

Conventional Source Simulations

A. Ushakov, A. Schällicke, S. Riemann

DESY

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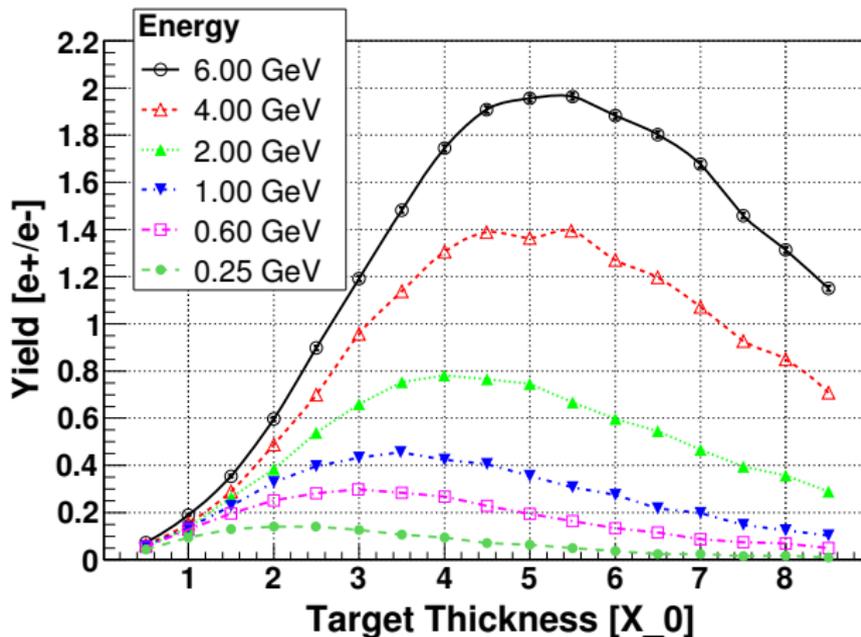
15 July, 2010

- Conventional Source Parameters
- Geant4 Simulation Results (Yield, PEDD):
 - Main Source with Lead Target and AMD
 - Auxiliary Source with Ti-alloy Target $0.4 X_0$ Thick and AMD
- Summary

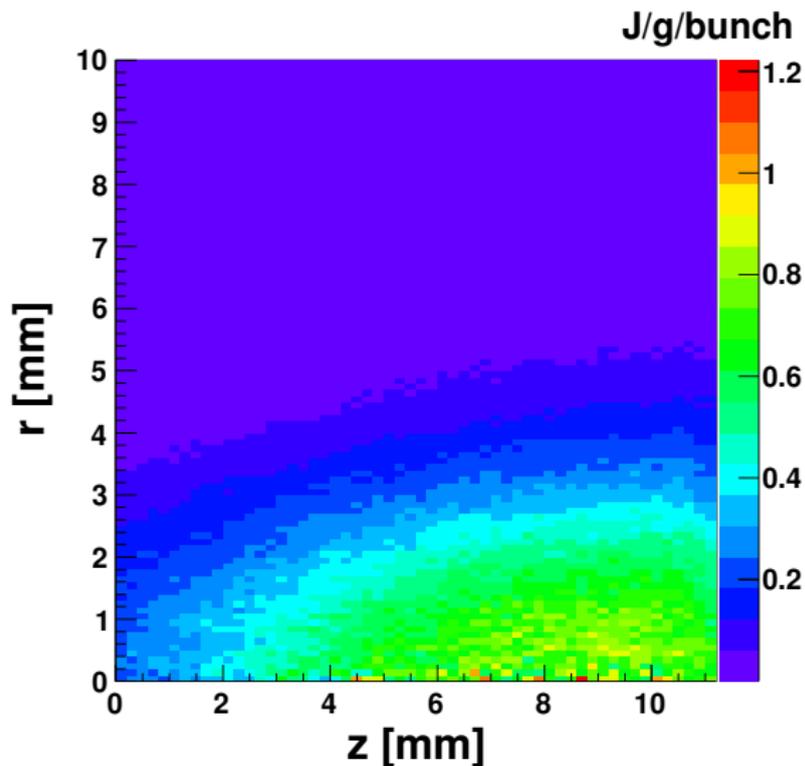
Parameters of Main Conventional Source

- Pb target, variable thickness
- 3 mm BN window
- e^- beam, pencil-like or $\sigma_x = \sigma_y = 2$ mm, variable energy
- AMD field: 6 T to 0.5 T, variable taper parameter
- E-field: 14.5 MeV/m
- DR acceptance: 0.09 m rad, 10 mm long. bunch size
- Number of e^+ per bunch: $3 \cdot 10^{10}$

“Captured” Positron Yield,
pencil-like e- beam



Energy Deposition in Lead Target



Yield and PEDD for Conventional Source

Lead Target and AMD

e^- Energy	Thickness [mm]	Taper [m^{-1}]	Yield [e^+/e^-] $\sigma_r = 0$	Yield [e^+/e^-]	E_{dep}^{total} [MeV/ e^+] $\sigma = 2$ mm	PEDD [J/g/bunch*]
250 MeV	11.2	35	0.14	0.09	582	0.8
600 MeV	16.8	34	0.29	0.19	869	0.8
2 GeV	22.4	28	0.78	0.44	1267	0.9
6 GeV	28.0	12	1.96	1.09	1698	1.2

