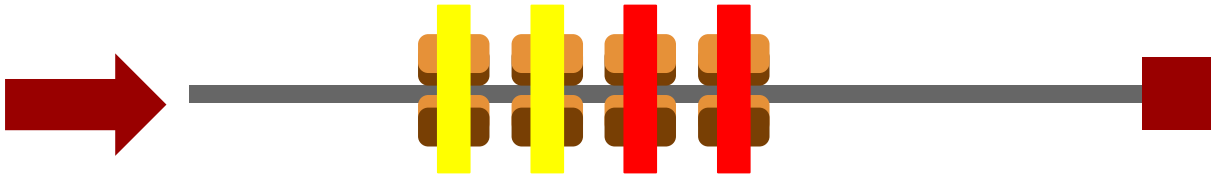
POPLAR BEAM PLANS

PREVIOUS OPTIMISED SETUP

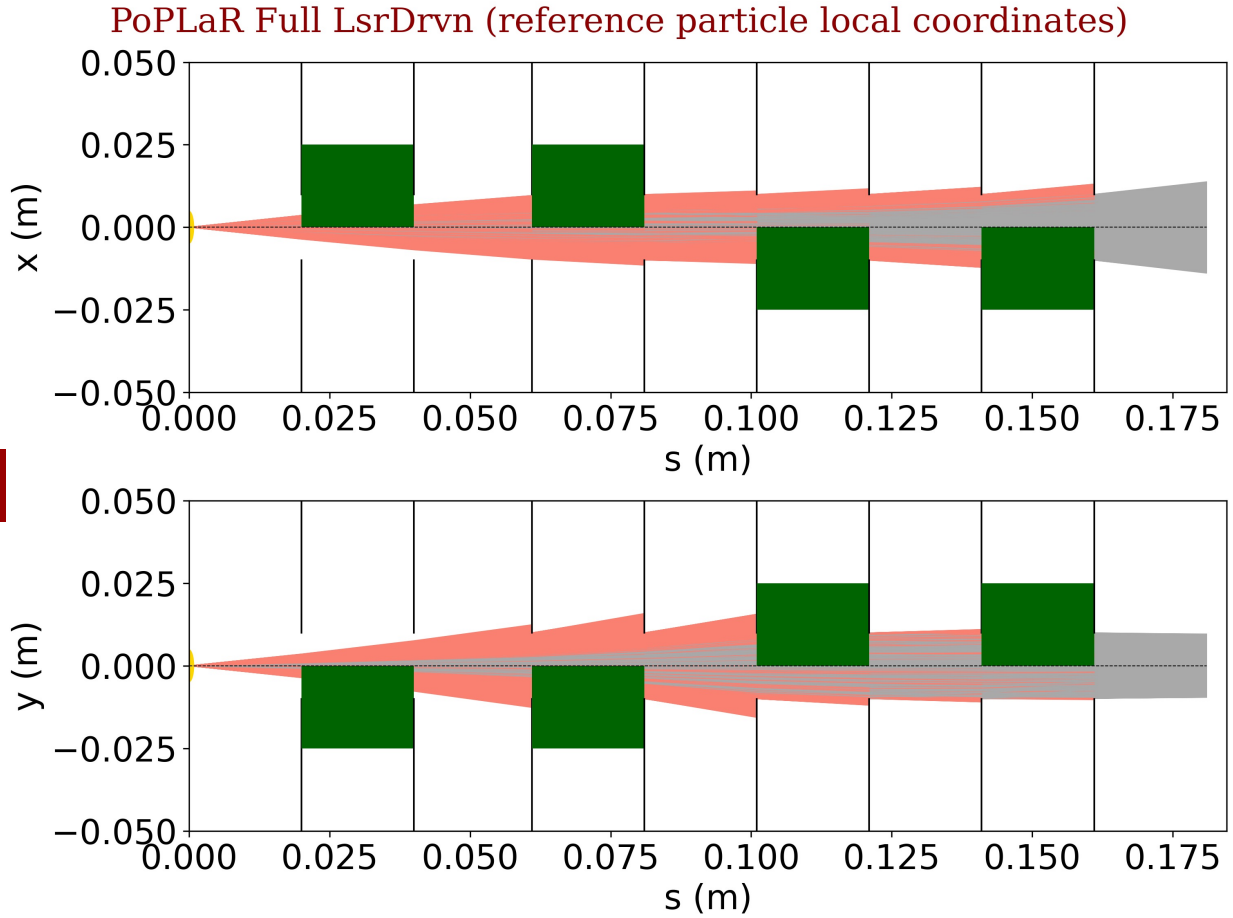
4 quad setup

4 QUADRUPOLE SETUP

Key: Focus Quadrupole Defocus Quadrupole



Set up:
All quad lengths = 0.02 m
Quad config = FFDD



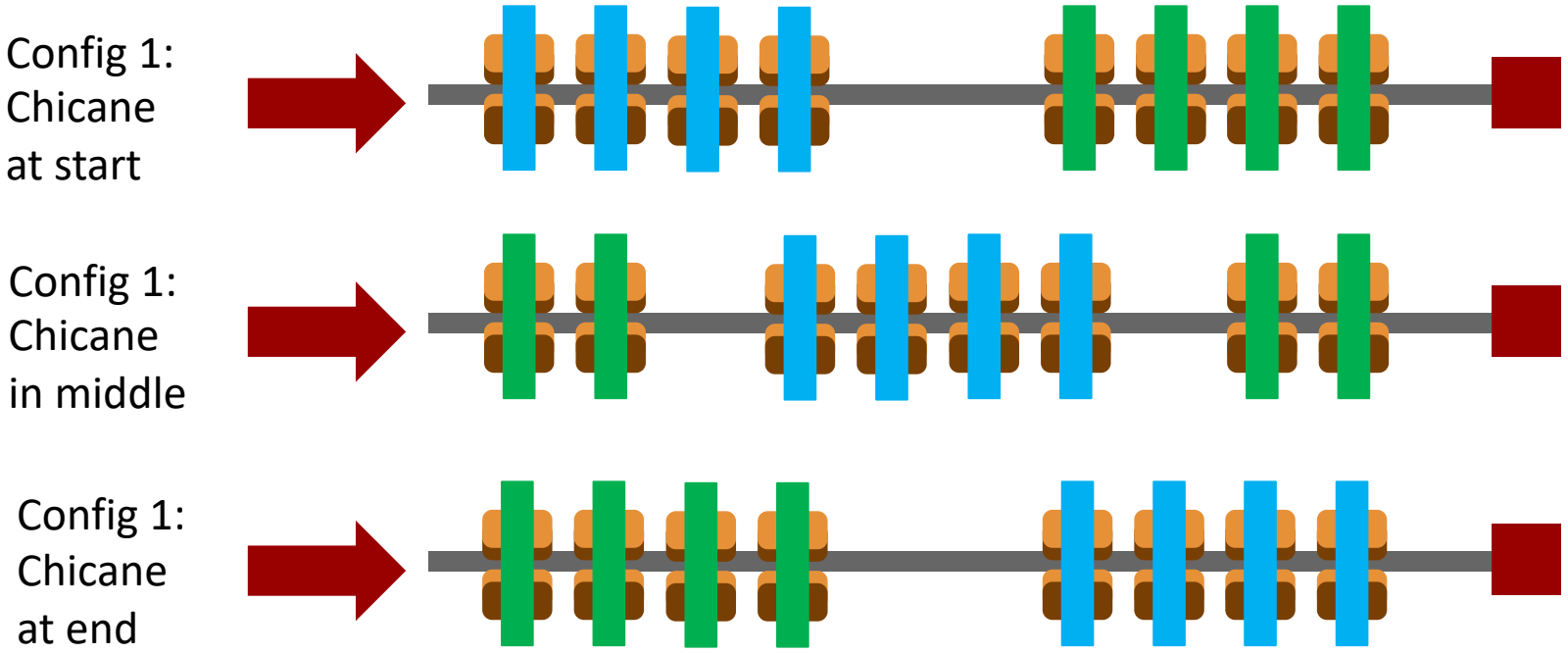
% particles at end within 10% of 8MeV = 35.886 ± 0.152 % CV = 32.291 ± 0.822 % Fluence = 62.549 ± 1.488 %

DIPOLE ADDITIONS

4 quad 4 dipole setups

CHICANE TRIALS

Key: F or D Quadrupole Non-specific but symmetric & equidistant dipole chicane



Search space parameters:

- Quadrupole length & position
- Dipole strength, length, angle and configuration

Optimising:

- Transmission
- Purity (within 10% of 8MeV)

CONFIG 1: CHICANE AT START

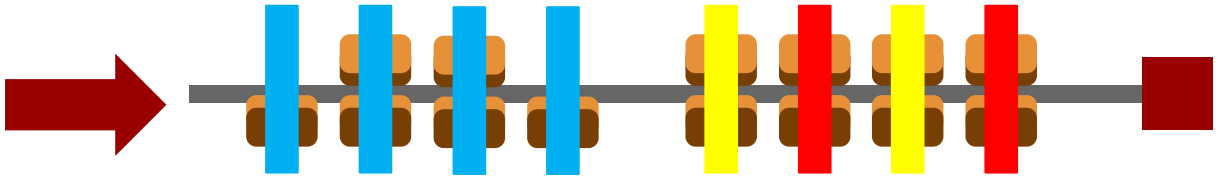
Key:

Focus Quadrupole

Defocus Quadrupole

- Dipole

+ Dipole



Set up:

