
Status of the CLIC Post-Collision Line

Edda Gschwendtner, EN/MEF

Outline

- Design Considerations
- Present Design
- Critical Issues
- Summary

Thanks for many discussions and information from

Konrad Elsener, Thibaut Lefevre, Jan Uythoven, Rob Appleby,
Arnaud Ferrari, Mike Salt, Volker Ziemann

Introduction

Some Numbers:

3.72 E9 e+e- /bunch

Disrupted beam:

→ Total power of ~10MW

Beamstrahlung photons:

→ 2.2 photons/incoming e+e-

→ 2.5 E12 photons/bunch train

→ Total power of ~4MW

Coherent e+e- pairs:

→ ~5E8 e+e- pairs/bunchX

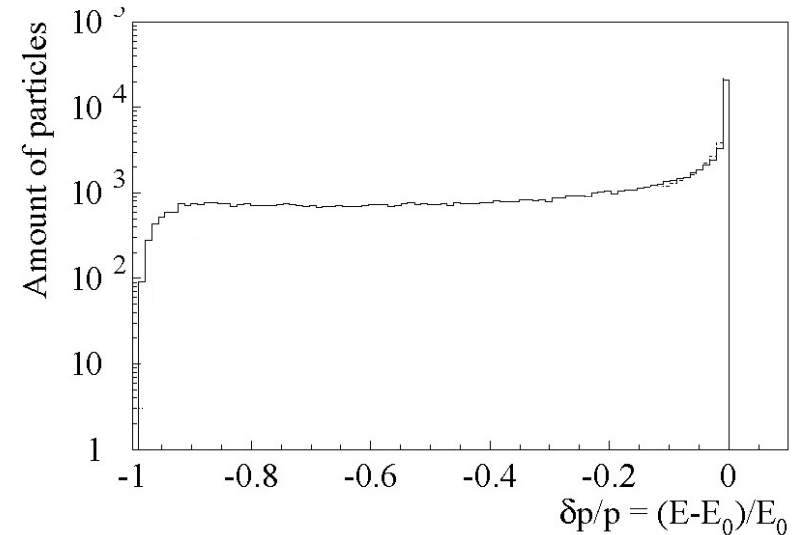
→ 170 kW opposite charge particles

Incoherent e+e- pairs:

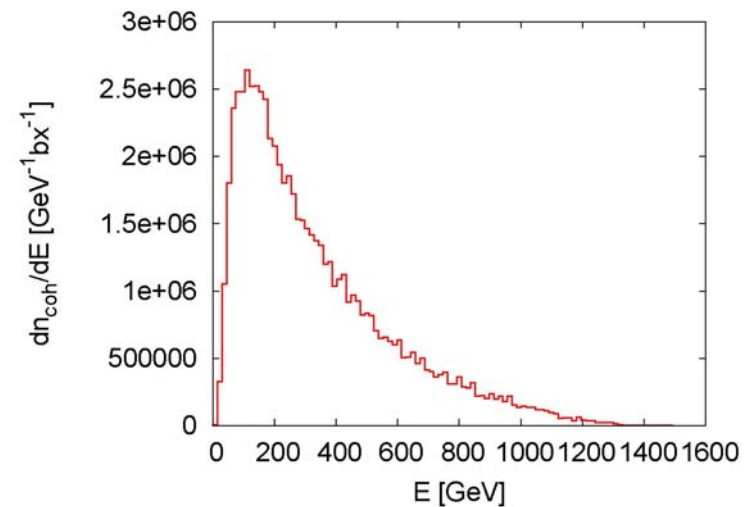
→ 4.4E5 e+e- pairs/bunchX

→ 78W

disrupted beam at interaction point



coherent pairs at interaction point



Design Considerations

- Transport particles from IP to dump
- Diagnostics (luminosity monitoring)

Constraints

- Particles of all energies and intensities
- Control beam losses in magnets and shielding
- Minimize background in the experiments
- Stay clear of the incoming beam

