hugo was used
- Three different scenarios: **Low**, **Medium** and **High** field peak
- AMD parameters
 - 14 turns; thickness: 8 mm; gap: 0.8 mm; outer radius: 60 mm
 - total length: 127.7 mm
 - inner radius: 6.5 → 55.45 mm (**Low**), 5 → 54 mm (**Medium**), 3.5 → 52.5 mm (**High**)
- Fringe field in target not considered



High peak scenario



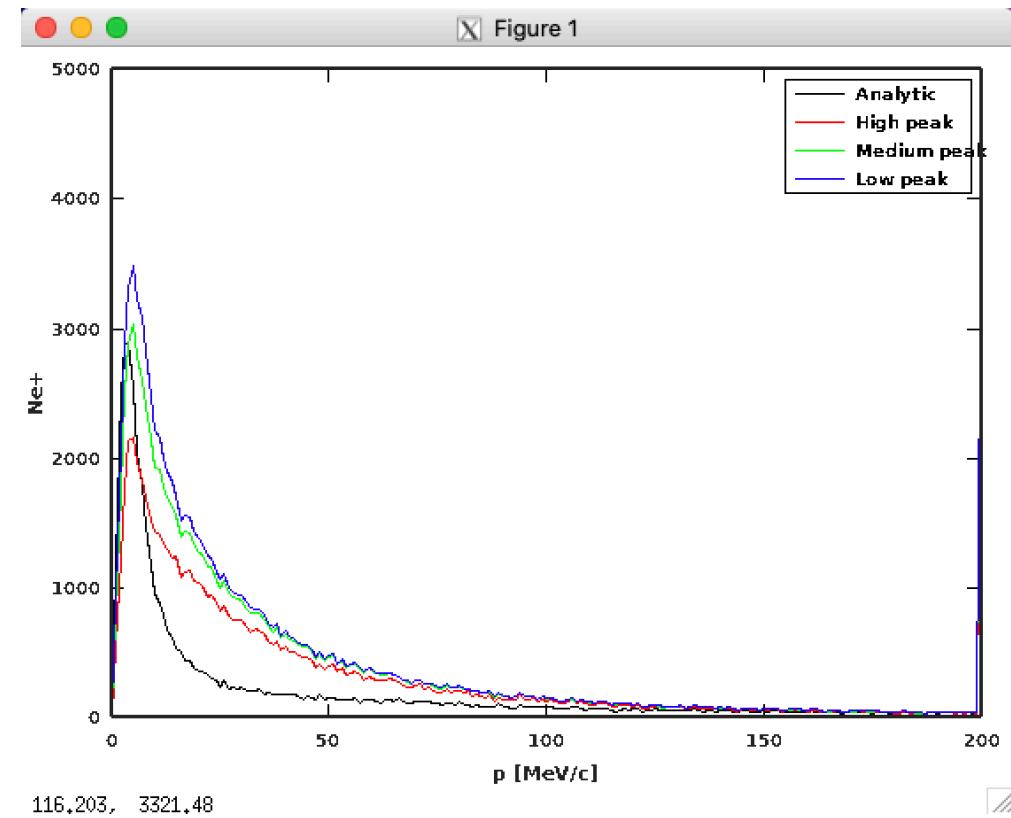
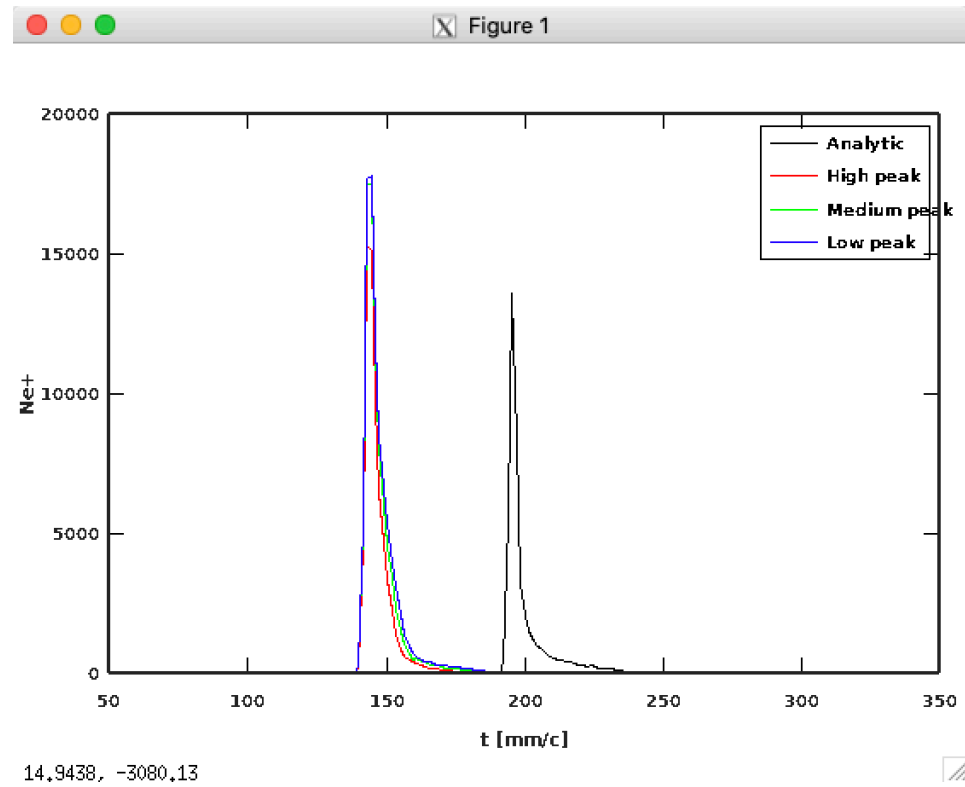
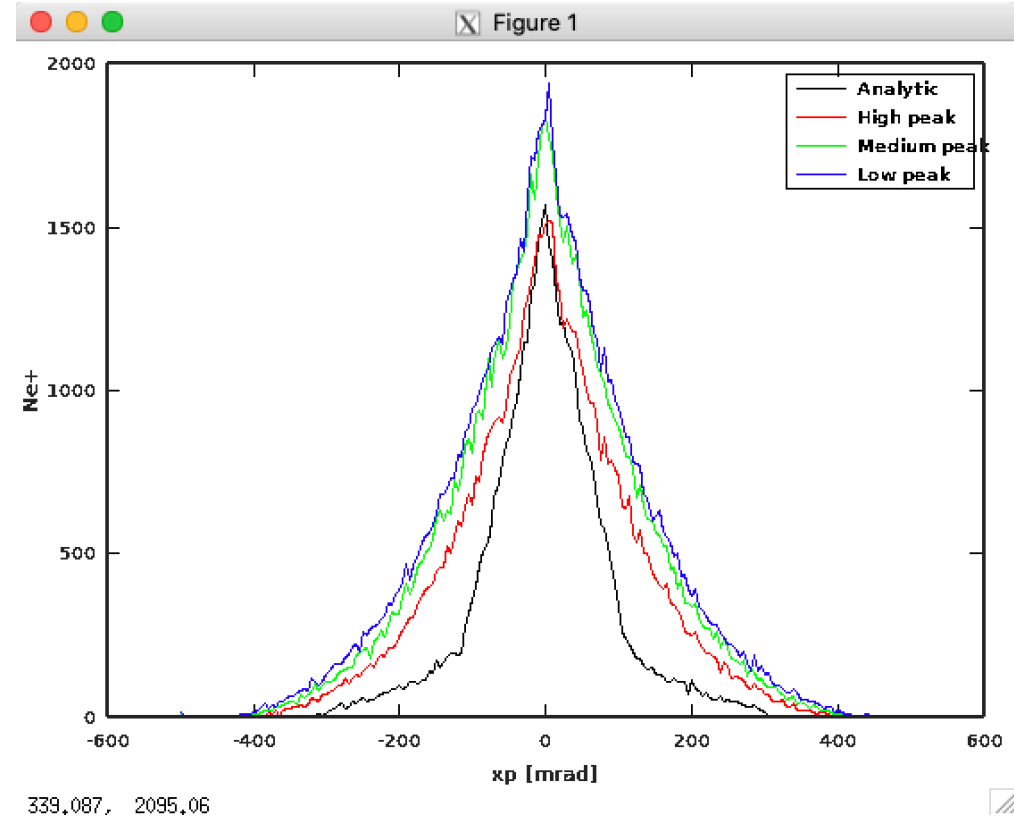
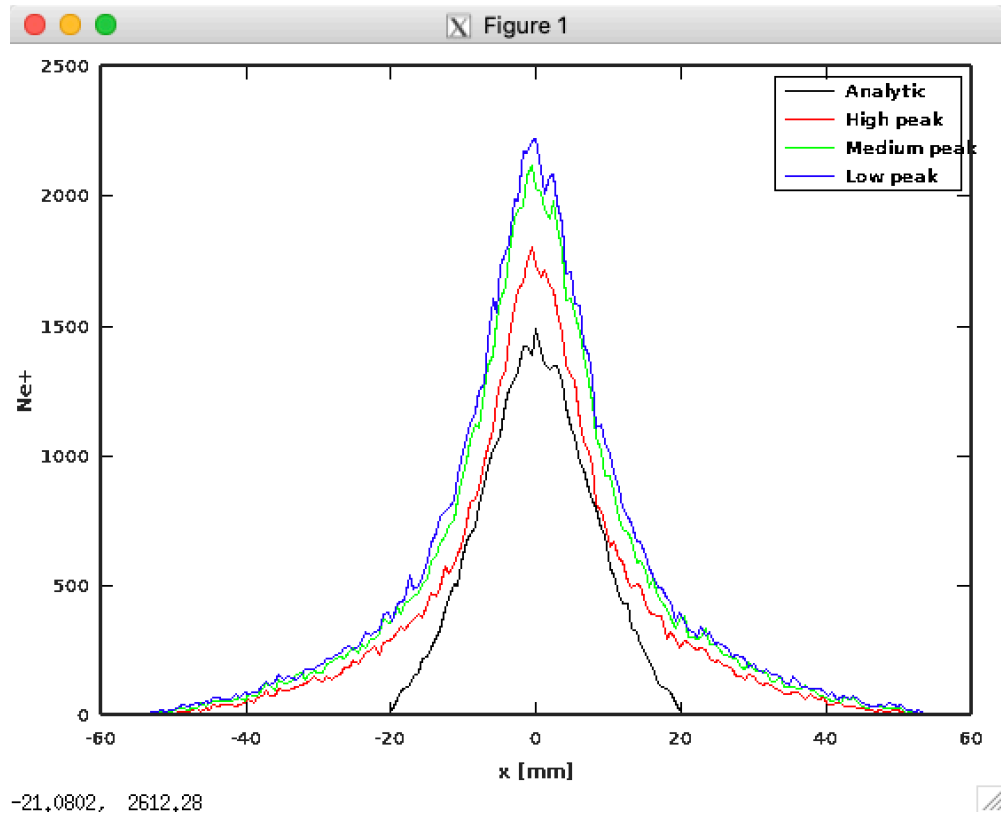
Three scenarios

