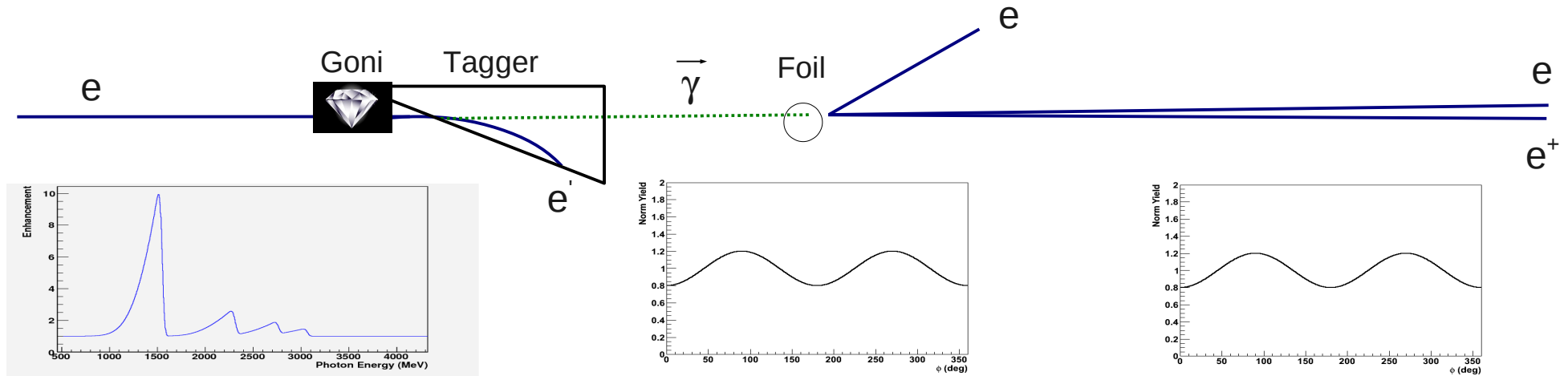


Polarimetry

Ken Livingston
GlueX Upgrade Workshop, May 2012



Coh Brem calculation

100% A (Analysing Power)
Detect tagging electron

Need to model:
Photon beam, Electron beam
Collimator, Crystal
Paid, tested. Works