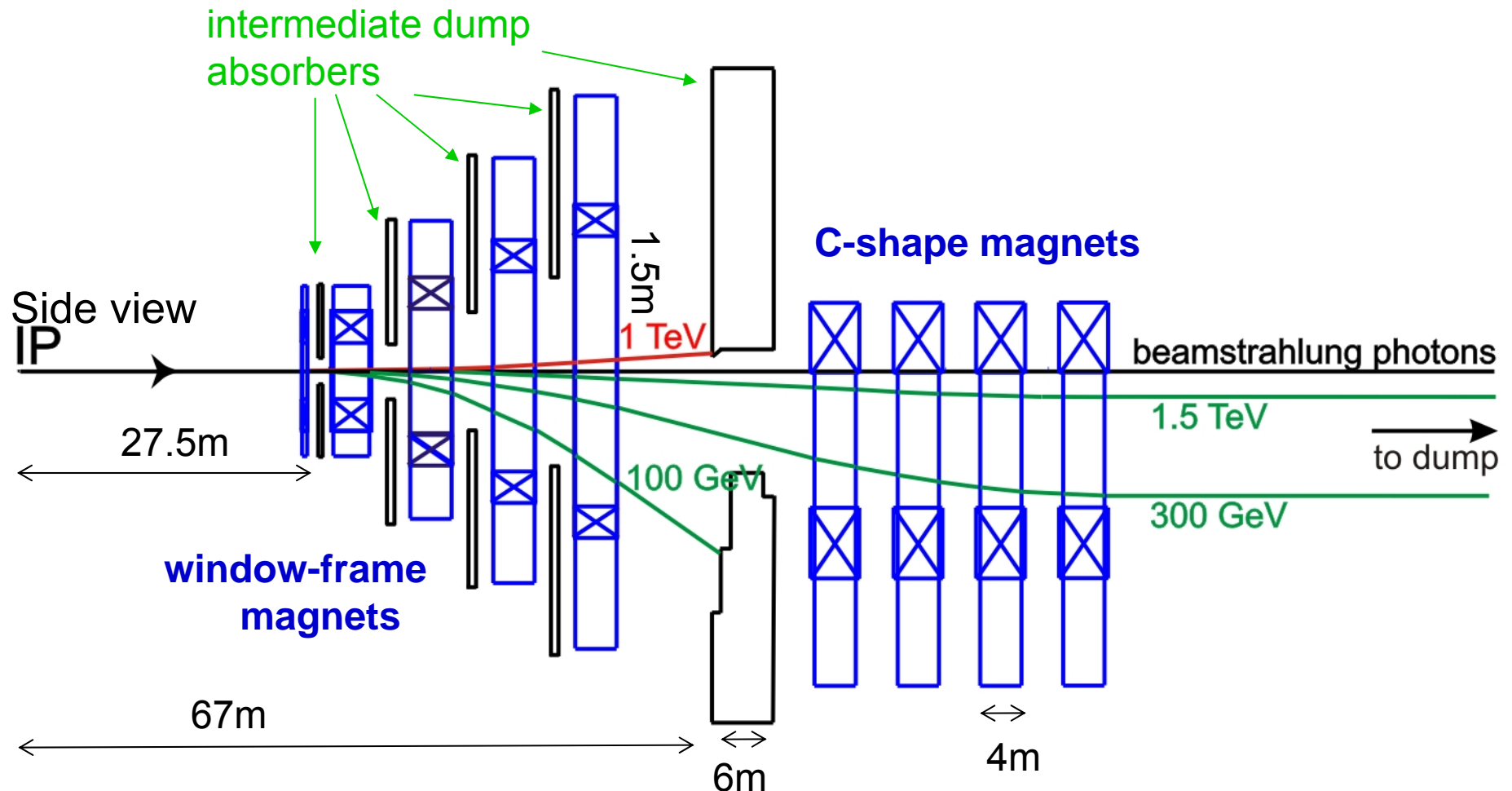
Consequences

- Large acceptance
- Collimation system
- Main dump protection system
- Beam diagnostic system

Present Conceptual Design (A. Ferrari, M. Salt et al)

