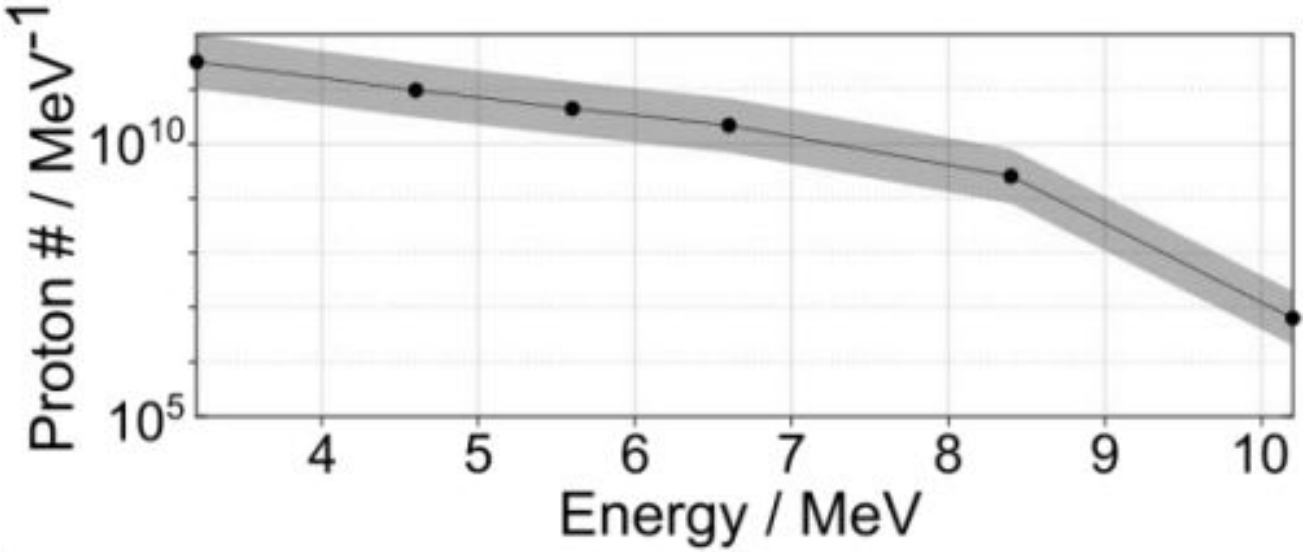
BELLA simulations

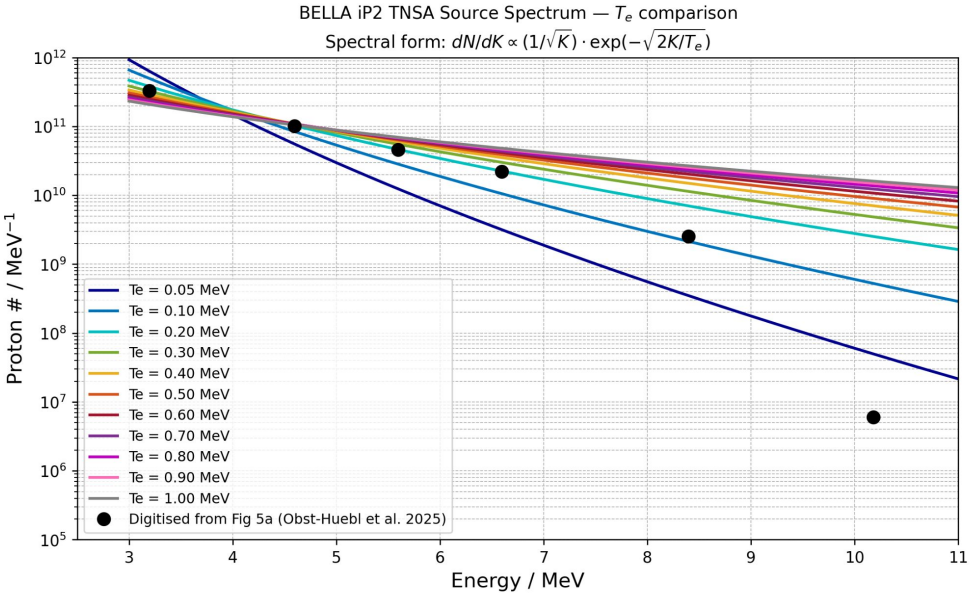
PoPLaR meeting 19/03/2026

Source characterisation- current knowledge



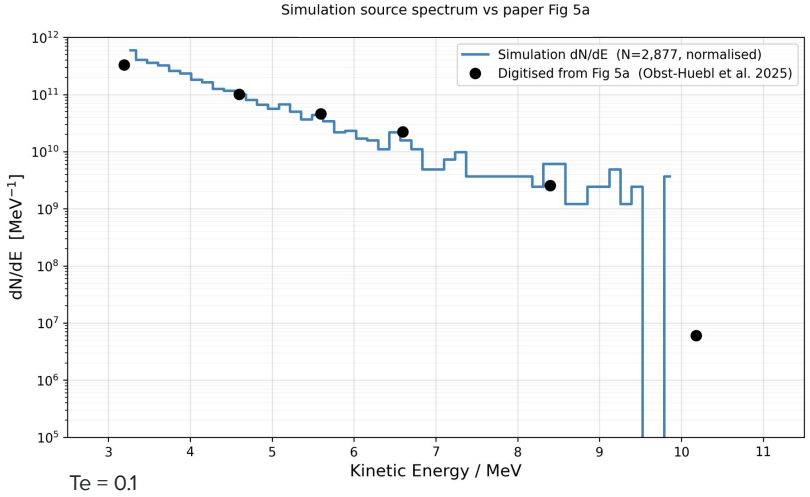
- Figure in the PDF, no raw data, showing the spectra at 52 mm after the source.