Triplet

Medium intrinsic A (~20%)
Low x-section

High background,
Hard to detect and keep
high A.
Need to build, test, model

Pair

Medium intrinsic A (~20%)
High x-section

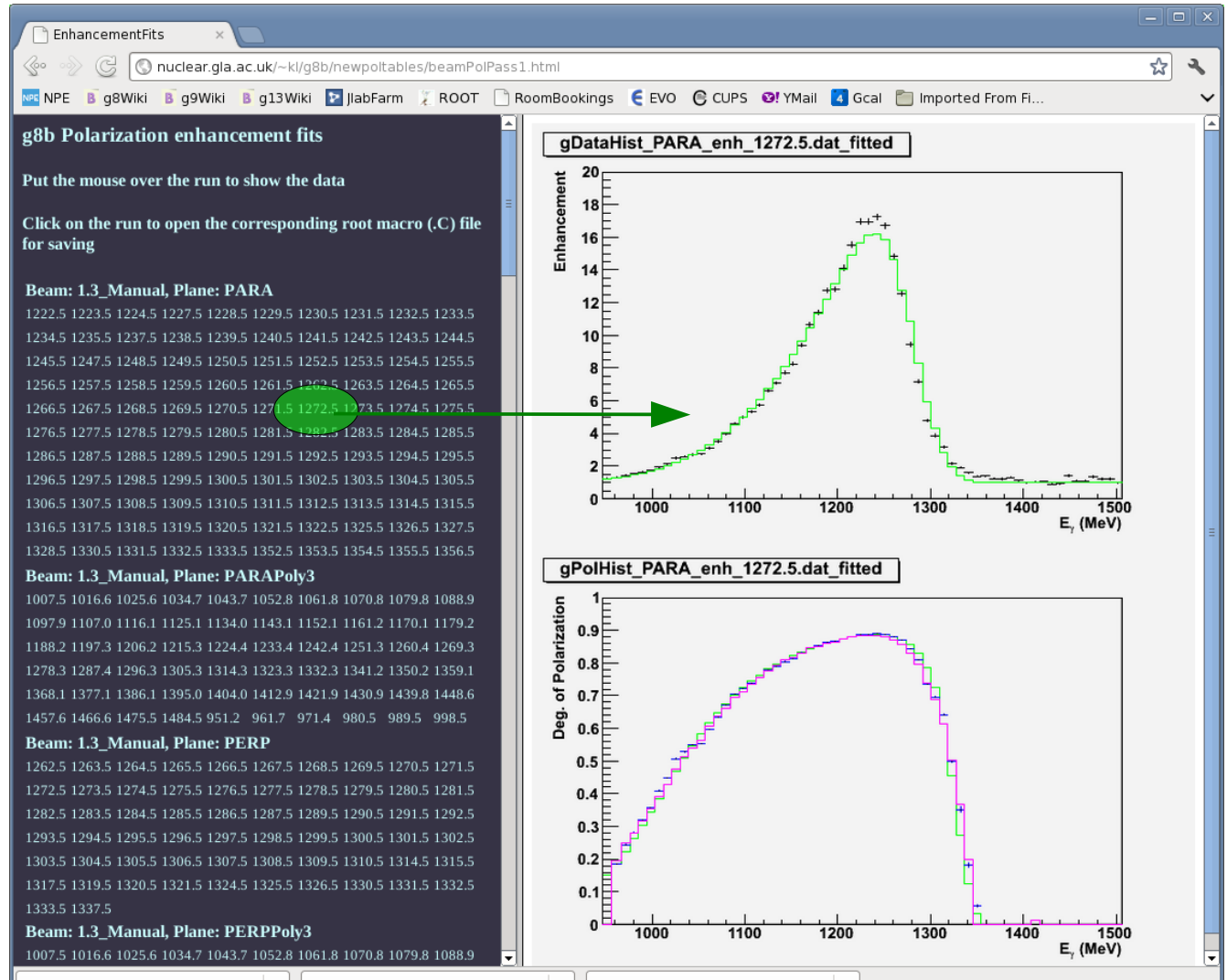
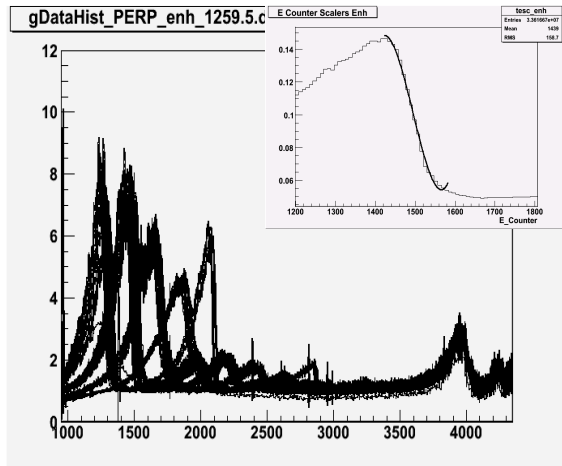
Medium background,
Very hard to detect pair
and keep high A.
Need to build, test, model

Already have in-beam polarimeter making continuous measurement: The Tagger.
Need to be sure an other polarimeter can improve on that .. or it's not worth the effort!