Tracking results

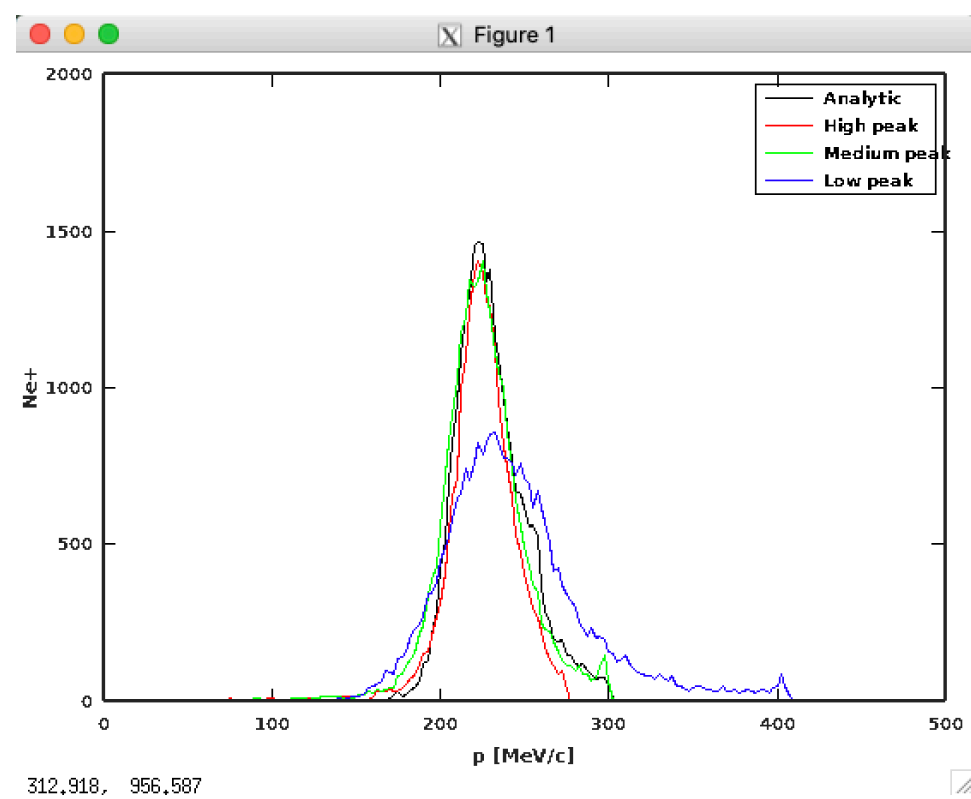
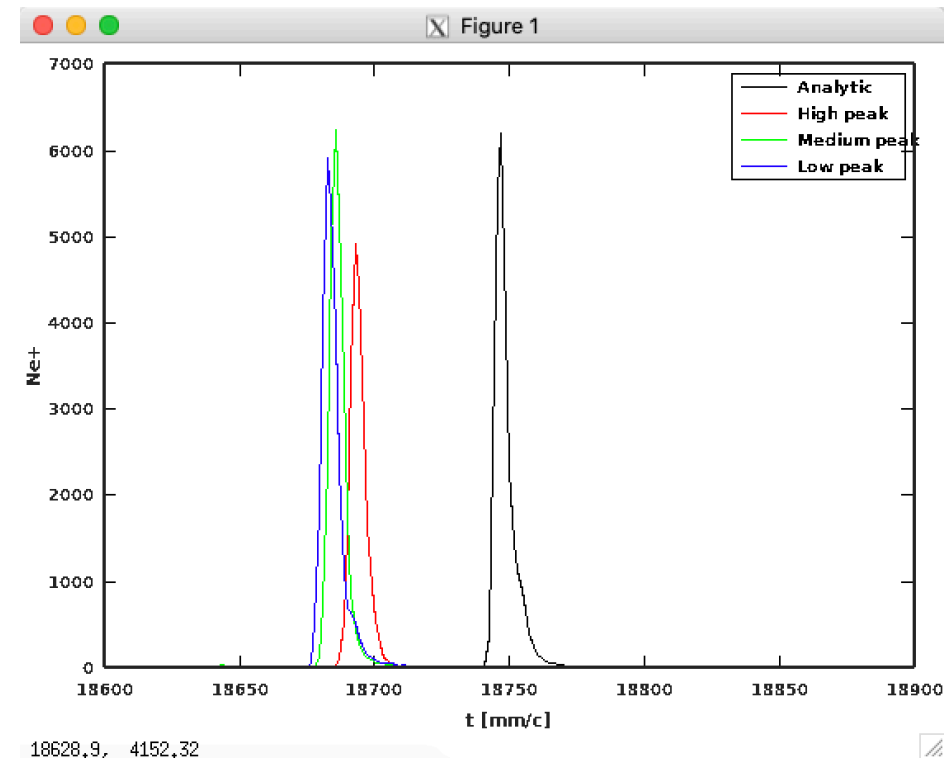
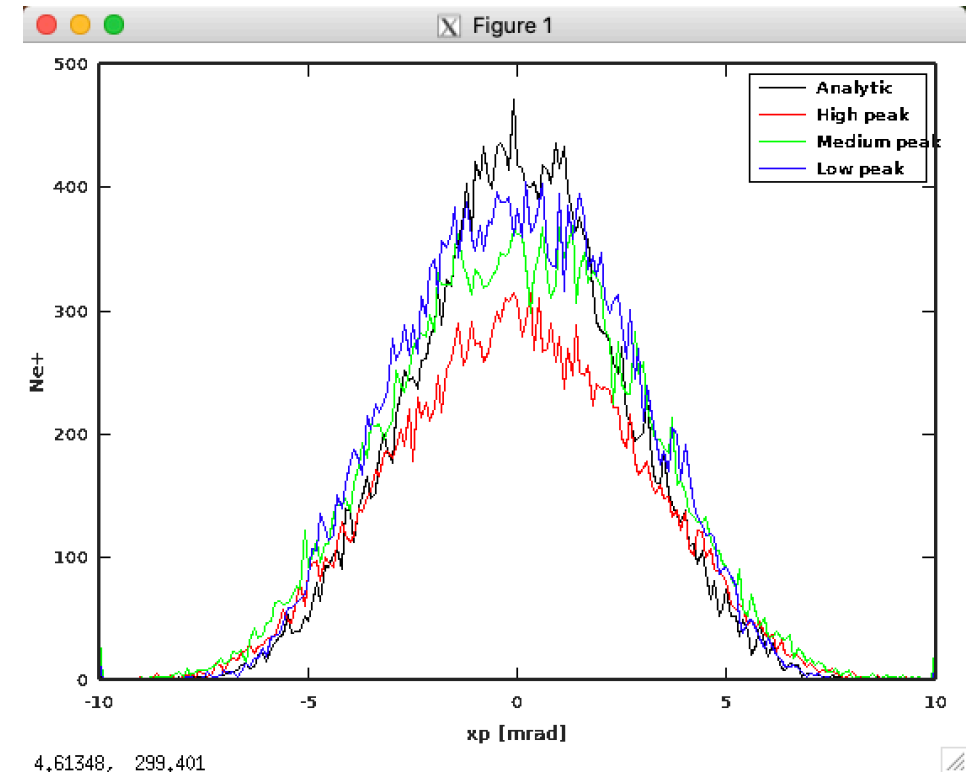
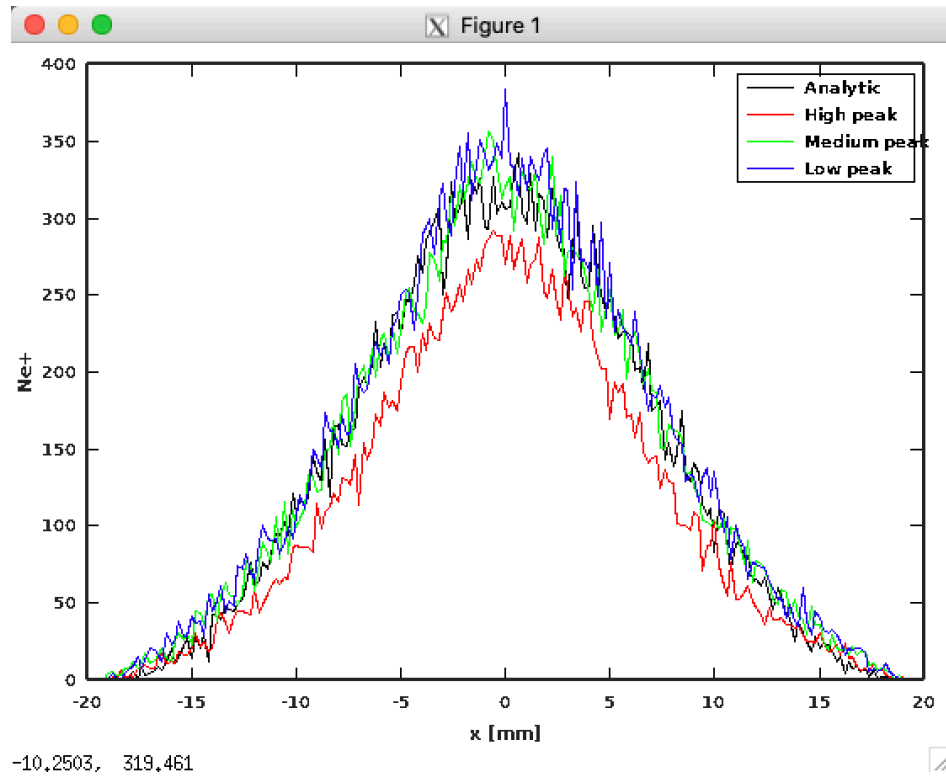
	Scenario	Ne+ injected	Ne+ at AMD exit	Ne+ at TW exit	Effective Ne+
Opera	High peak	119440	85100	21750	17604
	High peak (TW reoptimised)			20499	19013
	Medium peak			23480	21749
	Medium peak (TW reoptimised)			25780	23893
	Low peak			24207	22196
	Low peak (TW reoptimised)		91894	25332	23748
Analytic			44914	26398	22189