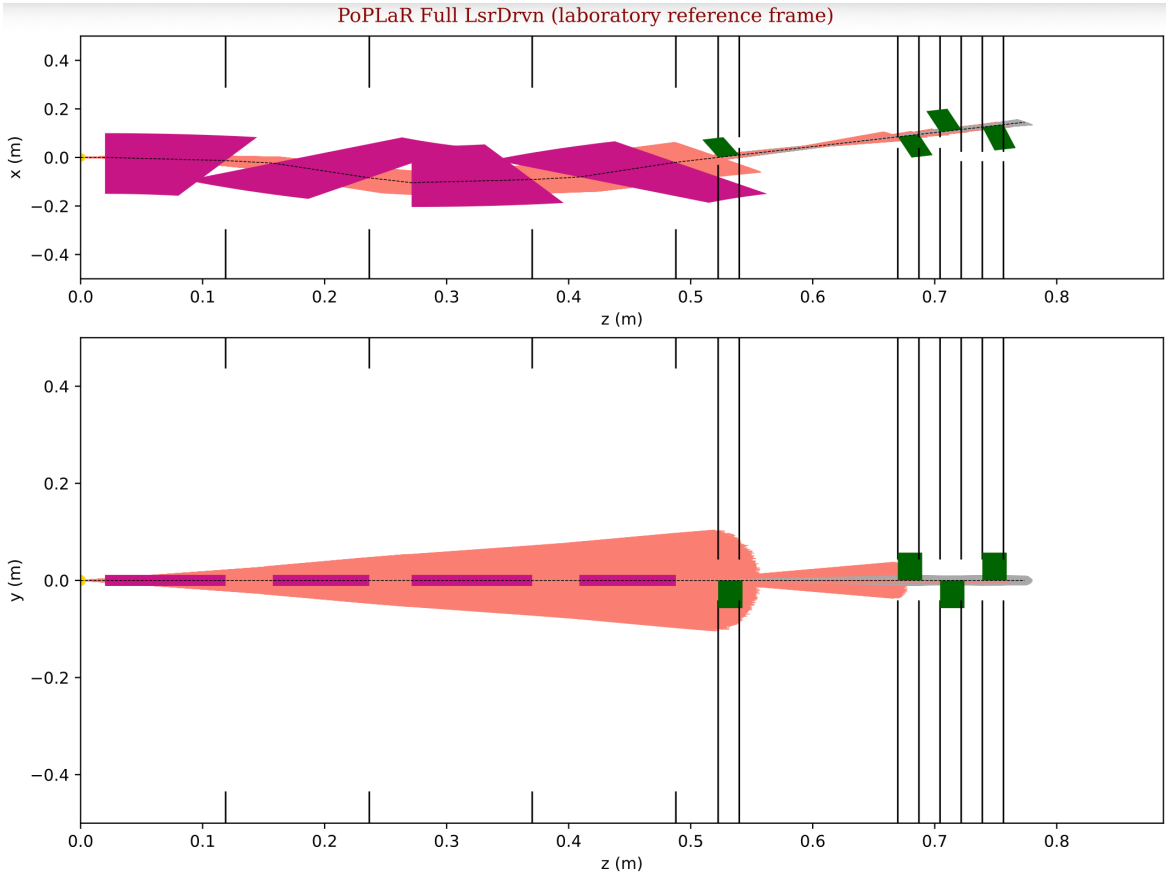
All quad lengths = 0.02 m

Quad config = FDFD

Dipole angles = 15 degrees

Dipole lengths = 0.1 m

Dipole pattern = -th +th +th –th (reverse symmetric)



% particles at end within 10% of 8MeV = 0.948 ± 0.031 %

CV = 50.537 ± 11.172 %

Fluence = 85.085 ± 5.990 %

CONFIG 2: CHICANE IN MIDDLE

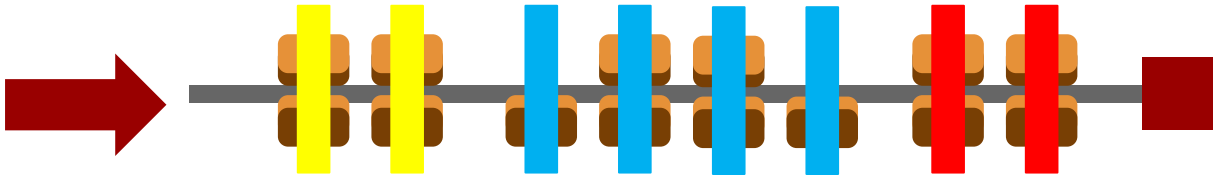
Key:

Focus Quadrupole

Defocus Quadrupole

- Dipole

+ Dipole



Set up:

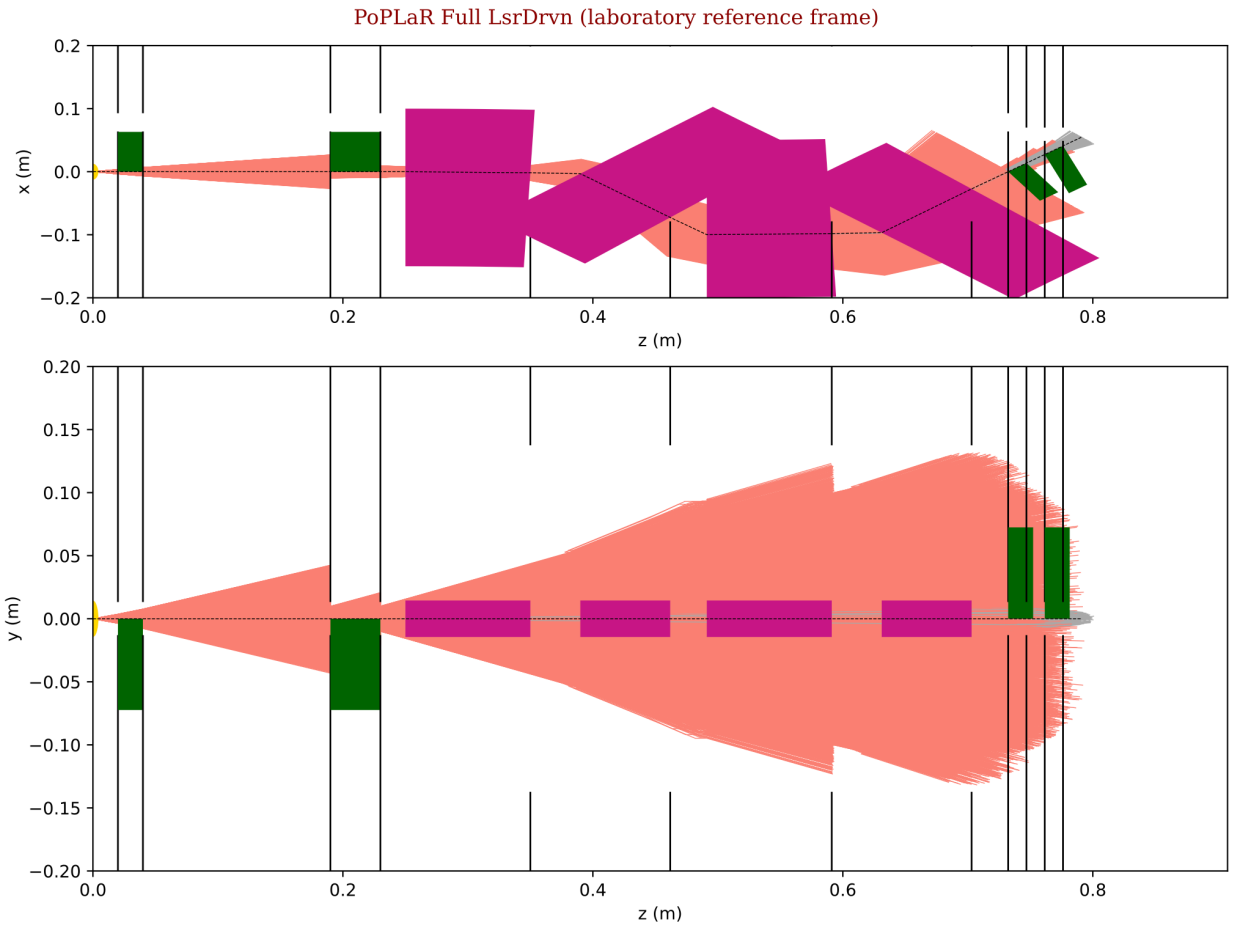
All quad lengths = [0.02, 0.04, 0.02, 0.02] m