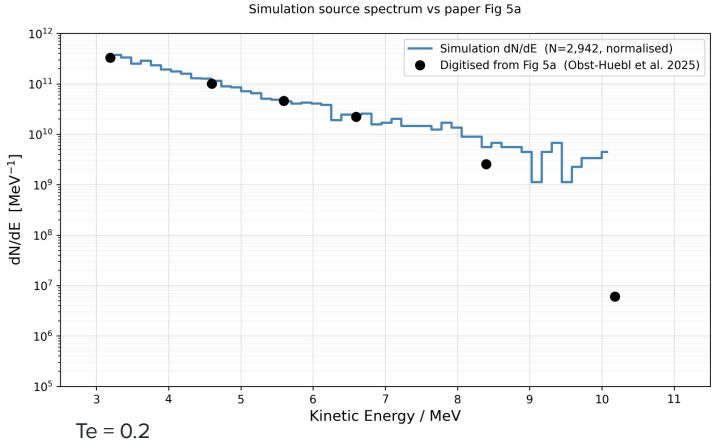
Source characterisation- estimating Te from extrapolated values

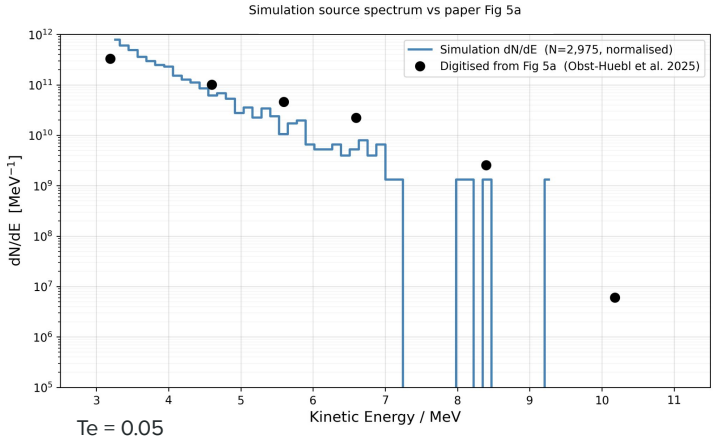


- Attempted to extract the data using image processing tools in MATLAB.
- Used this spectra to estimate the Te.

Source characterisation- sim vs experiment







- Simulated beam at 52 mm compared with the RCF data.
- Te = 0.1, 0.2, 0.05.

Source characterisation- best characterisation of source

Section	Element	Type	Parameter	Value	Unit	Comment
Facility	Global	Name	Name	BELLA		BELLA PW laser at iP2 setup
Facility	Global	Reference particle	Kinetic energy	8	MeV	Peak of proton spectrum at sample
Facility	Global	Vacuum chamber	Mother volume radius	0.5	m	Estimated from SCAPA setup
Source	Source	Parameterised TNSA	SourceMode	0		Estimated from SCAPA setup
Source	Source	Parameterised TNSA	Wavelength	0.815	um	Sapphire Laser
Source	Source	Parameterised TNSA	Power	117000000000000	W	Calculated: 7 J / 60 fs = 1.17×10^14 W
Source	Source	Parameterised TNSA	Strehl ratio	0.6		Estimated from SCAPA setup
Source	Source	Parameterised TNSA	r0	6.5	um	The target was deliberately positioned at the defocused condition with a 13 μm FWHM spot: r0 = 6.5 μm (13 μm / 2)
Source	Source	Parameterised TNSA	Duration	6E-14	s	Laser pulse duration- 60 fs
Source	Source	Parameterised TNSA	Te	0.1	MeV	Estimated from 52 mm RCF distribution
Source	Source	Parameterised TNSA	Kmin	3.2	MeV	Estimated from 52 mm RCF distribution
Source	Source	Parameterised TNSA	Kmax	10.2	MeV	Estimated from 52 mm RCF distribution
Source	Source	Parameterised TNSA	Thickness	13	um	Target thickness
Source	Source	Parameterised TNSA	DivAngle	30	degrees	Typical TNSA proton half-angle divergence is 20-40
Source	Source	Parameterised TNSA	SigmaThetaS0	30	MeV	Half-angle divergence at E=0 set to match laser incidence angle (30 deg) reported in Obst-Huebl et al. (2025) — no source divergence measurement available
Source	Source	Parameterised TNSA	SlopeThetaS	20	MeV	Linear divergence reduction with energy; gives theta(Kmax=11 MeV)=10 deg, consistent with partial PMQ capture — no source divergence measurement available

- Sourced-source parameters, some given, some calculated/estimated, some assumption based!