The **Medium** peak scenario has the largest e+ yield, even better than analytic results.

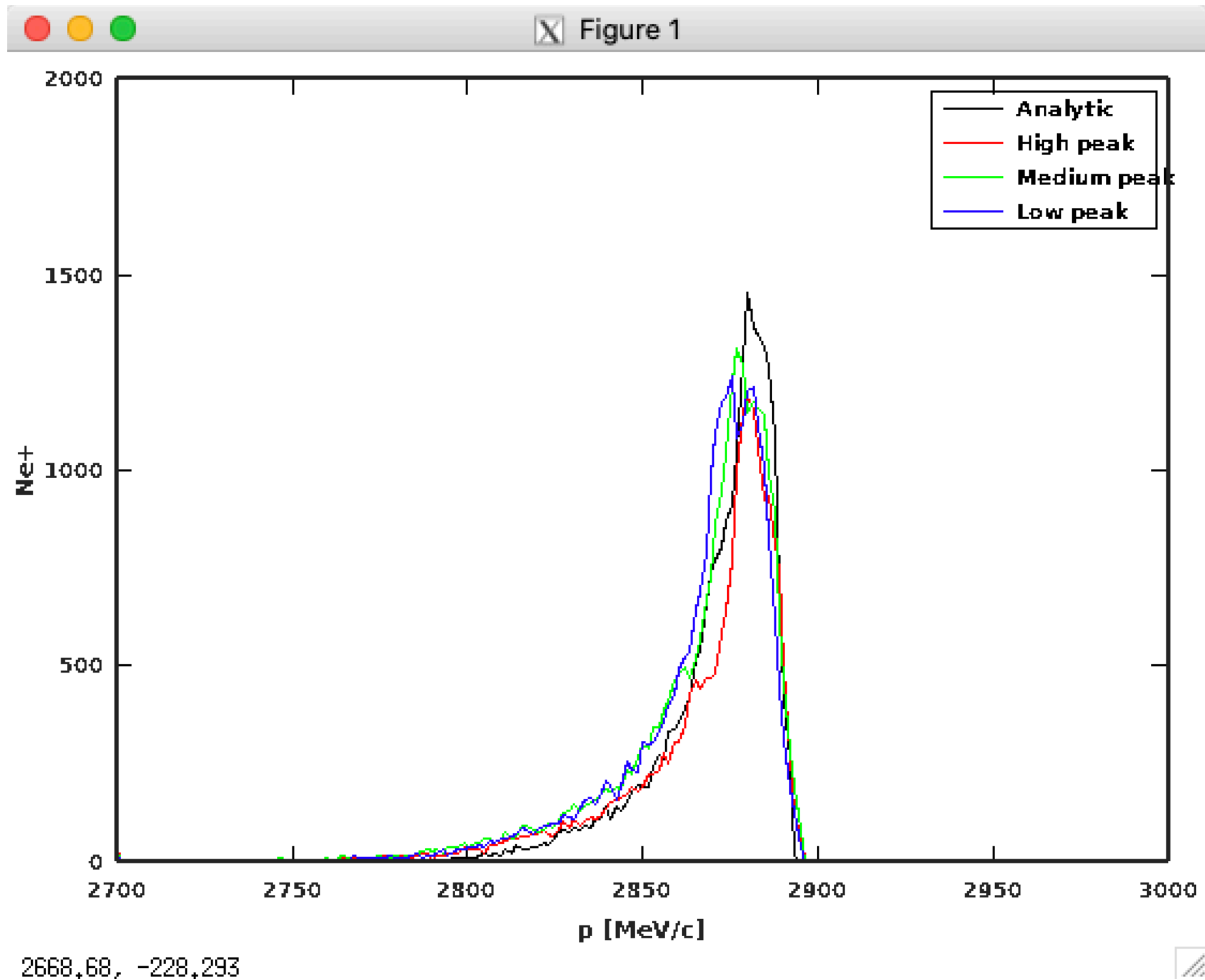
Comparison at AMD exit



Comparison at TW structures exit



Comparison at Injector Linac exit

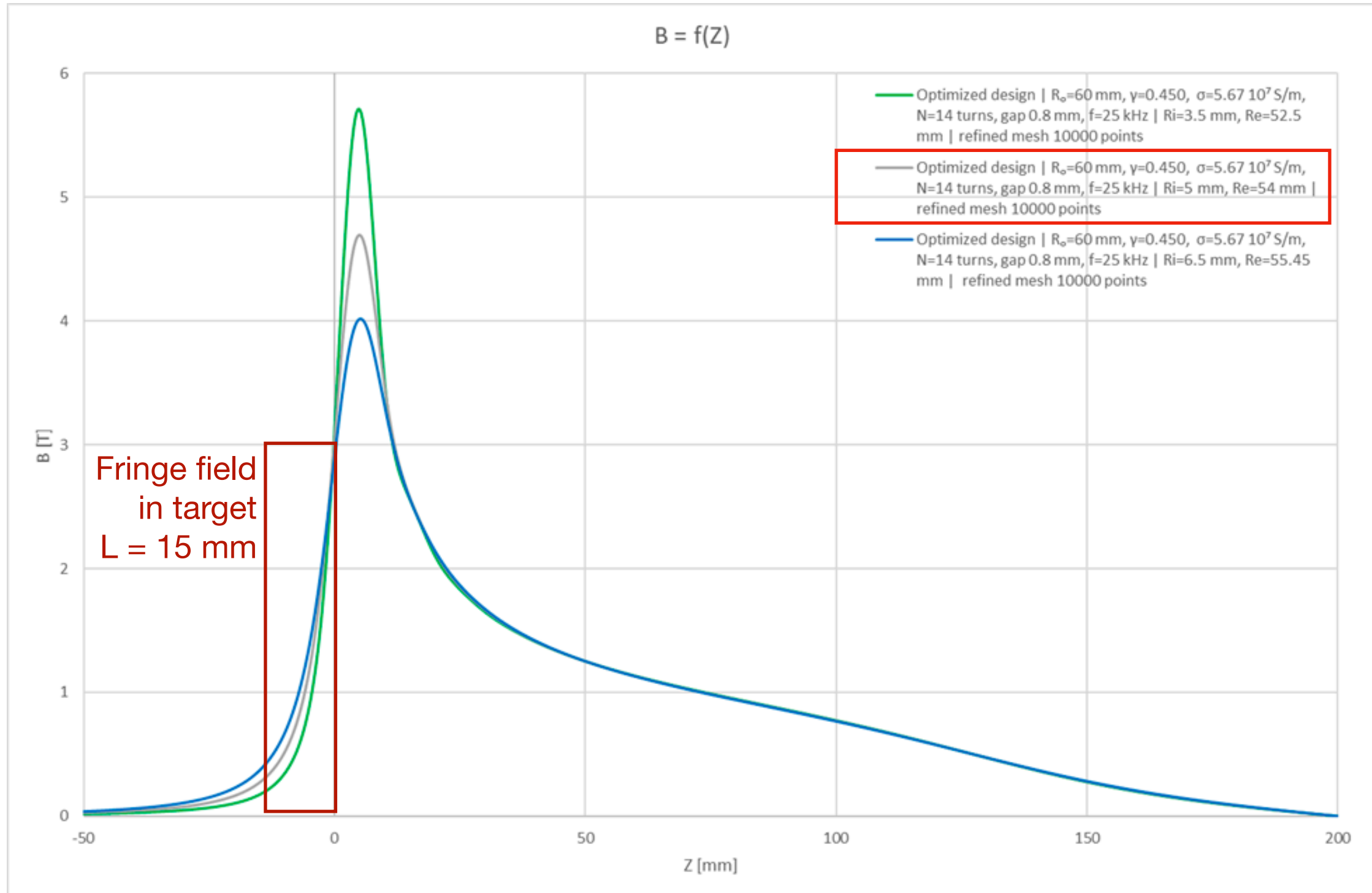


2668.68, -228.293

Fringe field in target

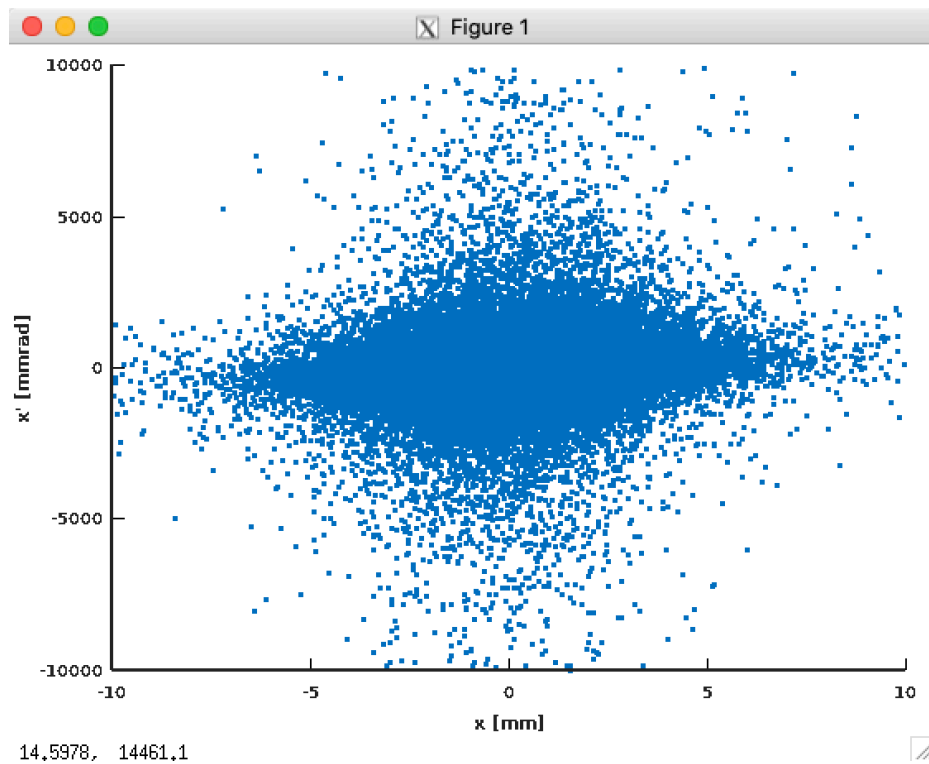
Field

- Medium peak scenario used in this test

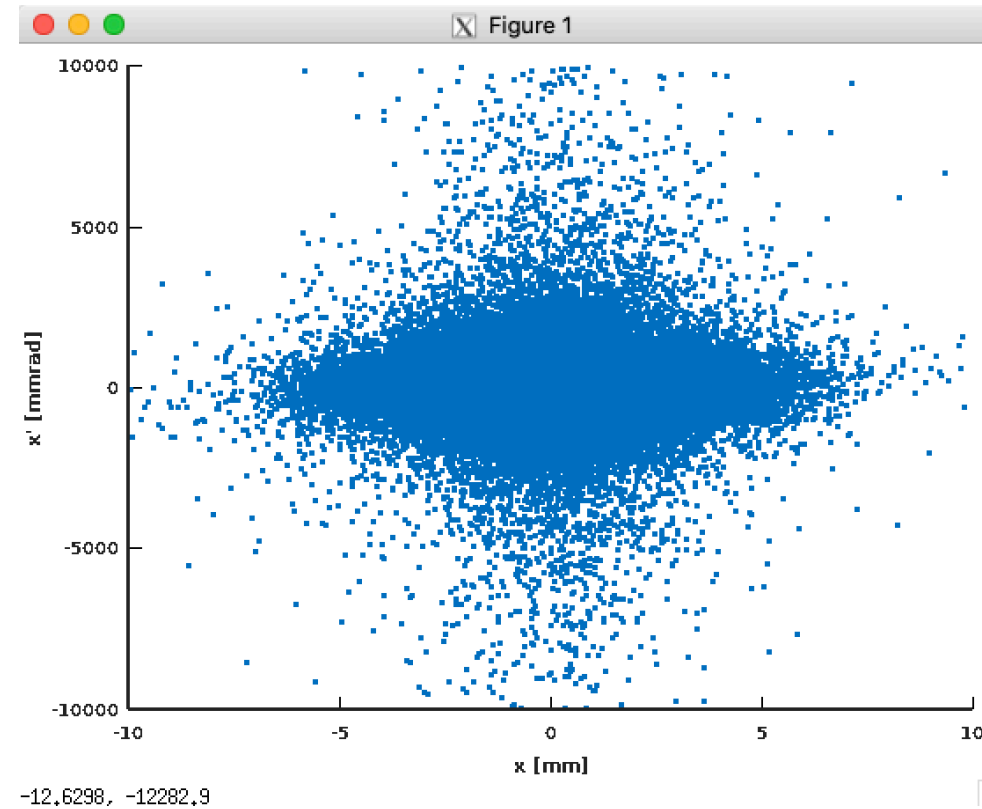


Comparison at target exit

Medium scenario	e+ yield at target exit	PEDD (given final yield = 2)
Without fringe field	11.9	34.6 J/g
With fringe field	11.2	46.5 J/g