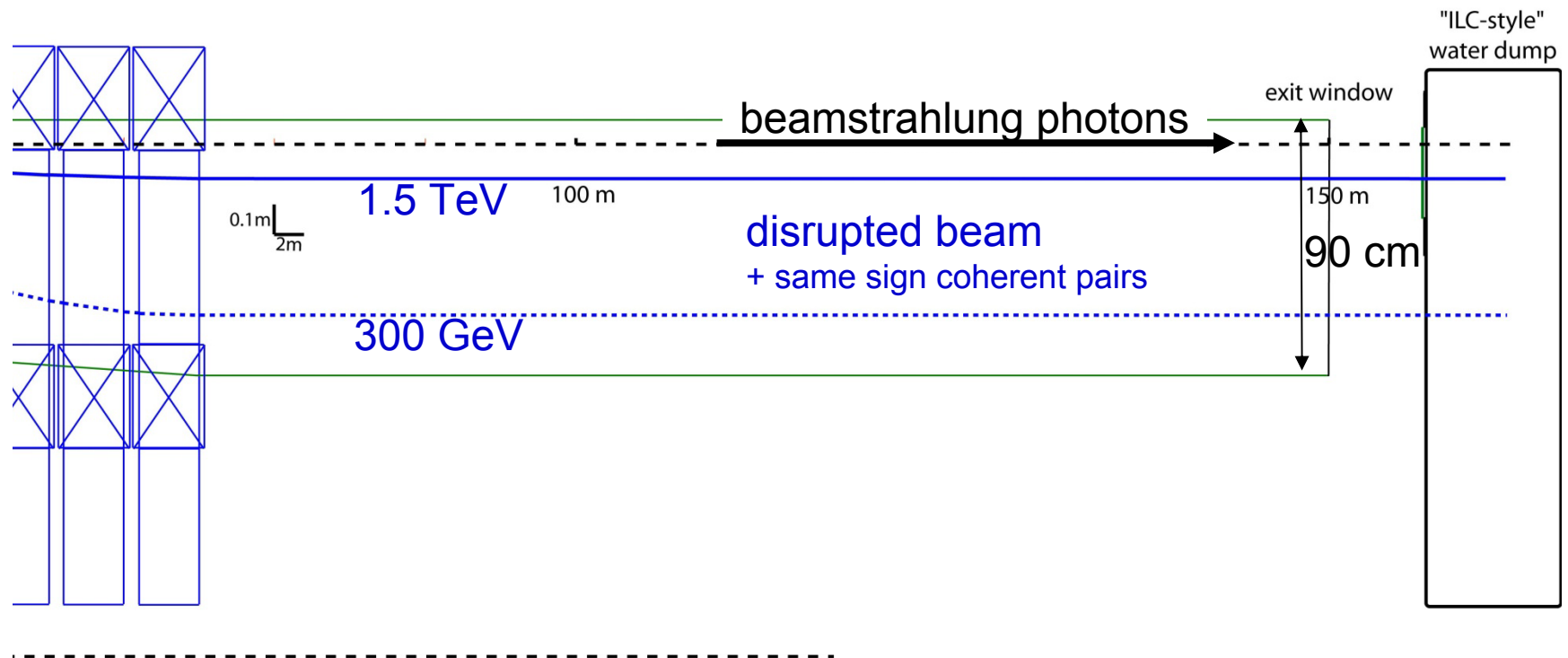
Baseline: vertical chicane with dipole magnets to separate

1. particles from the e^+, e^- pairs with the wrong-sign charge and low energy tail
2. disrupted beam, beamstrahlung photon



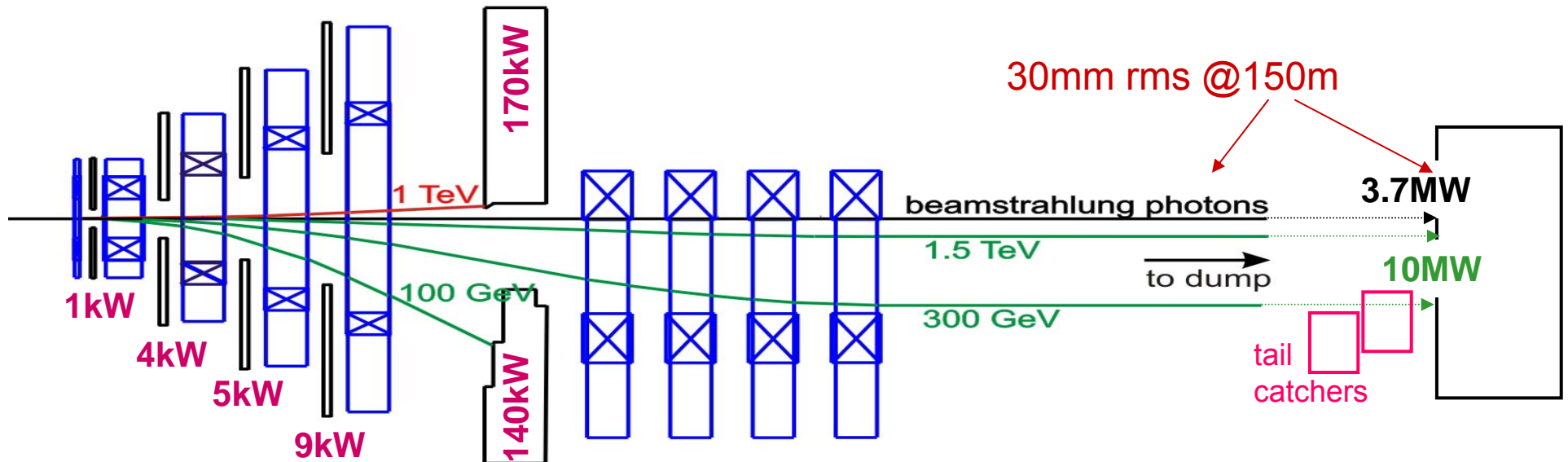
Present Conceptual Design (cont'd)