Polarimetry: Hall B Polarimeter – Brem calculation

Ken Livingston

GlueX Upgrade Workshop, May 2012



Coh Brem calculation

Fit enhancement -
Calc. Polarization table

Peak may drift -
Need many tables

Sys error < 5%

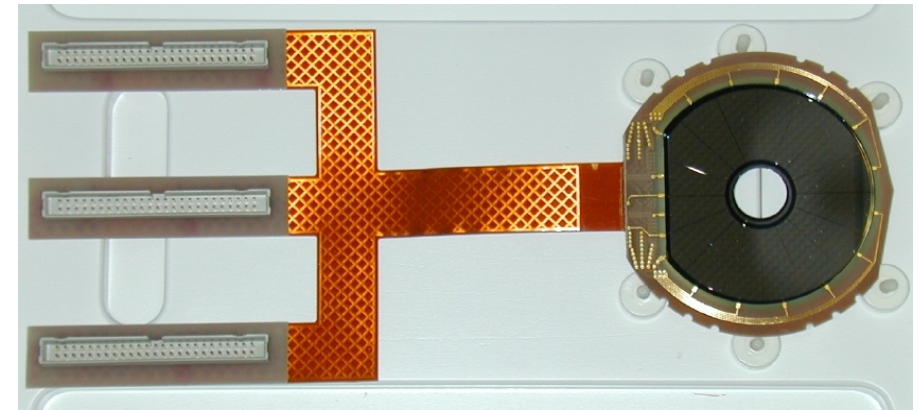
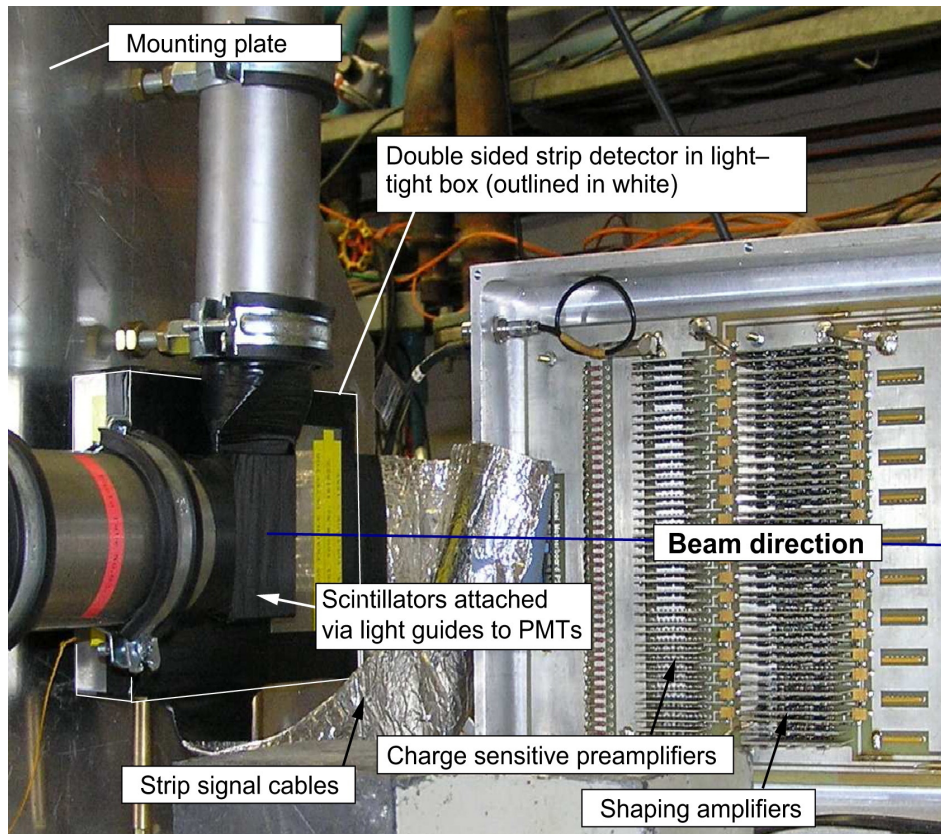
<http://nuclear.gla.ac.uk/~kl/g8b/newpoltables/beamPolPass1.html>
<http://nuclear.gla.ac.uk/~kl/g8b/CbremJlab/polTables.pdf>

Polarimetry: Prototype Triplet Polarimeter

Ken Livingston

GlueX Upgrade Workshop, May 2012

- Michael Dugger has shown in simulation that a triplet device is feasible
- Between Glasgow and Mainz we have enough bits to prototype and test.



Annular double sided strip detector: Mainz/Pavia
Micron S2: 48 rings, 16 Sectors, 1000um
From Daphne detector. P.Pedroni, INFN, Pavia.

Have annular triplet detector + electronics

Can we develop a prototype and test configuration in Mainz?