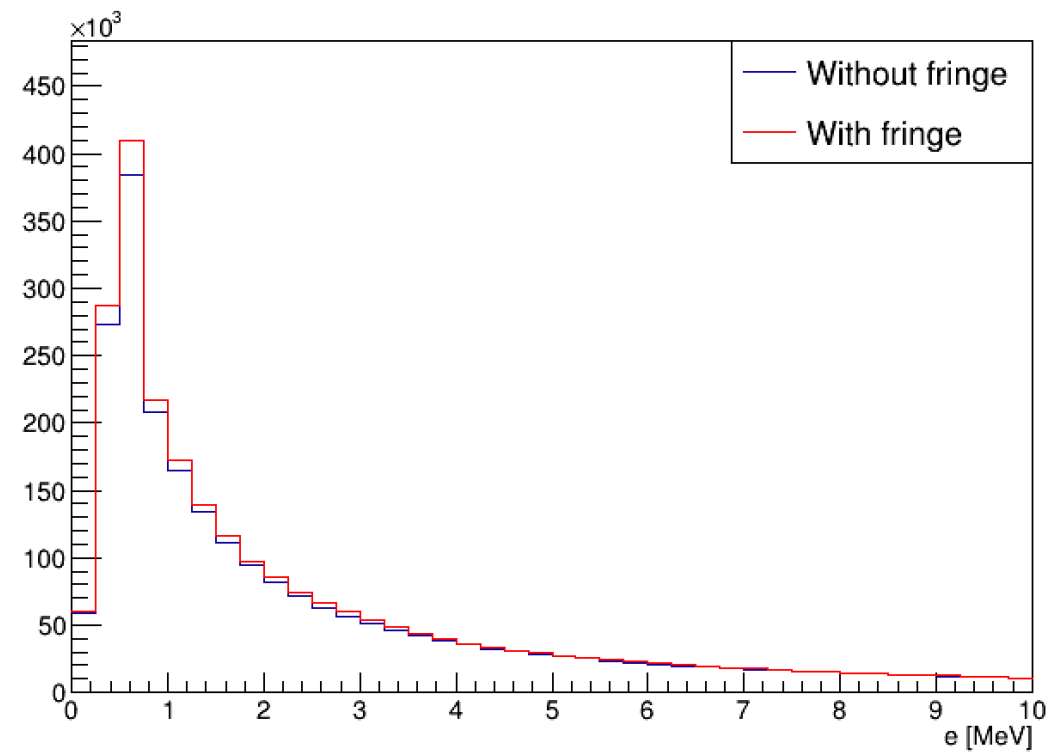
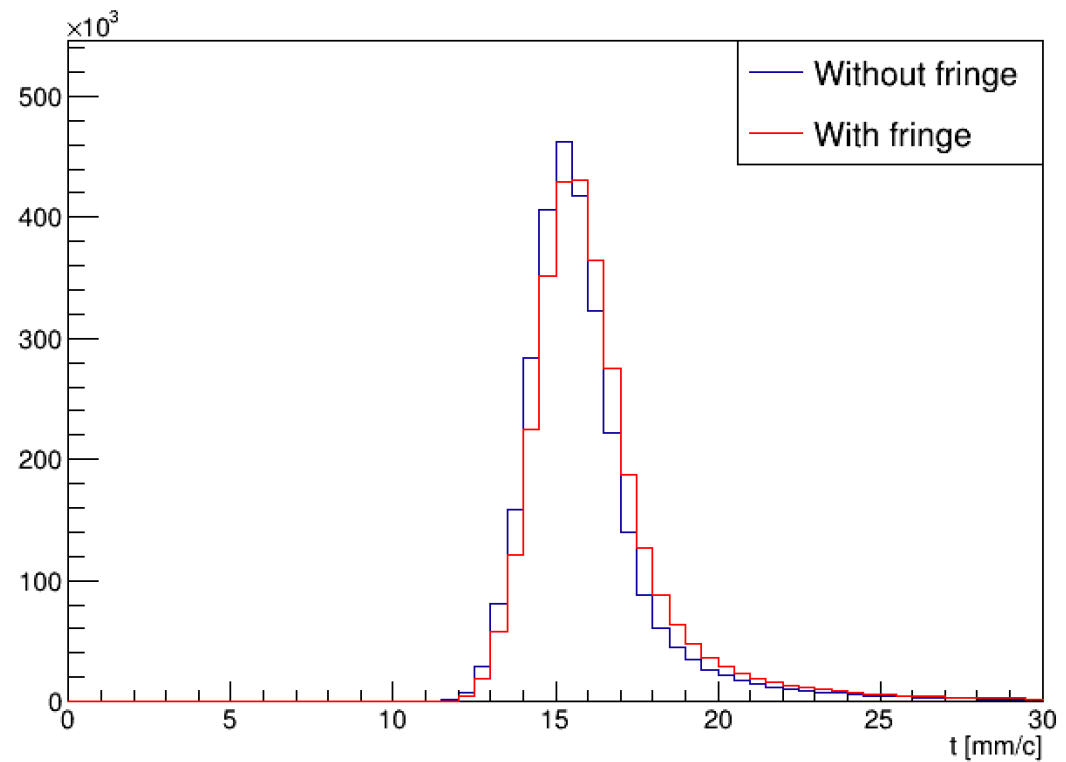
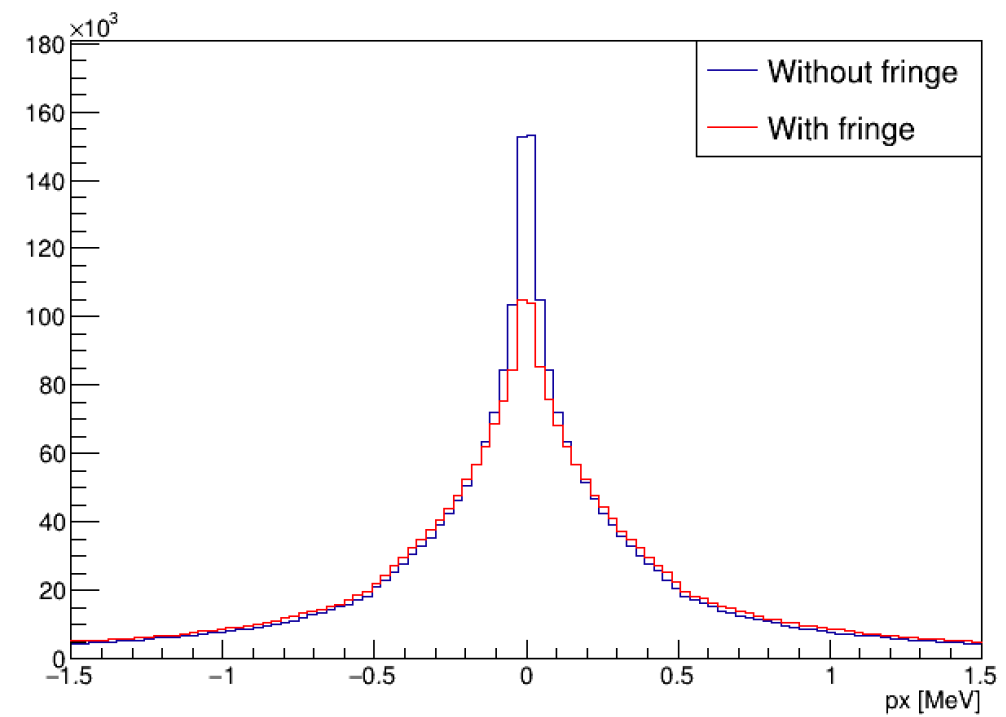
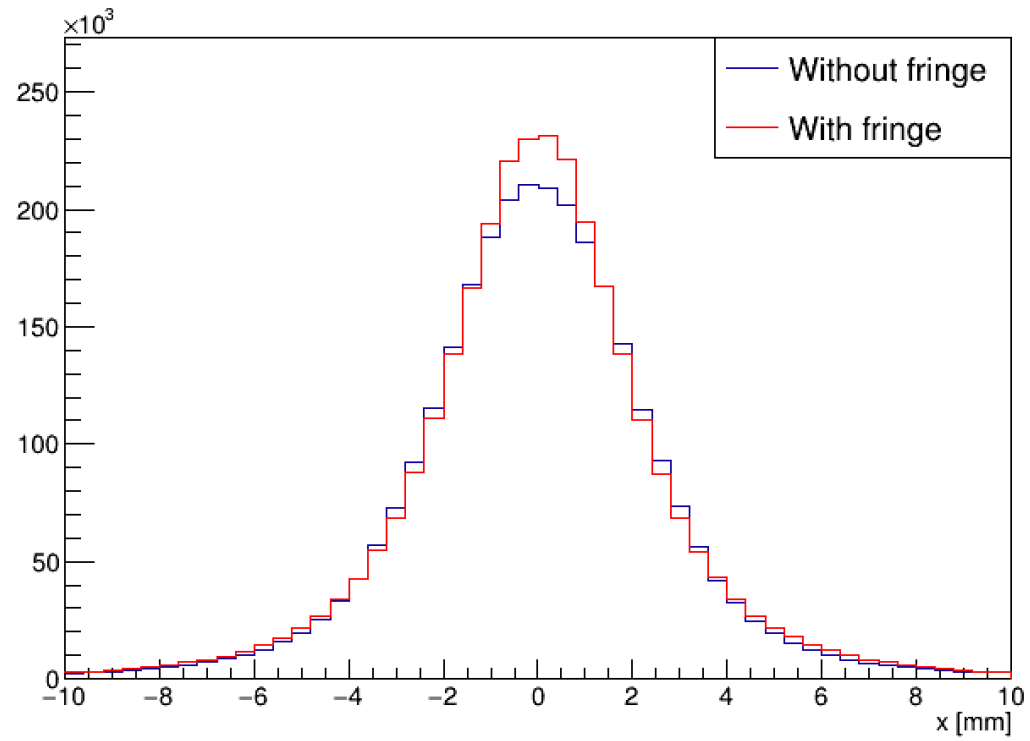


