

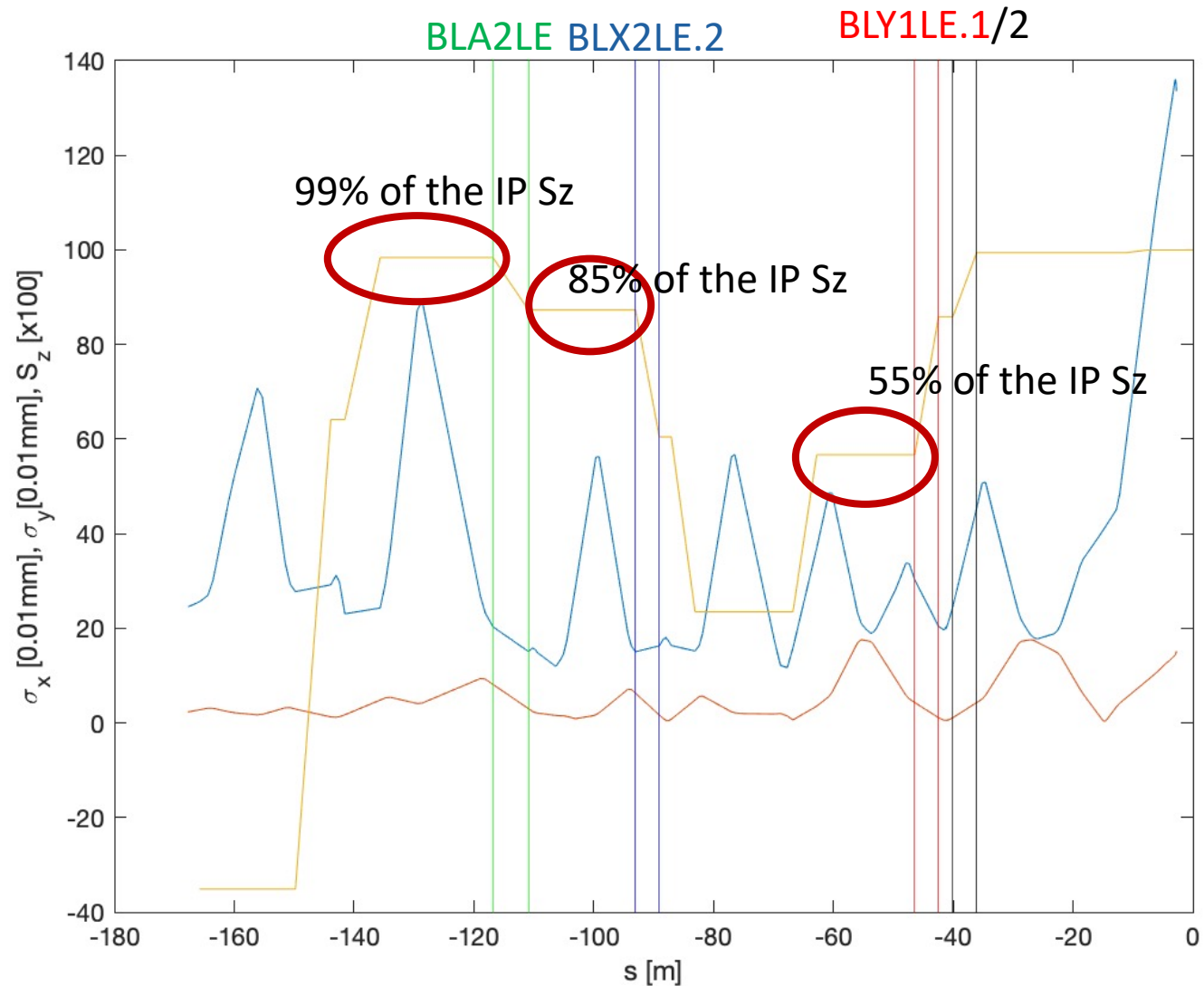
Compton polarimetry for SuperKEKB upgrade