Side view

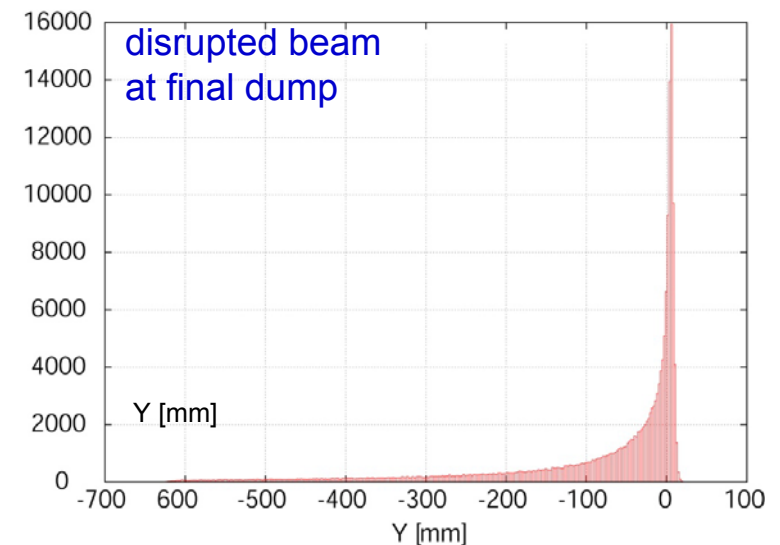


Critical Issues

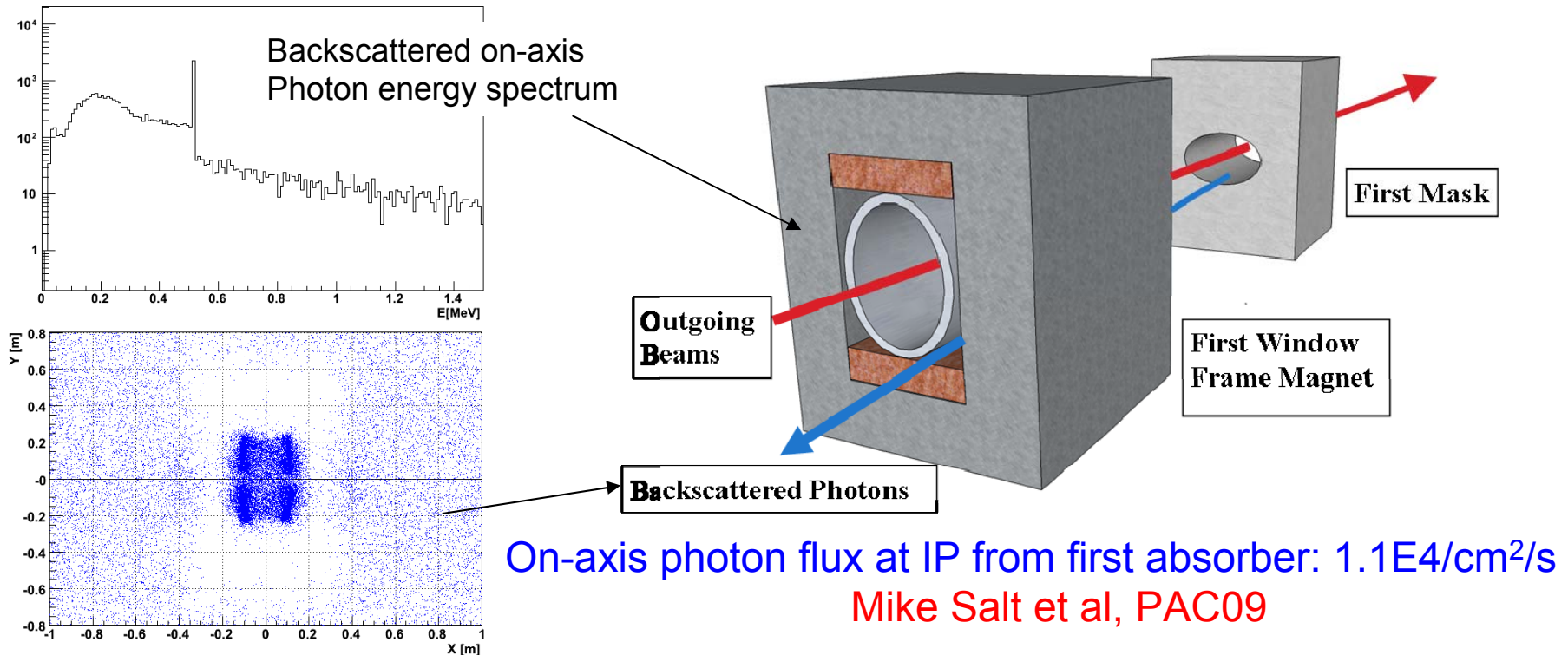
Power Deposition in Main Dump



- Main dump design
- Tail catcher
- How much must the beam be blown up
→ need of sweeping magnet or defocusing?



Background from Post-Collision Line to IP



Next steps:

Extend geometry: add magnets, absorbers, intermediate dump, etc..

→ Photon background

→ Neutron background

Mike Salt + Post-Doc, R. Appleby
 Cockcroft Institute, UK, EUCARD

Beam Diagnostics

Luminosity monitors

Experiments measure luminosity (slowly!)

- Need fast signal for monitoring and correcting beam