Without fringe



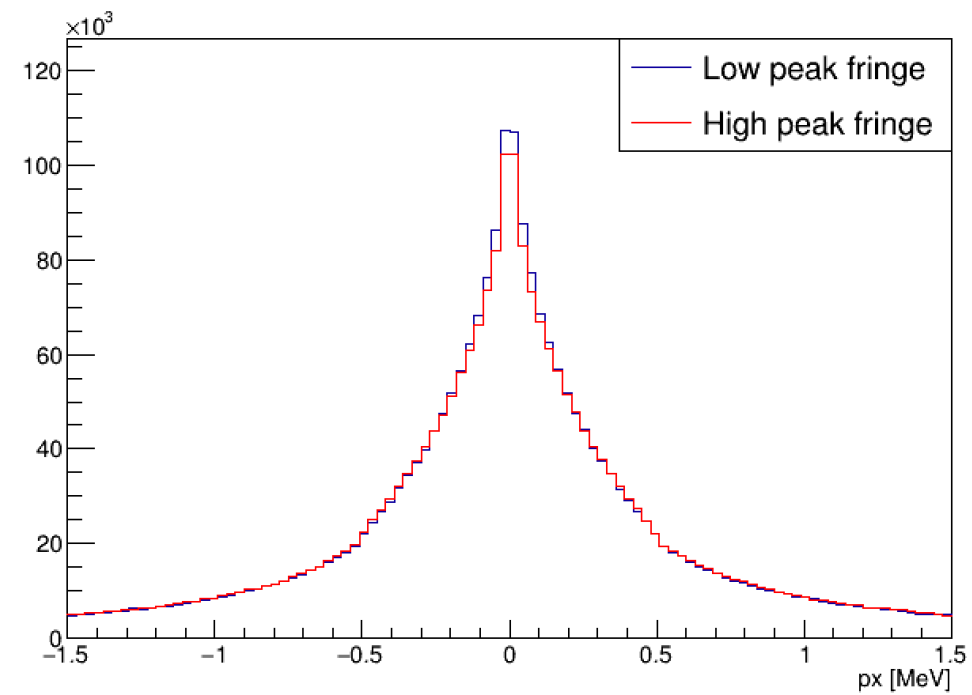
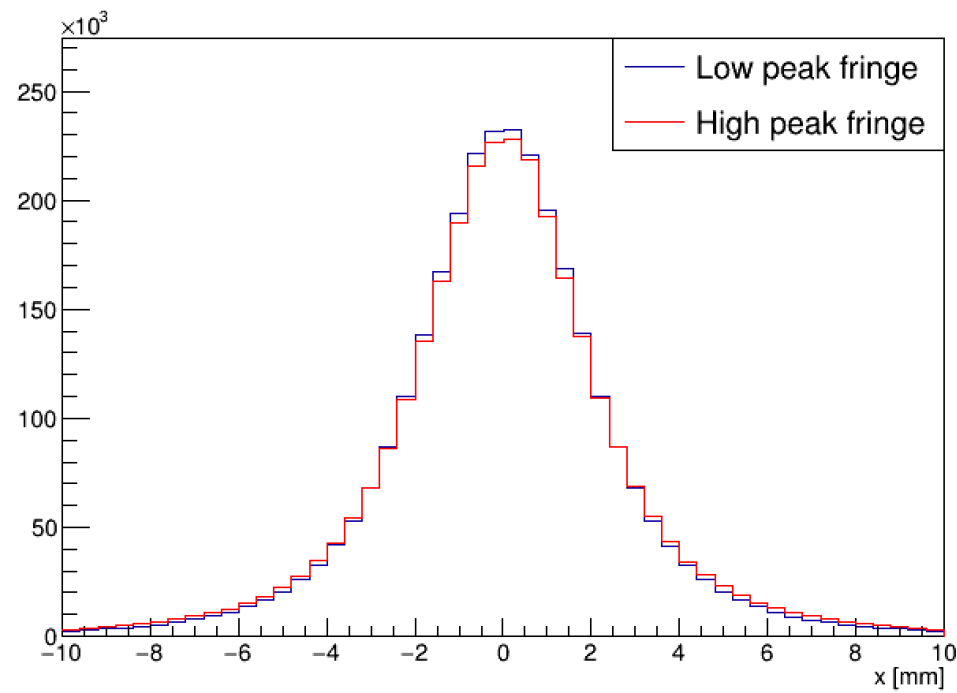
With fringe

Comparison at target exit



Comparison at target exit

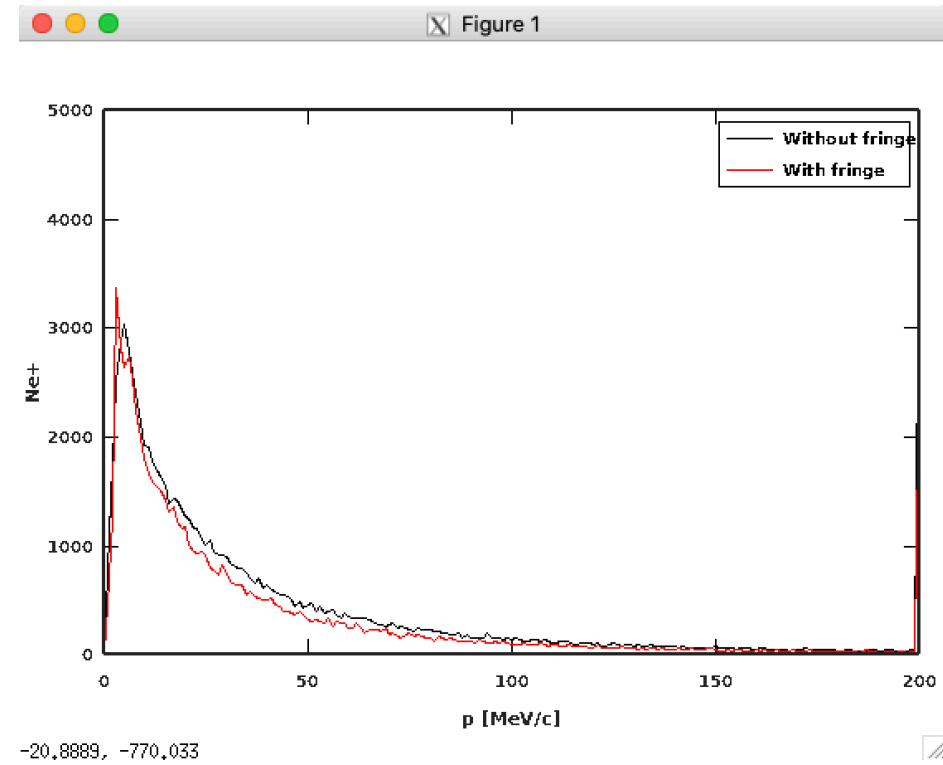
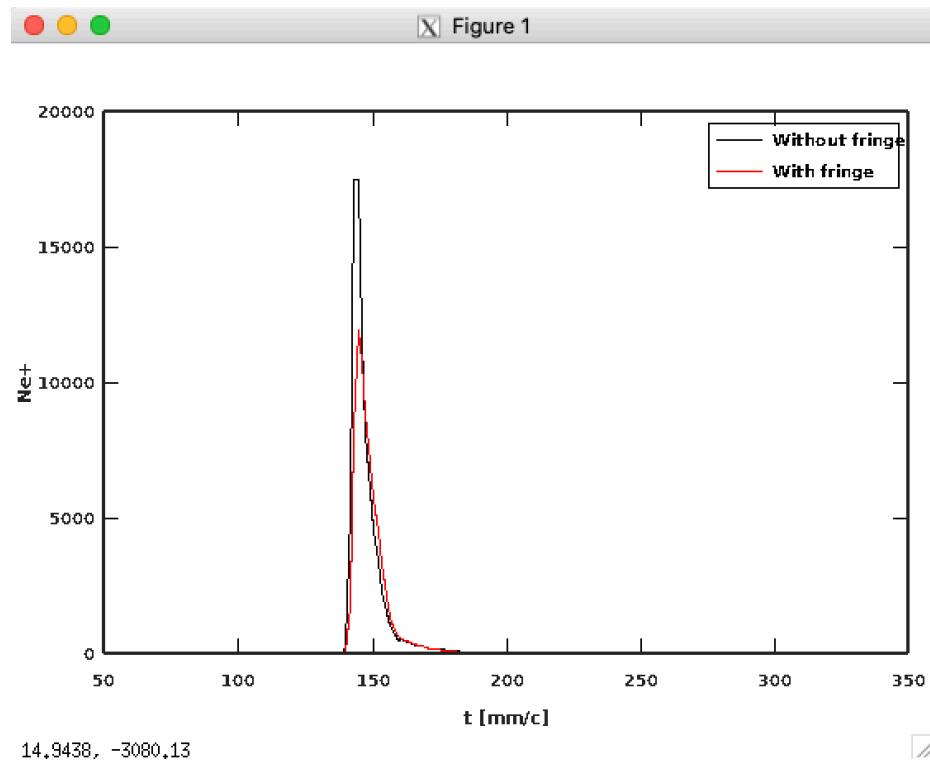