Quad config = FFDD

Dipole angles = 2 degrees

Dipole lengths = 0.1 m

Dipole pattern = -th +th +th –th (alternating)



% particles at end within 10% of 8MeV = 0.136 ± 0.012 %

CV = 78.688 ± 18.271 %

Fluence = 97.713 ± 1.768 %

CONFIG 3: CHICANE AT END

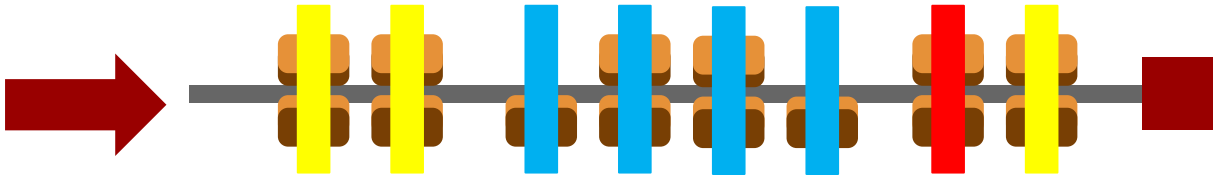
Key:

Focus Quadrupole

Defocus Quadrupole

- Dipole

+ Dipole



Set up:

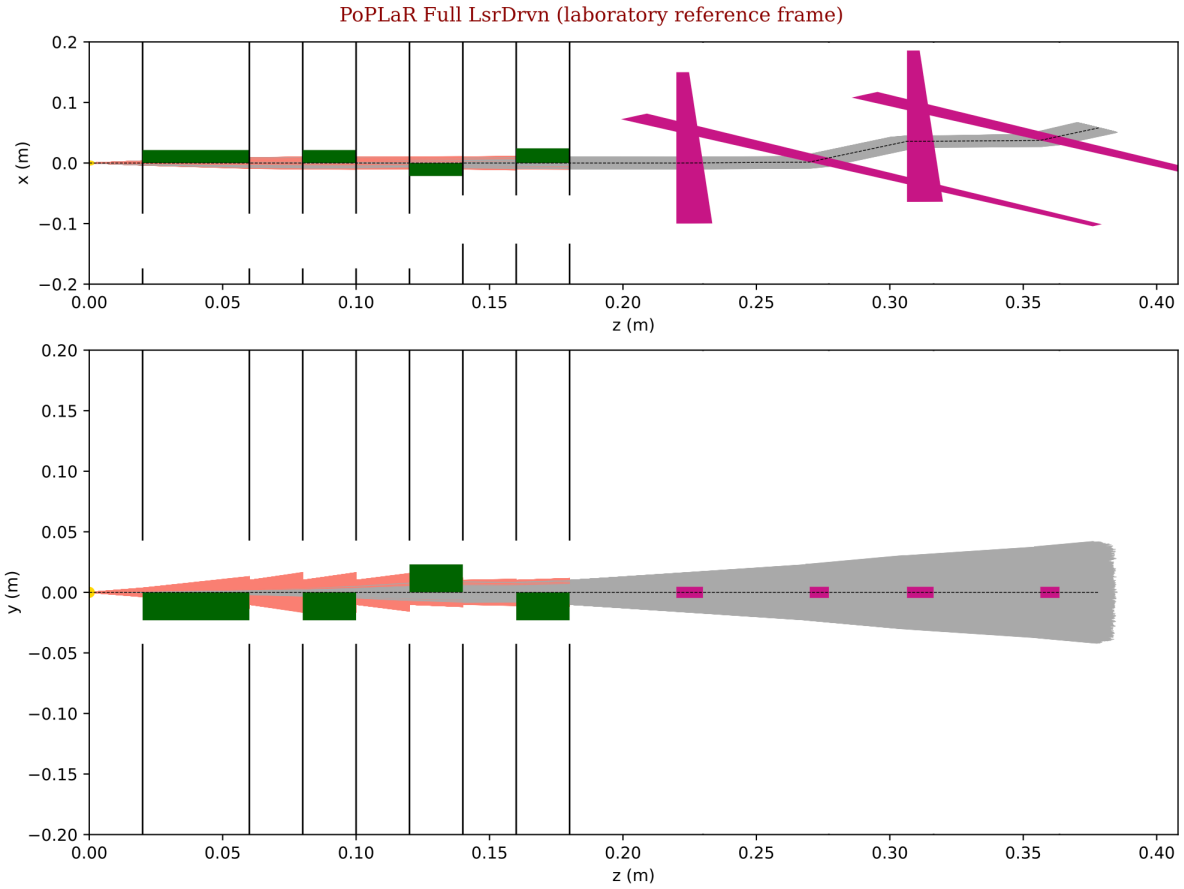
All quad lengths = [0.04, 0.02, 0.02, 0.02] m

Quad config = FFDF

Dipole angles = 2 degrees

Dipole lengths = 0.1 m

Dipole pattern = +th -th -th +th (symmetric)