 - beam-beam offset: effect on beamstrahlung photons and coherent pairs
 - Monitoring per \leq bunch train
 - Measure relative changes

Post-collision diagnostics:

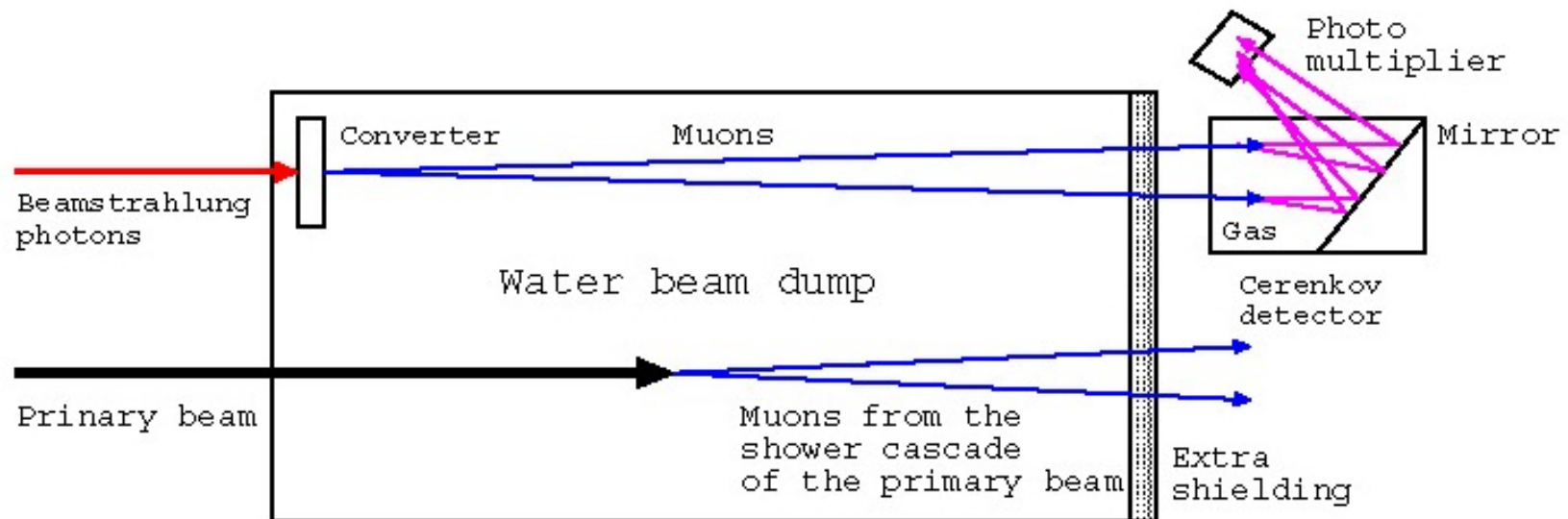
Volker Ziemann, EUROTev-Report-2008-016

- Measuring opposite sign coherent pairs before or in intermediate dump
- Tail monitors close to collimators
- Interferometric beam dump thermometer

Luminosity Monitoring: $\mu+\mu^-$ pair production

- Converter in main dump \rightarrow muons
- Cherenkov detector
 - $\sim 4 \text{ E}5$ photons/bunch

EUROTeV-Report-2008- 016 .