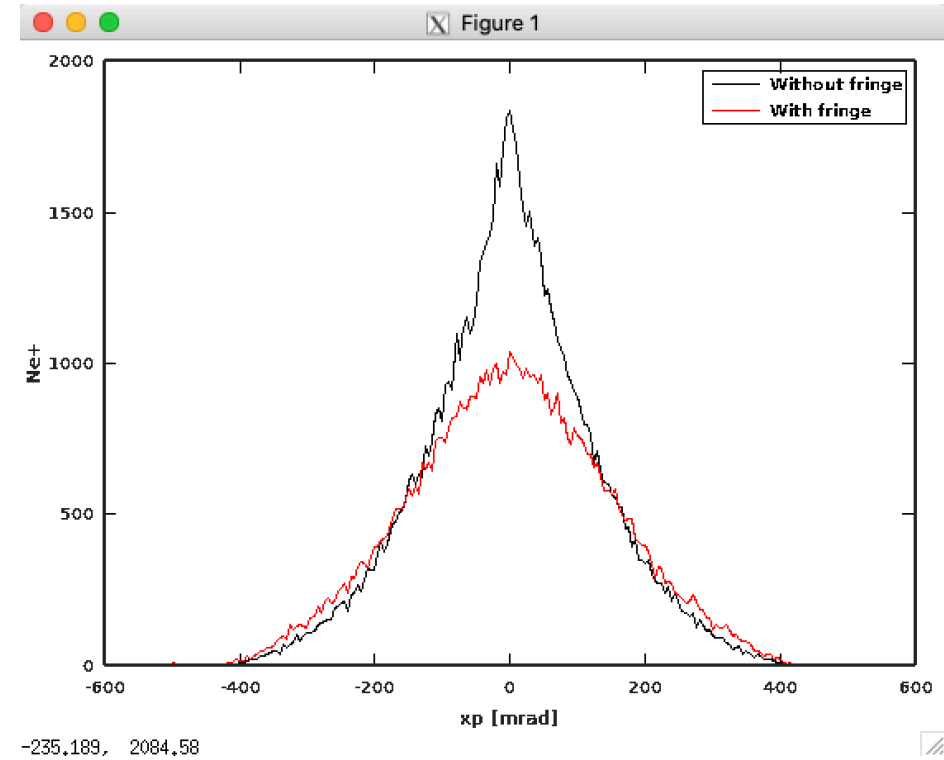
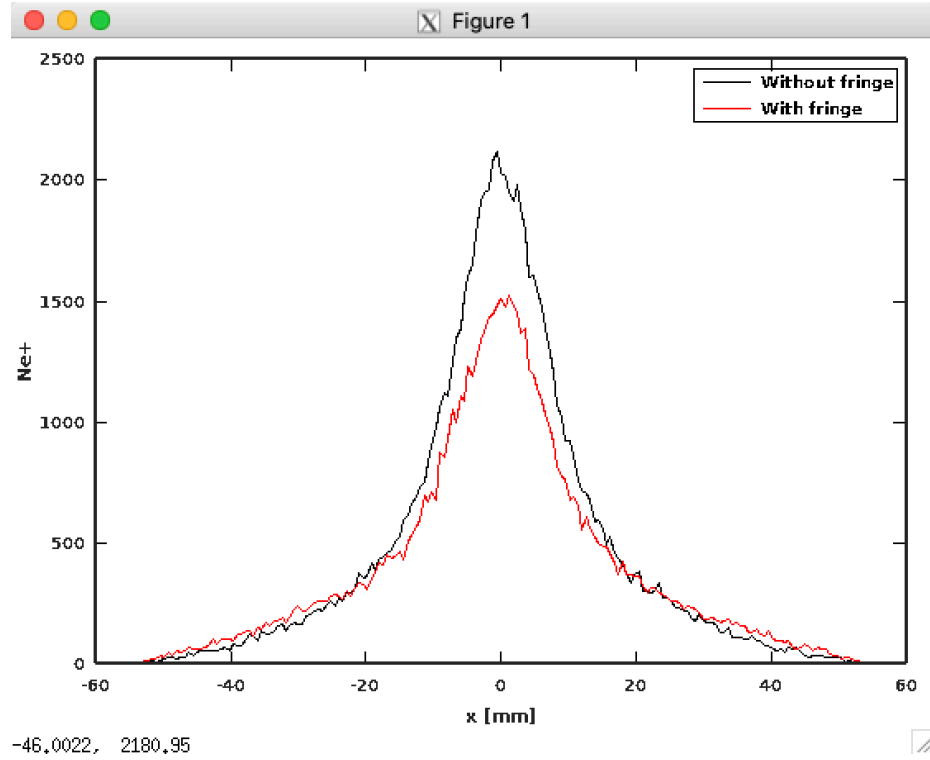
With fringe field	e+ yield at target exit	PEDD (given final yield = 2)
Low peak scenario	11.5	47.3 J/g
High peak scenario	10.6	45.8 J/g