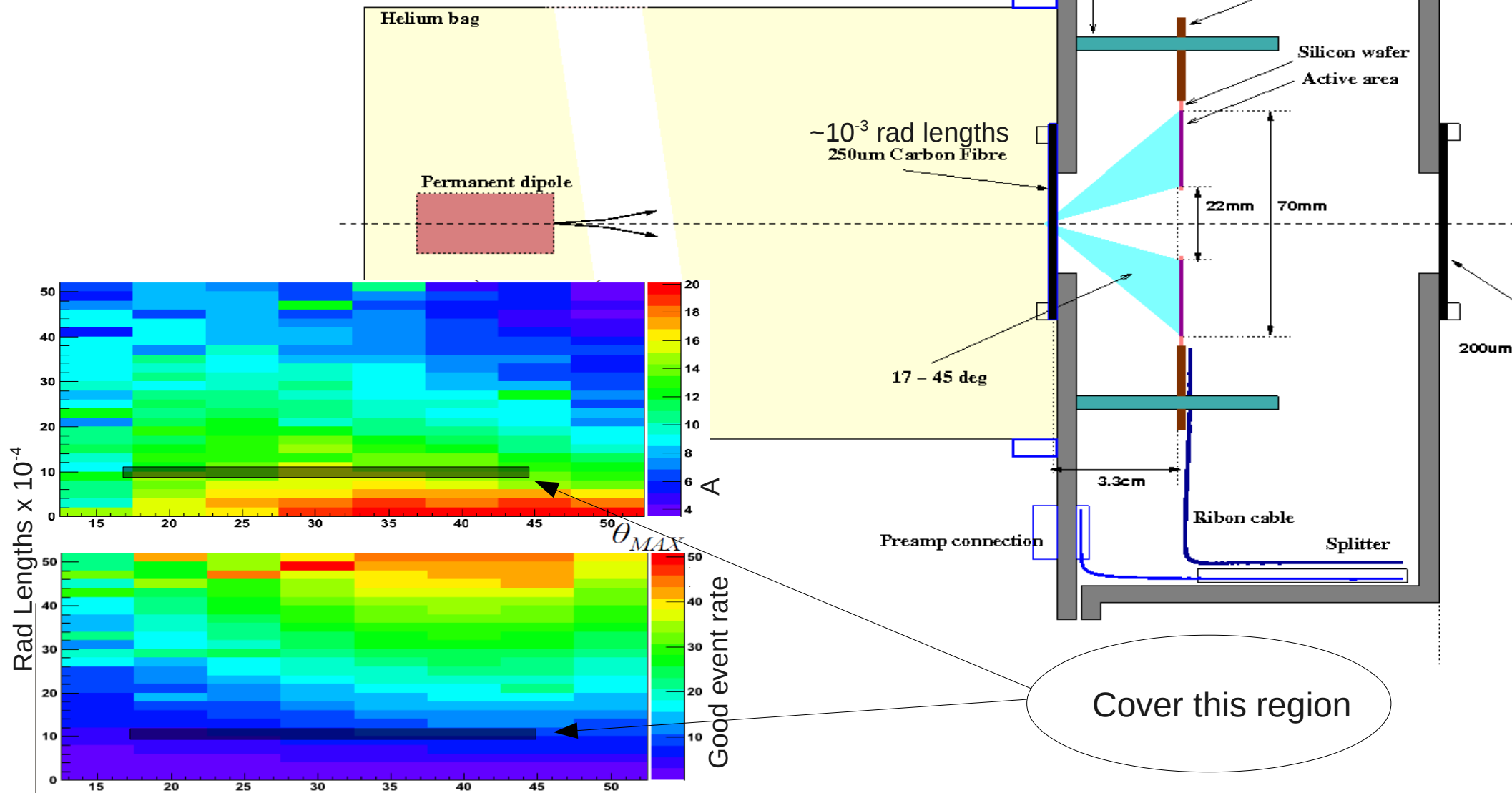
Electronics: Glasgow

*Angular distribution of coherent bremsstrahlung,
D.Glazier, K. Livingston et al, NIM A664, 2012*