% particles at end within 10% of 8MeV = 9.422 ± 0.092 %

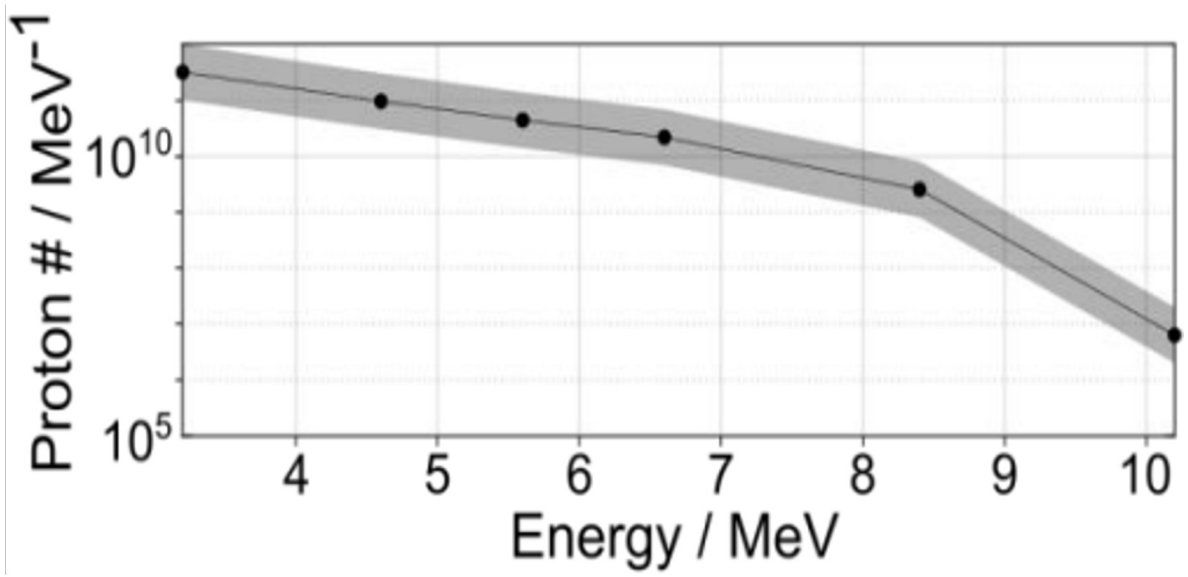
CV = 47.022 ± 2.978 %

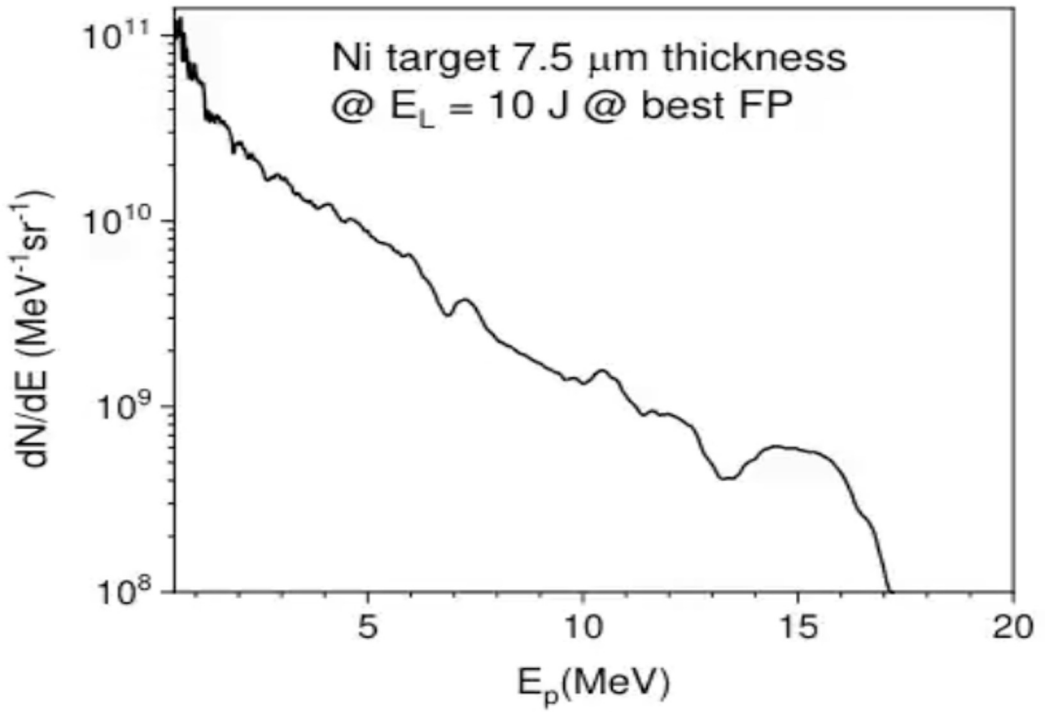
Fluence = 63.825 ± 2.527 %

EXISTING BEAM CHARACTERISATIONS

ELI & BELLA

LOW ENERGY PROTON SPECTRA