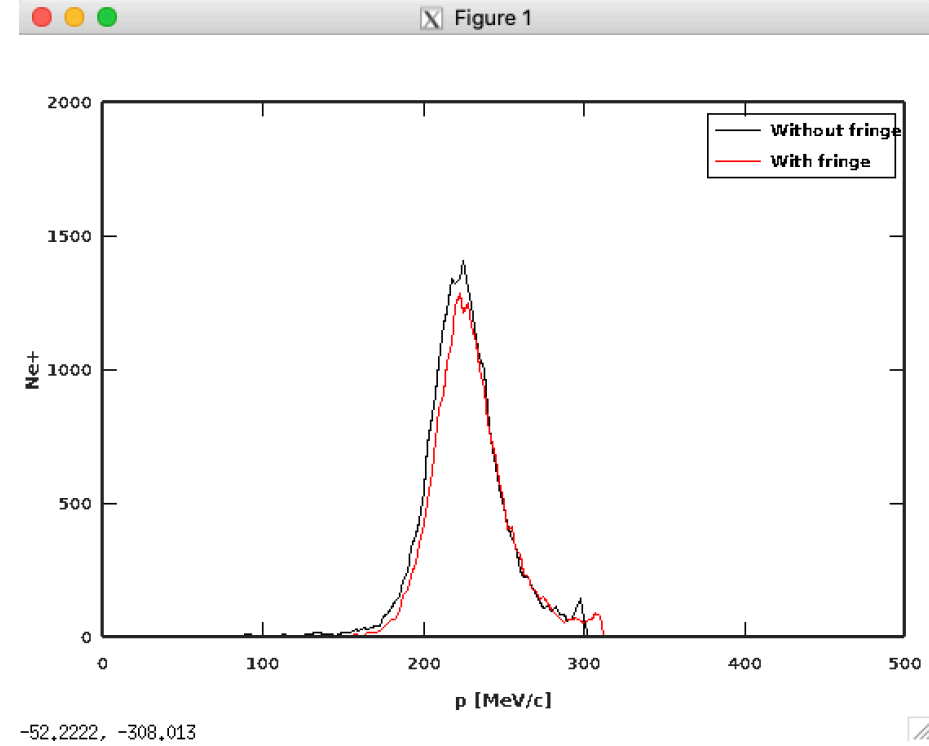
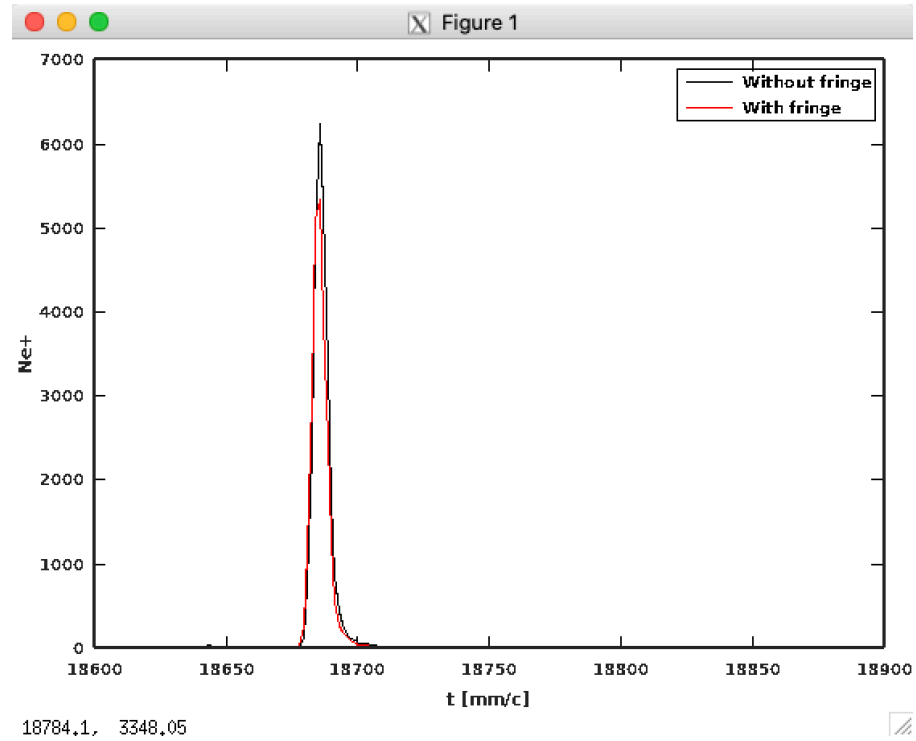
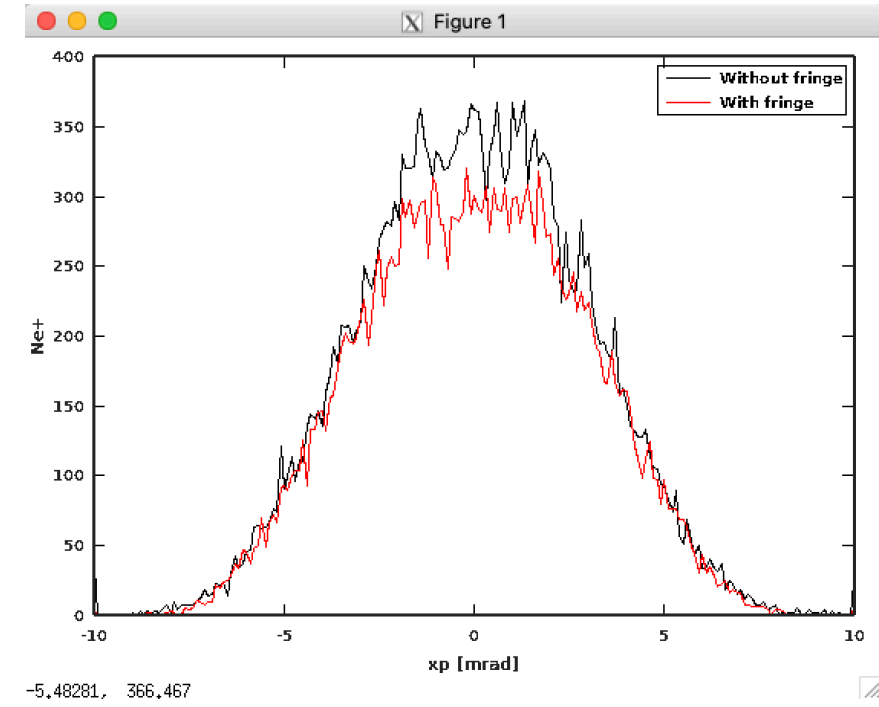
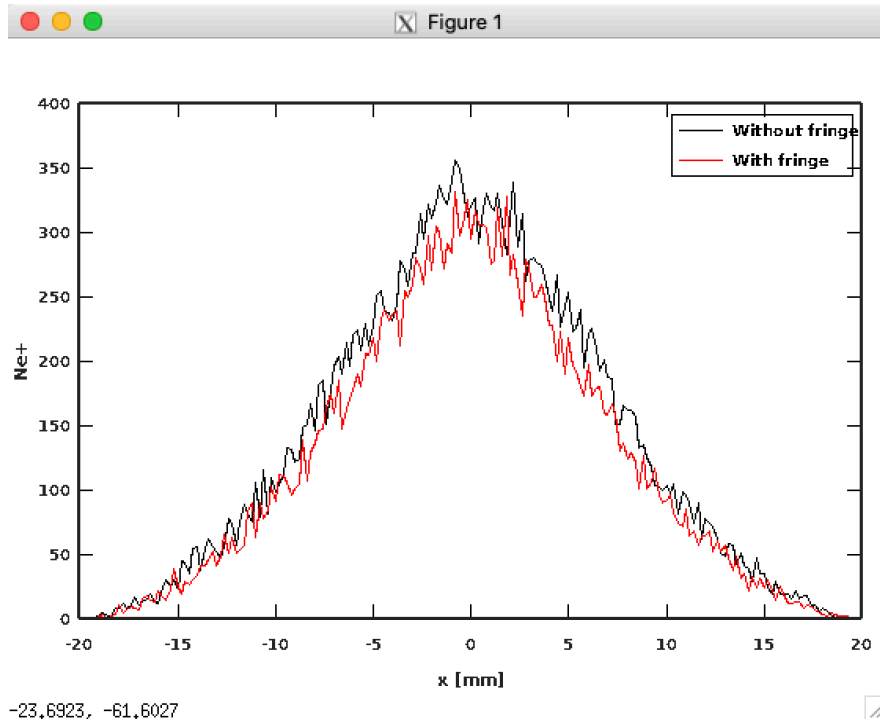
Comparison of final results