Polarimetry: Prototype Triplet Polarimeter

Ken Livingston
GlueX Upgrade Workshop, May 2012

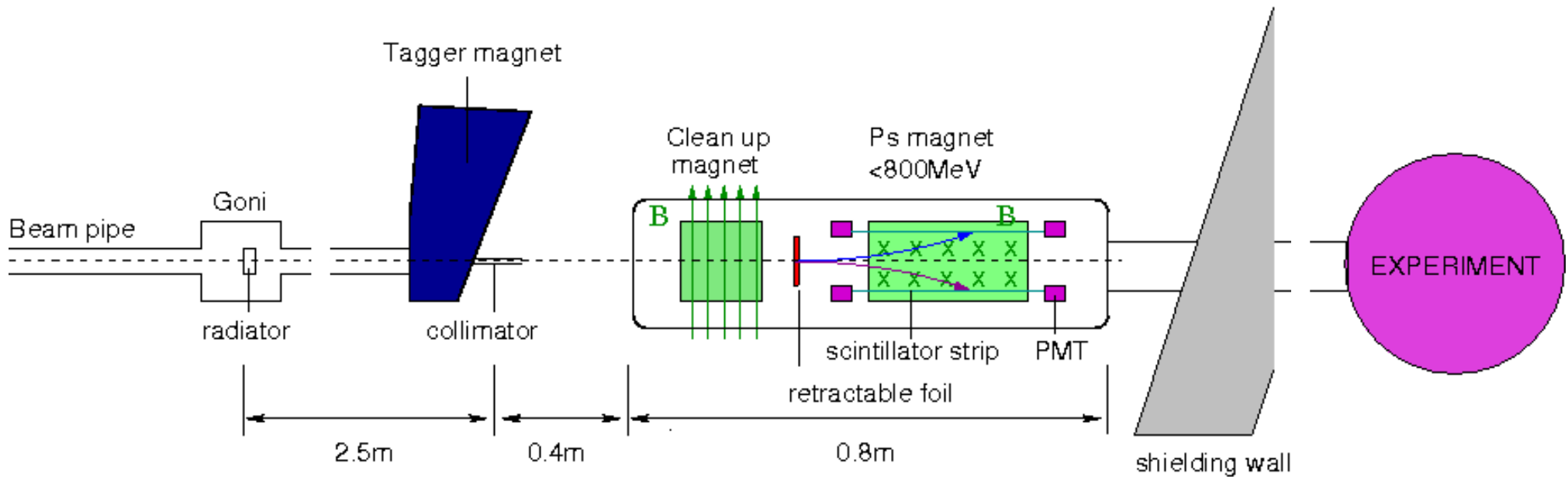
1st design: Based only simulation and strip detector geometry
No consideration of Mainz details: Position, Pair detection, Trigger etc.



Polarimetry: Prototype Triplet Polarimeter

Ken Livingston
GlueX Upgrade Workshop, May 2012

MAINZ, MAMI A2 Hall, Pair spectrometer (*Juergen Ahrens*)
(not to scale)



Pair spectrometer already installed and working in Mainz.

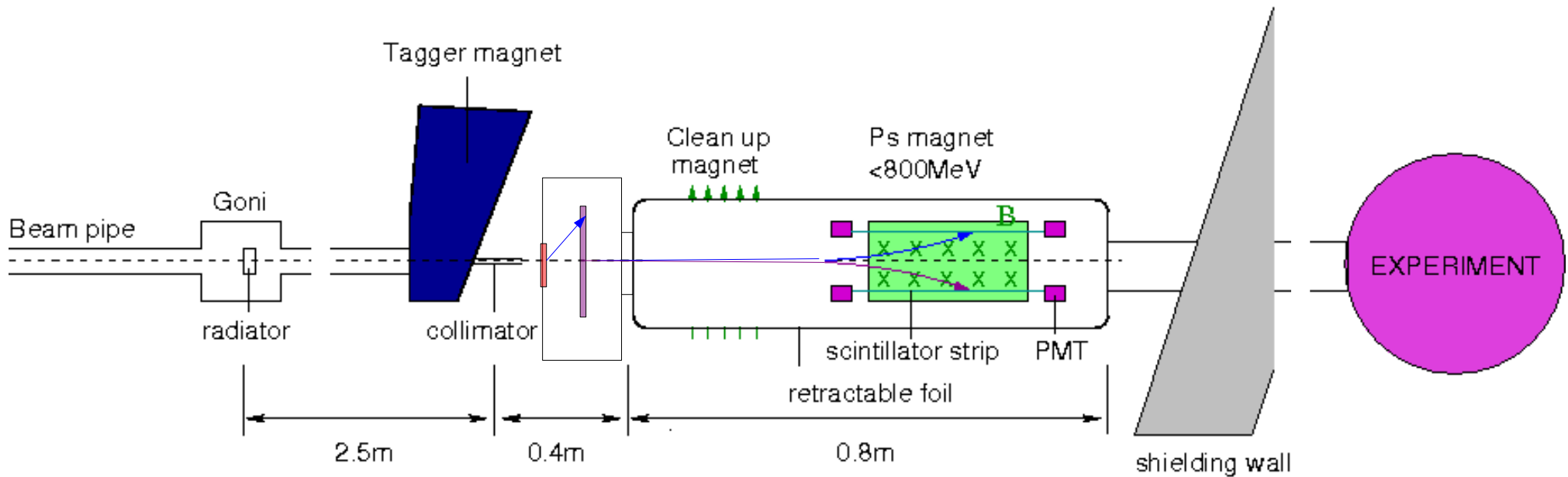
No photon energy differentiation – aim was for flux monitoring

How can we use this setup to test the triplet polarimeter.

