EuPRAXIA

Horizon2020

WP7: HEP and other applications

Presented by Arnd Specka

On behalf of

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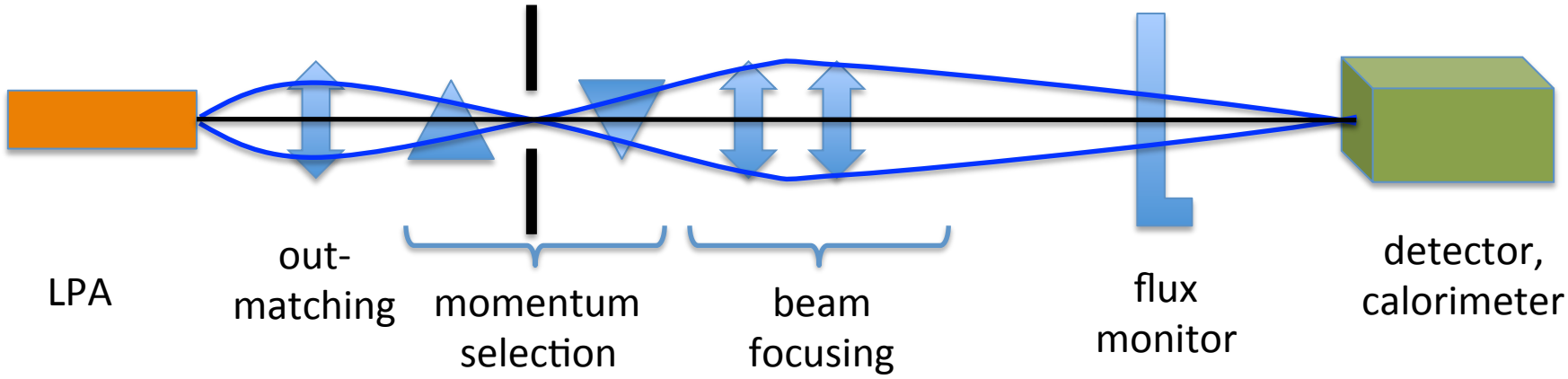
Combined parallel session with WP3, WP5, WP6

Four groups of applications for e- beams

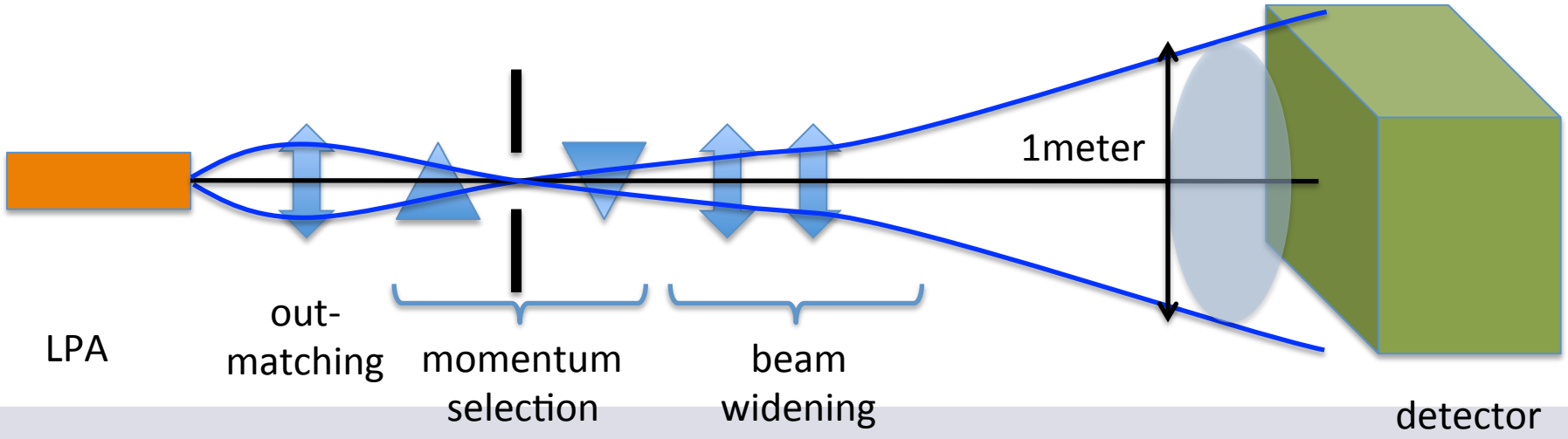
- Applications of electron beams for high energy ph. (HEP)
  - HE EM shower "simulation" in the lab
  - big detector calibration
- Applications of electron beams other than HEP
  - test facility for bunch length diagnostics
  - generating a "e-/e+ plasma" beam
- Applications of plasma generated radiation
  - betatron radiation, THz radiation
- R&D of plasma accelerators as an application
  - (2 stage acceleration), hybrid acceleration, plasma devices….