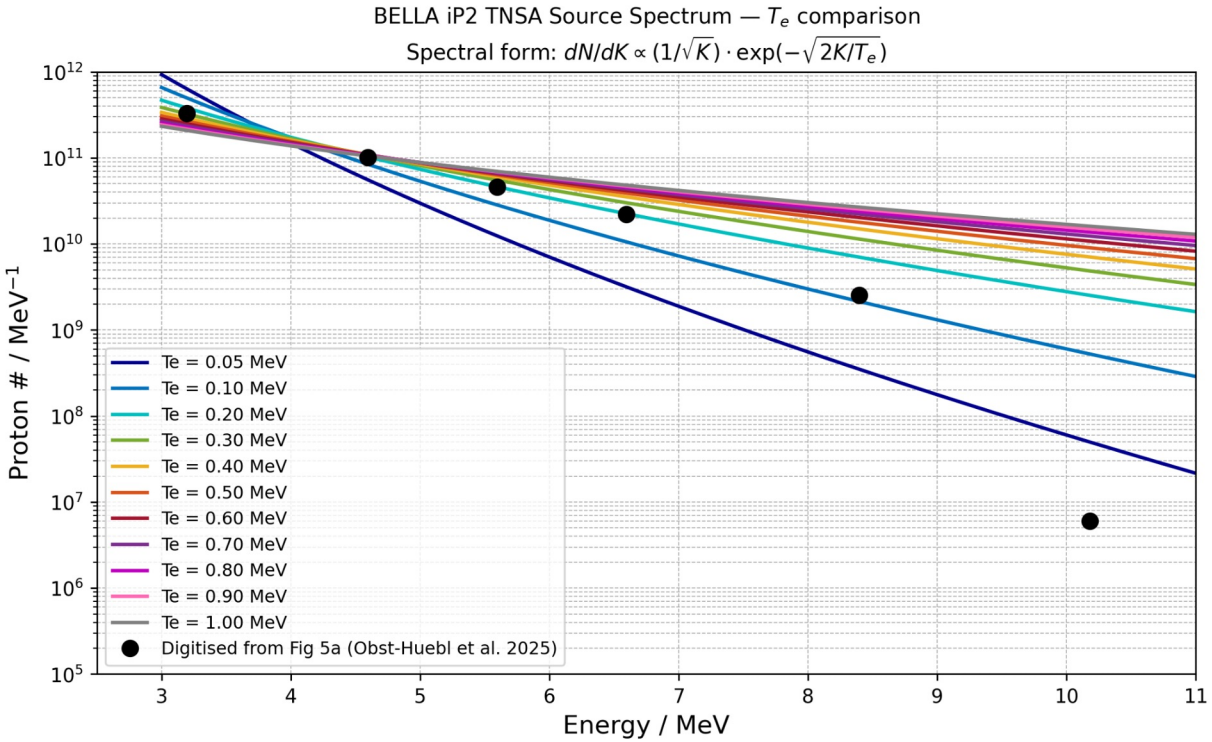


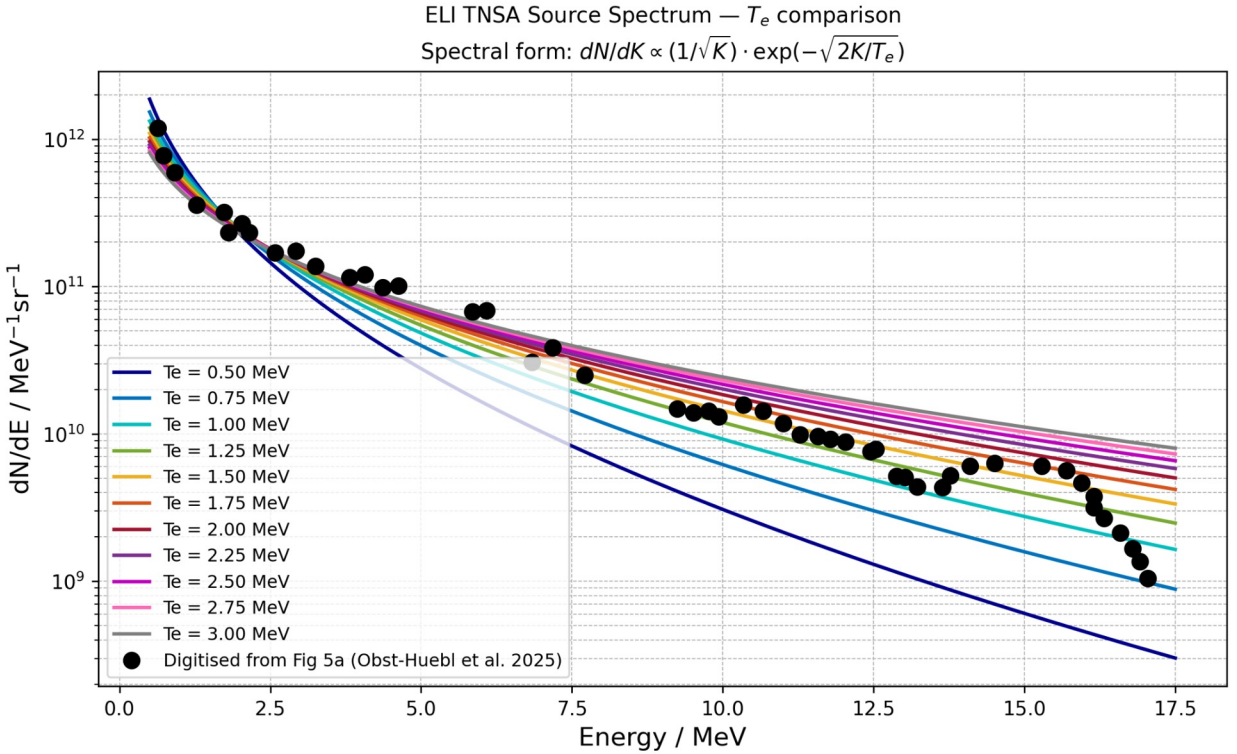


- BELLA low energy spectra, no raw data, showing the spectra at 52 mm after the source .

- ELI low energy spectra, no raw data, showing the spectra at ? mm after the source .