Aurélien MARTENS

Introduction

- Description of the current best candidate for the location of the polarimeter
- Open questions related to integration of the polarimeter that is made of 3 elements
 - A laser-e beams interaction chamber
 - A scattered electron detector
 - A scattered photon detector

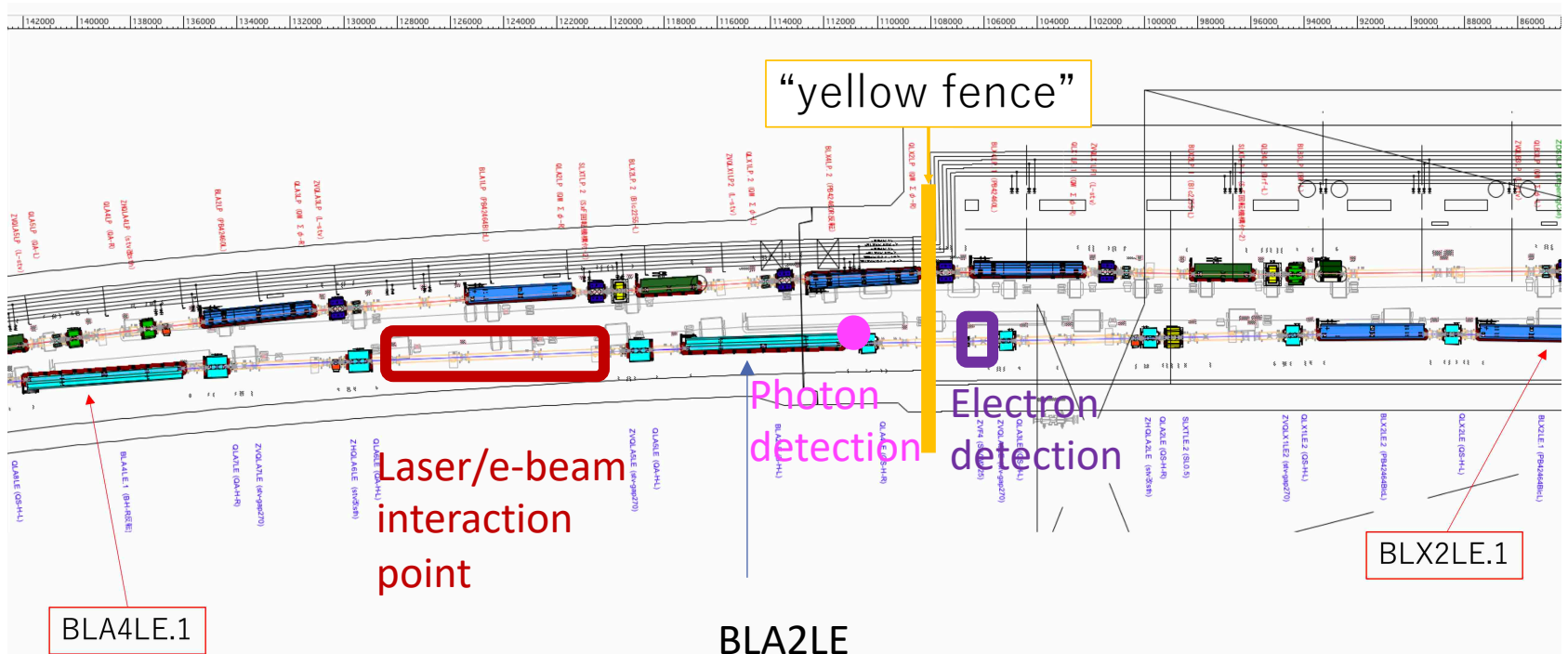
Beam sizes and spin projection in z



BLA2LE/BLX2LE.2

Ideal in terms of spin projection on the longitudinal axis:

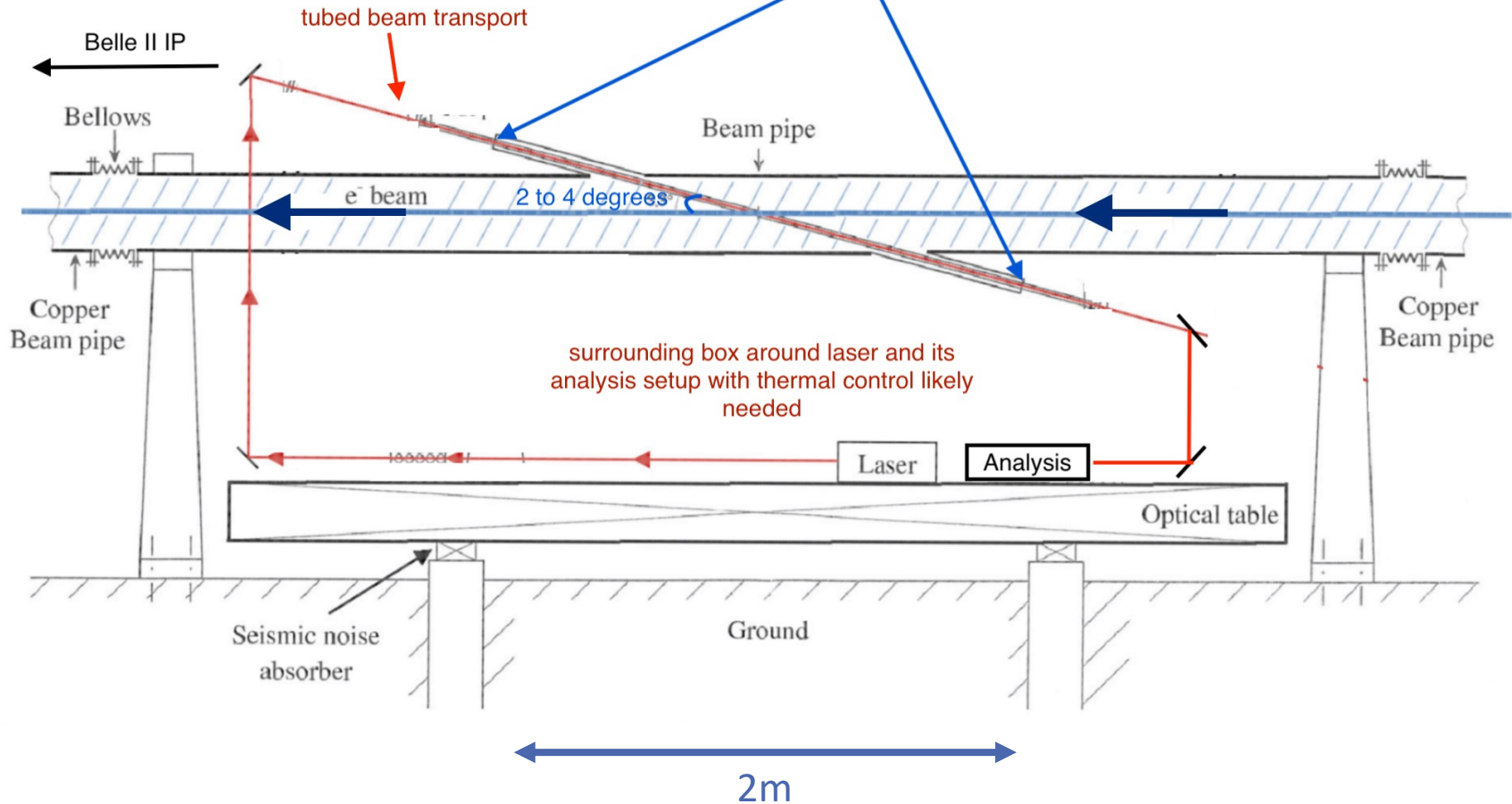
- 99%/85% of the value at IP if interaction before BLA2LE or BLX2LE.2
- Not so busy area



Beam pipe for interaction chamber

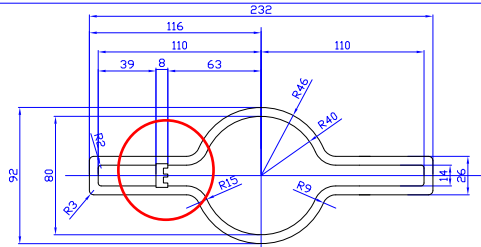
Fused silica ?
10mm diameter ?
optical windows

Assumed vertical crossing.