beam conditioning for HEP applications

HE electromagnetic shower simulation (« 1000x5GeV=5TeV »)



simultaneous iradiation of detectors at high occupancies



Challenges for HEP applications

- ❑ reducing the peak particle flux (➔ momentum selection)
- ❑ focussing the selected beam to shower size dimensions ➔ emittance
- ❑ measuring particle flux to sufficient precision

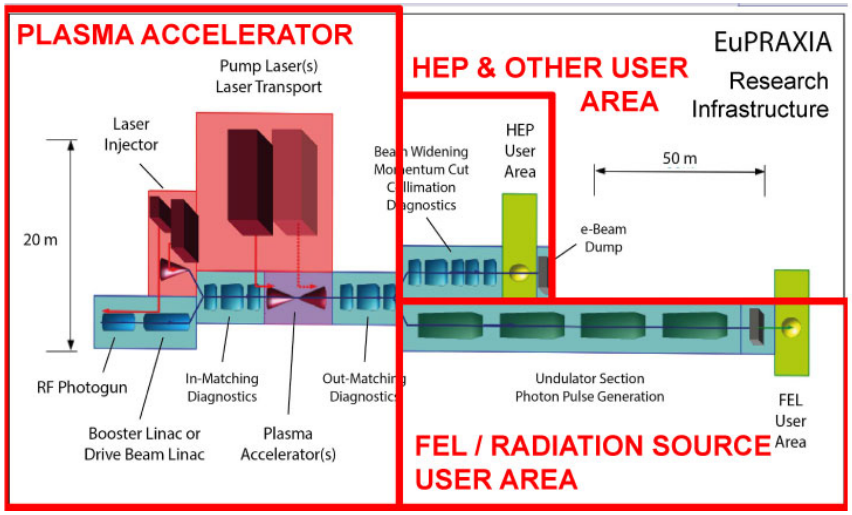
HE electromagnetic shower simulation:

- What bunch of N electrons of identical energy E_B= O(1-5GeV) generates a shower that ressembles most a shower generated by one electron (positron, gamma) of E=N$\times E_B$?

4 types of applications: 2 classes of setups

- proximal applications (radiation, diagnostics test stand)
  - close to the LPA
  - high particle flux, no beam conditioning
  - immediately available
- distal applications (HEP detector calibration)
  - needs beam conditioning
  - flux reduction, refocussing/ widening

Baseline design (proposal) and alternatives



- single LPA -> e- beam switchyard -> FEL / HOA
- single LPA -> straight transport to FEL -> switch to HOA
- single LPA -> HOA inserted (push-pull)
- two LPAs for each line (switch laser, 2 laser beams)

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Connections to other WPs

	1 coordination	2 simulation	3 plasma	4 laser	5 beam optics	6 FEL appl	7 HEPO Appl
lab simulation of showers					X		X
high flux/ high occupancy					X		X
test bench for long diags						X	X
positron beam source		X	X				X
pump(L)/probe(e-)		X		X	X		X
betatron radiation			X			X	X
compton source		X	X	X	X		X
Brems source			X	X	X		X
THz source							X
multistage		X	X	X	X		X
plasma accelerator elements		X	X	X			X

Next steps for WP7

- Define functionalities of HOA user area
  - compare baseline setup and potential alternatives
  - derive parameter requirements
  - analyse space requirements
- discuss with WP5: videoconferencing in july
- reiterate in september: narrow down beam dyn studies
- status to be presented in steering meeting in september
- Applications workshop: Paris Oct 11-13,/2016
- WP7: quantitative assessm^{t} of beam parameters for HOA

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manpower

- Roman Walczak, Andy Walker, Imre Barna, Arnd Specka
- postdoc (23 months) to be hired in Year 2
- more contributions welcome!
- also to be discussed: (with WP3 WP4 WP5)
  - laser beam outcoupling and cohabitation w/ user radiation beams
    -> WP3, WP4, WP5
  - background and collimation studies for HOA
    -> WP5, WP6