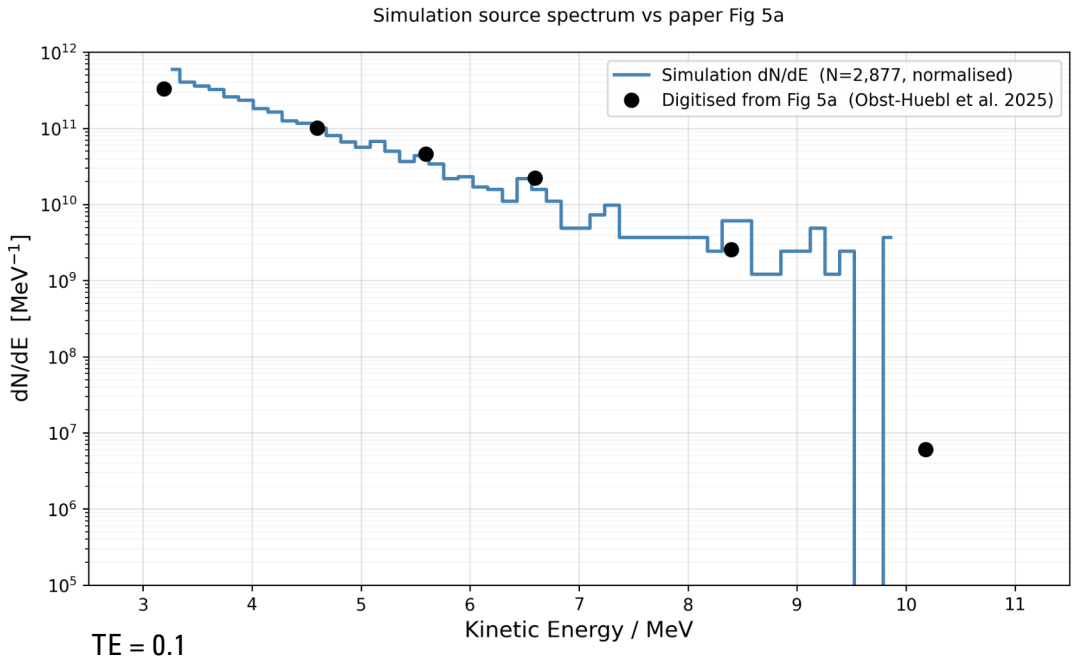
ESTIMATING TE FROM EXTRAPOLATED VALUES

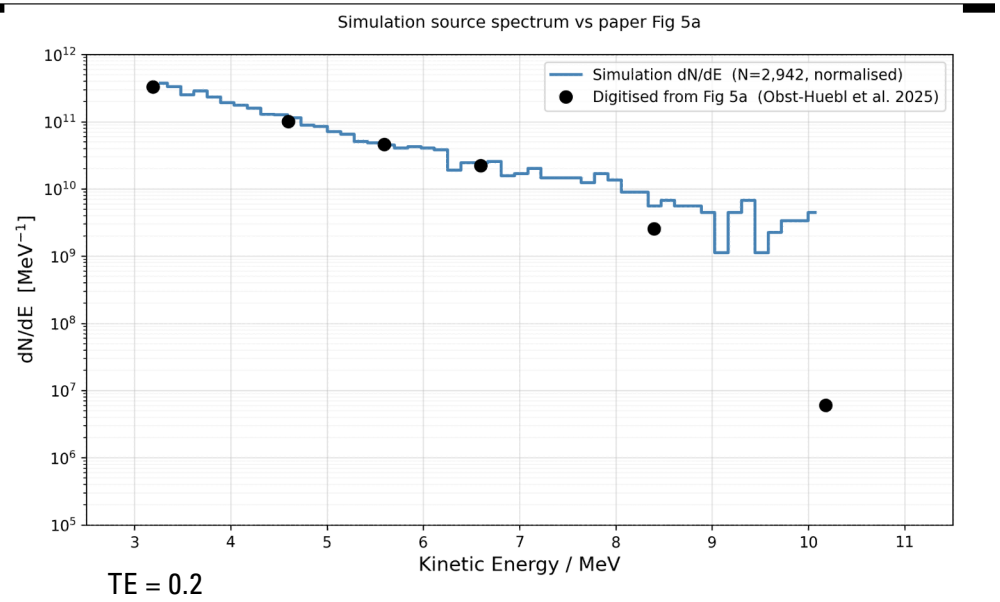


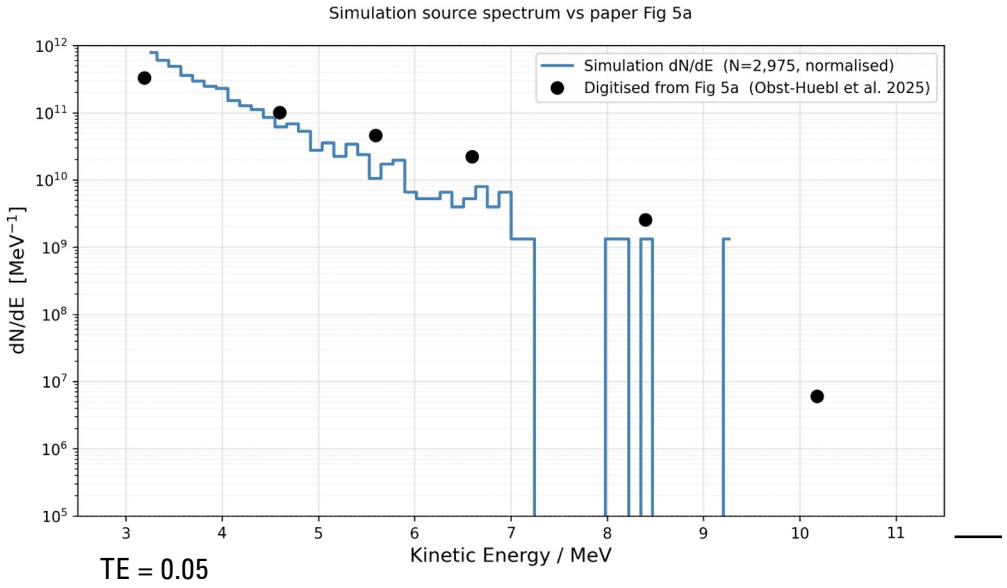


- Attempted to extract the data using image processing tools in MATLAB .
- Used this spectra to estimate the Te .