* $3 \cdot 10^{10}$ e^+ /bunch

Auxiliary Source Parameters

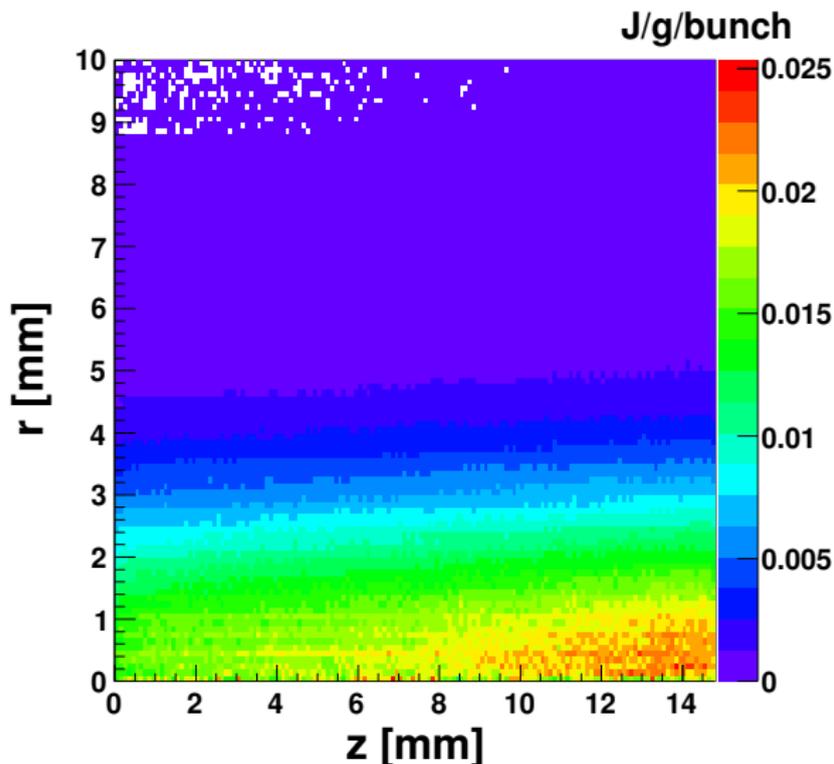
- Ti6Al4V target, $0.4 X_0$ thick
- 3 mm BN window
- 500 MeV e^- beam, $\sigma_x = \sigma_y = 2$ mm
- AMD field: 6 T to 0.5 T, taper parameter = 30 m^{-1}
- E-field: 14.5 MeV/m
- DR acceptance: 0.09 m rad, 10 mm long. bunch size
- 1% nominal bunch intensity

Positron Yield and Capture Efficiency

Yield after Target	Captured Yield	Capture Efficiency
0.13	0.017	$\simeq 14\%$

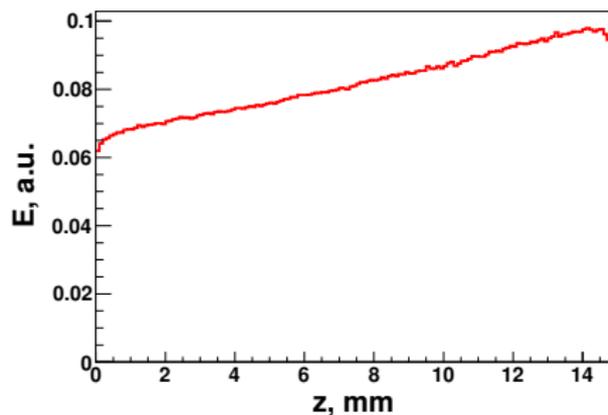
PEDD for 500 MeV e^- beam, $\sigma_x, \sigma_y = 2$ mm

Energy deposition in Ti6Al4V target, 1% nominal bunch intensity

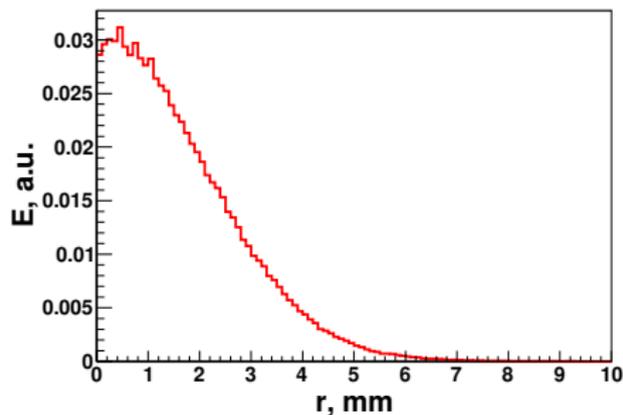


Energy Deposition along Z- and R-axis

Energy Deposition along Z-axis



Energy Deposition along R-axis



- Positron Source simulations using PPS-Sim have been performed for the conventional source with lead target and AMD
- Positron yield and PEDD have been calculated for the different energies of primary e^- beam (between 250 MeV and 6 GeV)
- Efficiency of auxiliary source with “shared” Ti-alloy target has been estimated
- Energy deposited in the target of auxiliary source has been calculated