Polarimetry: Prototype Triplet Polarimeter

Ken Livingston
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MAINZ, MAMI A2 Hall, Pair spectrometer
(not to scale)



Test setup

Install triplet chamber on front of PS vacuum box.
Remove cleanup magnet and retract PS foil

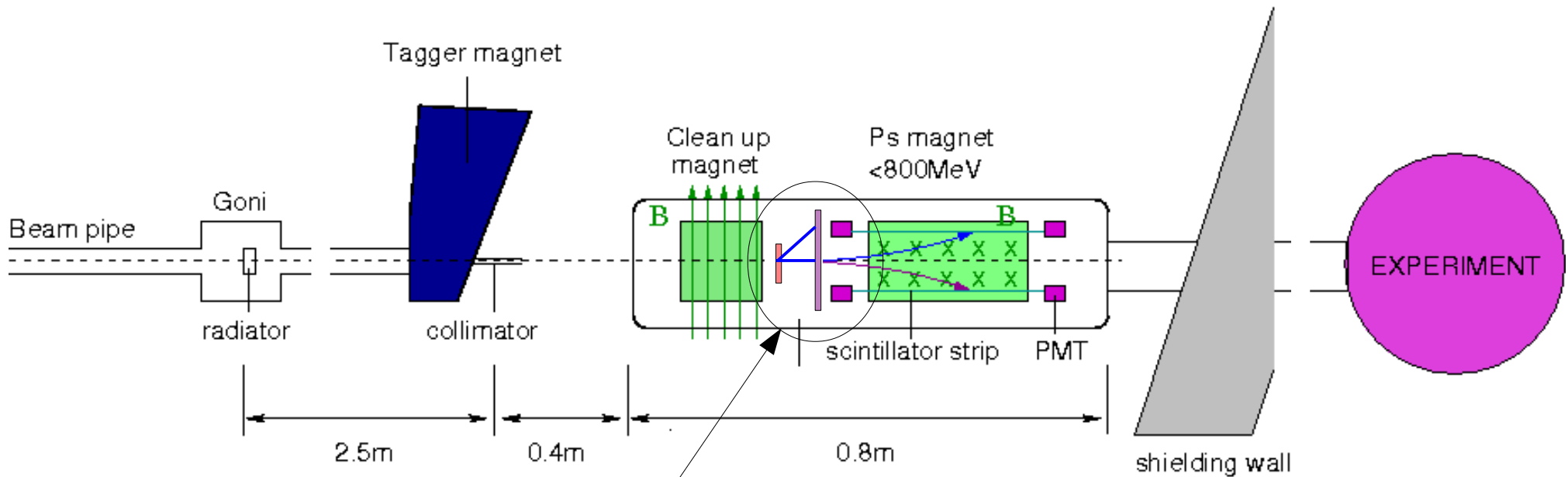
Issues:

Rate of good triplet events. Background from collimator / air.
Stray magnetic fields. Shielding.

Polarimetry: Prototype Triplet Polarimeter

Ken Livingston
GlueX Upgrade Workshop, May 2012

MAINZ, MAMI A2 Hall, Pair spectrometer
(not to scale)



A permanent fixture ?

If test is successful we can make this permanent in Mainz
Ideal position, between cleanup magnet and PS magnet

Issues

Rate of triplet events at normal running rates may be low

Polarimetry: Summary

Ken Livingston

GlueX Upgrade Workshop, May 2012

- **Let's not forget the dear old bremsstrahlung calculation**
 - < 5 % with the coherent peak at $\sim 1/3$ endpoint energy (Hall B)
- **Triplet polarimeter**
 - Simulations show it is feasible
 - Build and test prototype in Mainz with existing parts.
- **Status of prototype**
 - Detector and electronics in Glasgow, design of chamber underway
 - Lab tests in Glasgow – Summer 2012
 - Beam test in Mainz – Fall 2012
- **Required**
 - Info from Mainz on stray fields.
 - Simulations based on Mainz specs.