BELLA SIM VS EXPERIMENT

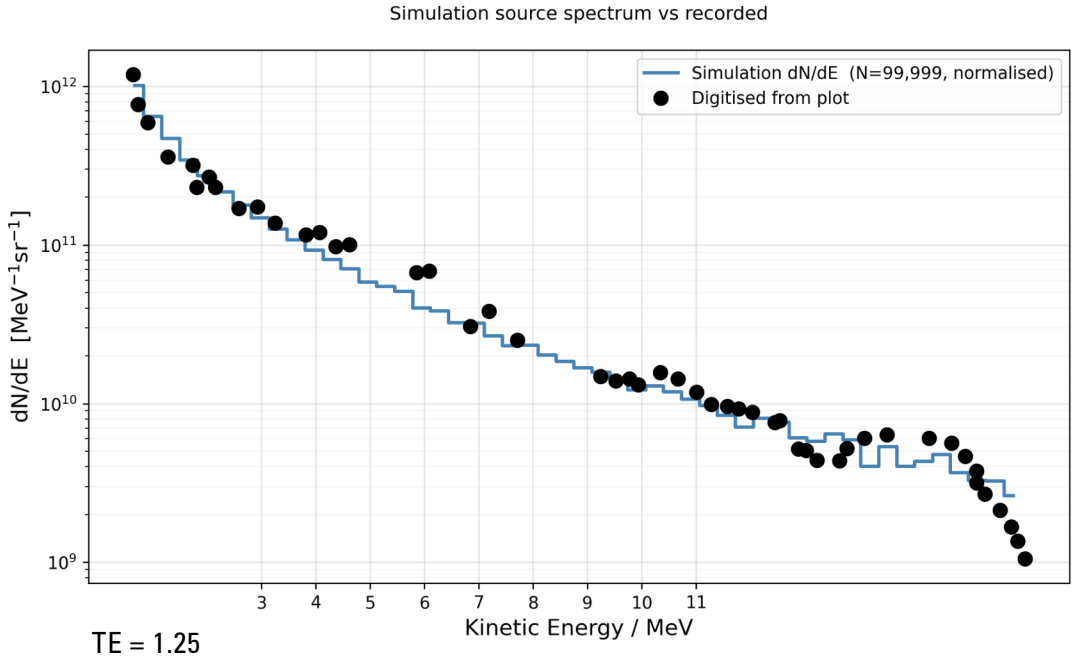


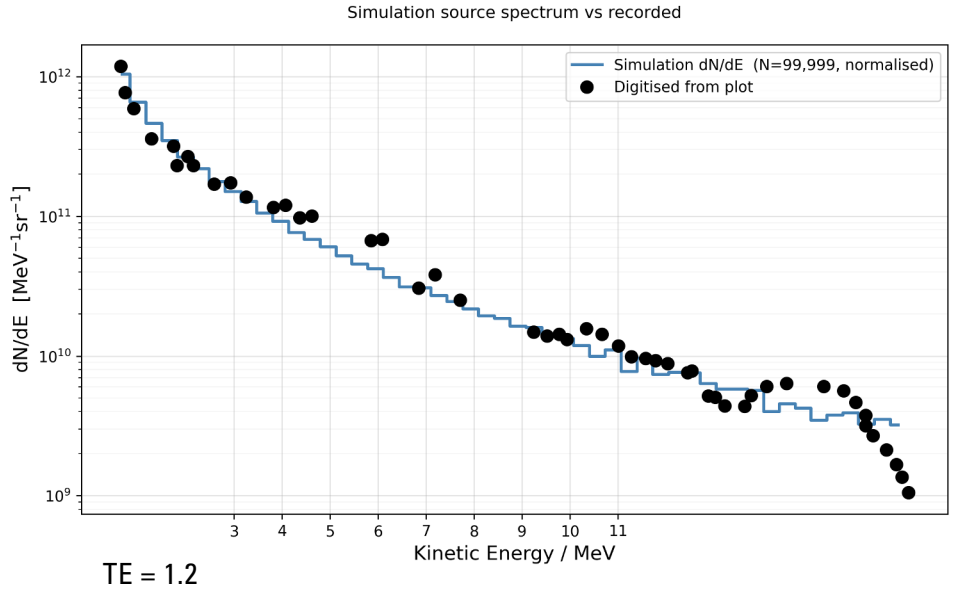


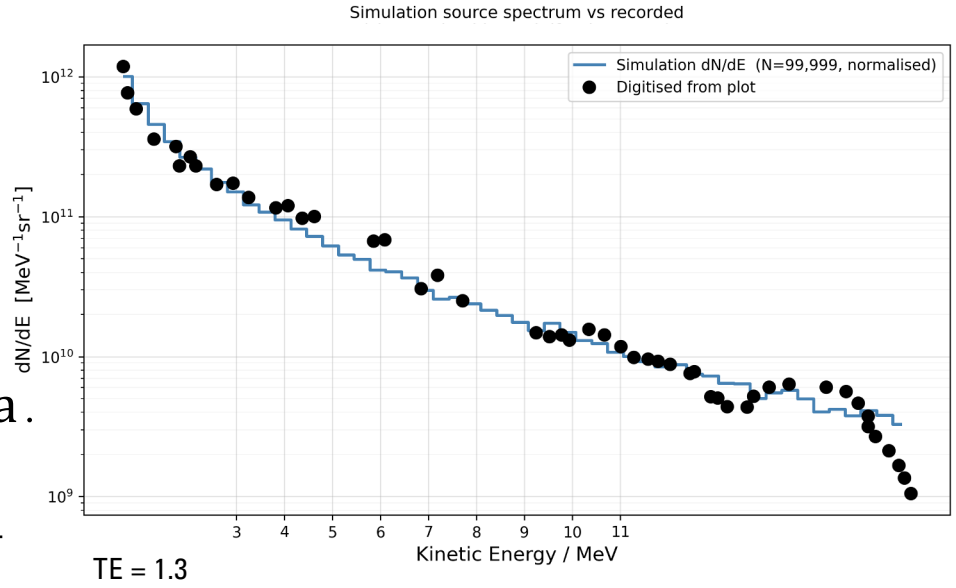


- Simulated beam at 52 mm compared with the RCF data.
- $\mathrm{Te} = 0.1, 0.2, 0.05$.

ELI SIM VS EXPERIMENT







- Simulated beam after source compared with the RCF data .
- Te = 1 . 2, 1 . 25, 1 . 3 .

NEXT STEPS

- Longer runs of the dipole–chicane (with chicane at the end) with adjusted cost function to account for CV .
- Recreate ELI and BELLA full line .
- Run optimizer with ELI and BELLA source input to see what we could achieve with our equipment .