Medium scenario	e+ yield at AMD exit	e+ yield at TW exit	e+ yield at IL exit	Effective e+ yield	PEDD
Without fringe field	8.51	2.58	2.39	2.17	31.9 J/g
With fringe field	7.19	2.41	2.29	2.17	42.9 J/g

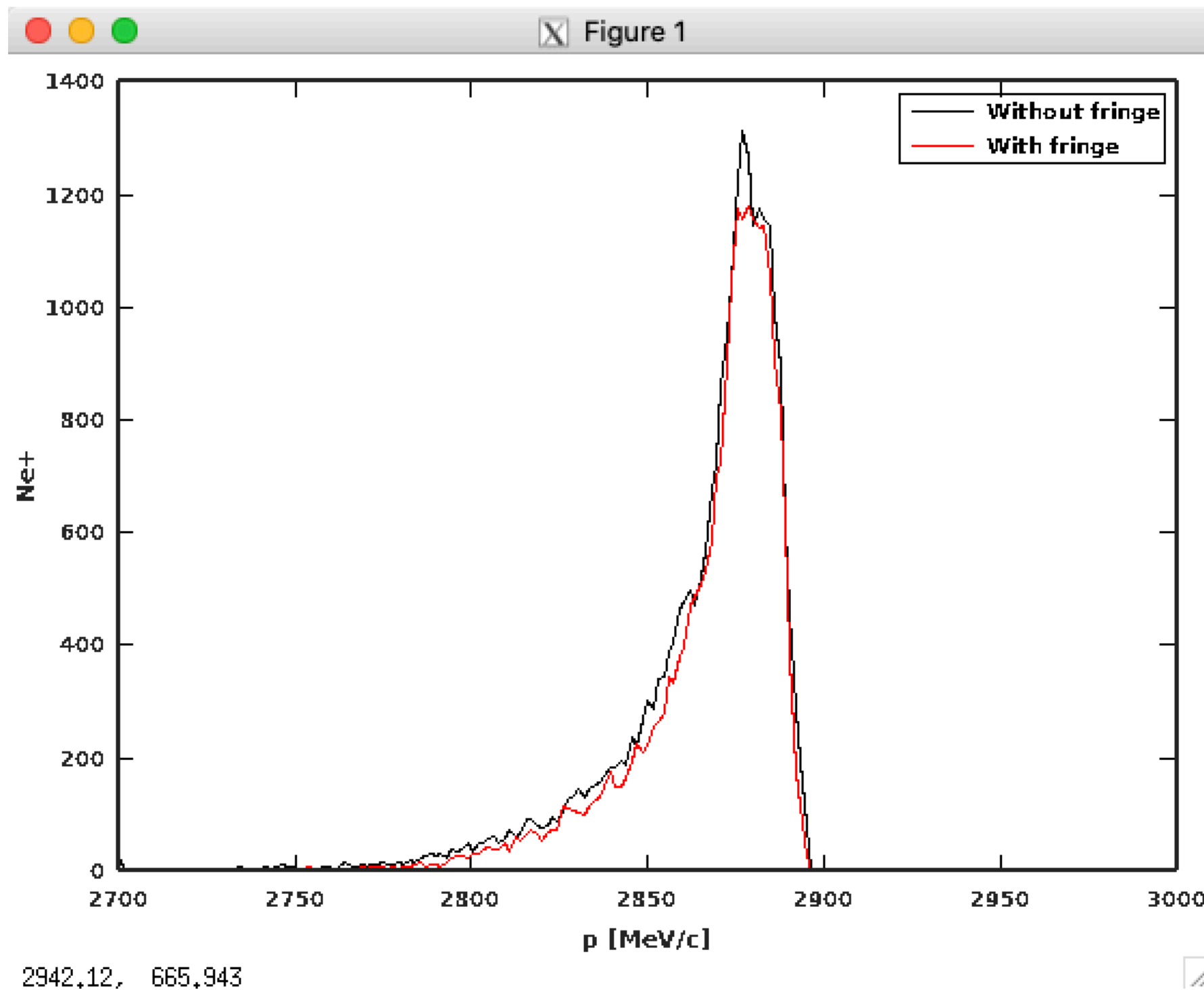
Comparison at AMD exit



Comparison at TW exit



Comparison at IL exit



Conclusion

- Medium peak scenario for AMD design seems to be the best
- Opera model seems to have better results than analytic model, where the peak field is less affected with the increase of the entrance aperture compared to the analytic formula
- Fringe field has small effect on e^+ yield, but has a big affect on PEDD and therefore can not be neglected. Low peak scenario has larger effect than High scenario, as expected from the field maps
- Once the AMD field map is finalised and decided, need to re-do the global optimisation, with the fringe field taken into account in target