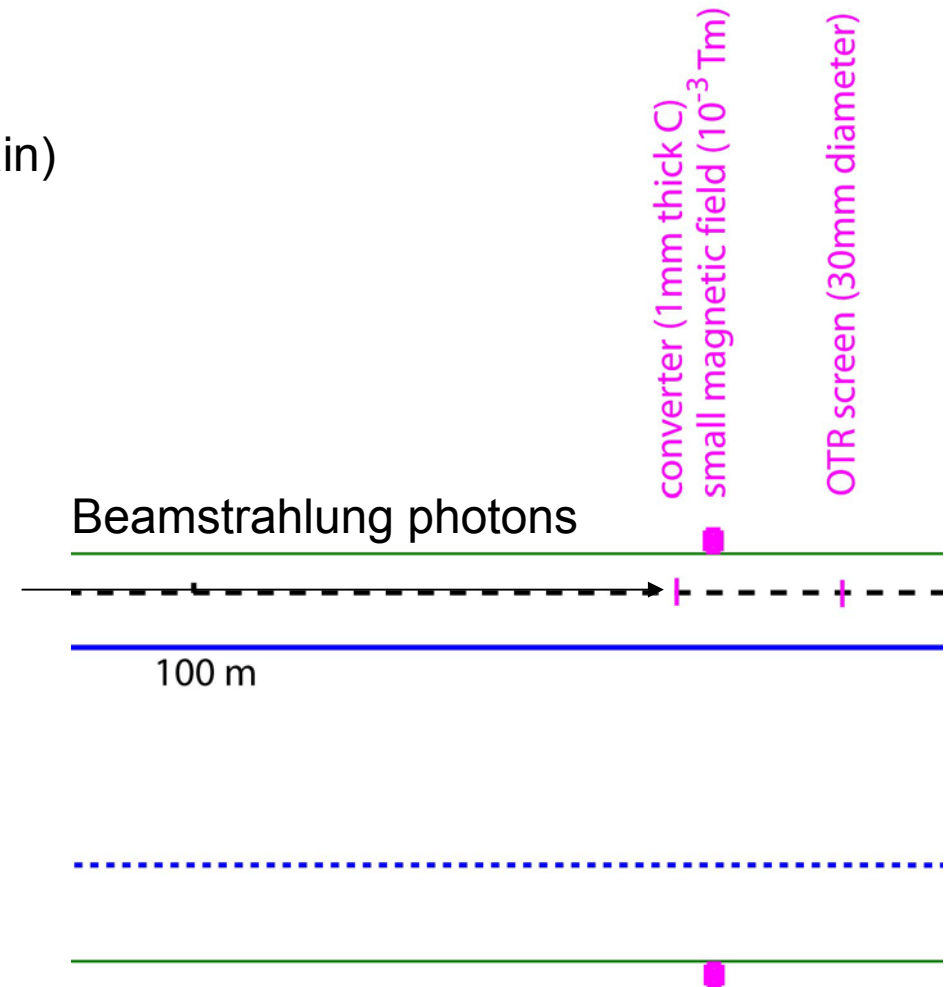
\rightarrow To be studied in more detail: background, converter, detector, etc..

Luminosity Monitoring: e+e- pair production

Enrico Bravin, July 2007

- Beamstrahlung photons through converter
- Produce charged particles (5E9/train)
- Optical Transition Radiation in thin screen
- Observation with CCD or photomultiplier

→ To be studied in more detail:
→ background, detector, etc..



Summary

Conceptual design of post-collision line exists

Work to be done on many issues such as:

- Calculations of Background to IP } **on-going,
Cockcroft Institute**
- Beam diagnostics } **PhD student at CERN
has been requested**
 - Luminosity
 - Background to monitors
- Beam Dump } **Project associate
at CERN**
 - Type, entrance window
 - Background from dump
- Large beam spot size at dump } **Contact with TE/ABT**
 - Sweeping magnets or defocusing
- Collimator and intermediate dump design
- Magnet design
- Radiation in post-collision line

Extra slides