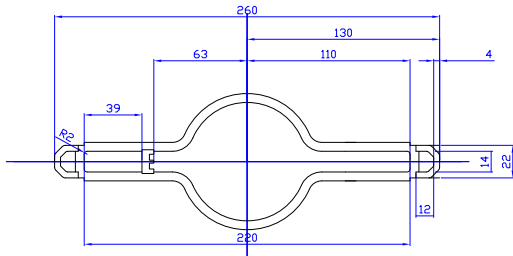


Influence of beam impedance → see Demin's presentation

Gamma-beam detector



Pumping port on opposite side of SR 1m length every 4mm



HER LC f80x220 Cross Section

Need to have a $\sim 25\text{mm}$ diameter window to let the gamma beam go through on one side (assumed compton IP 12m upstream)

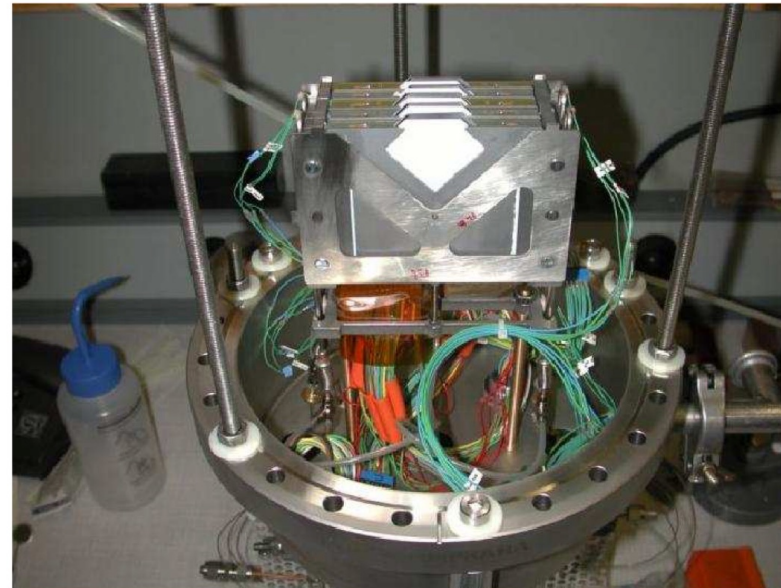
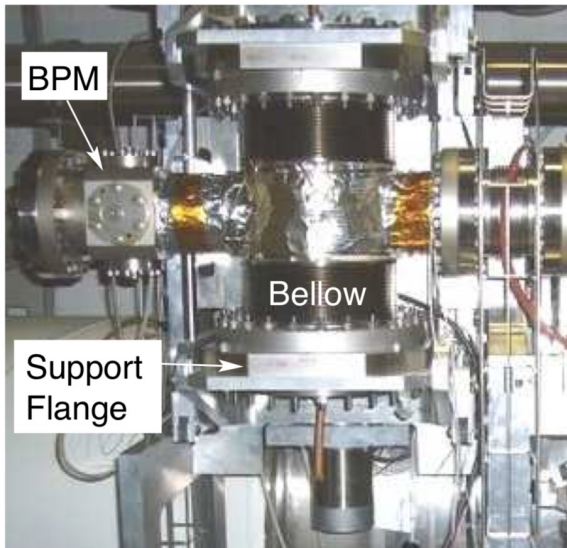
→ Size can be reduced by reducing distance to compton IP

→ Material and thickness to be discussed

Magnet modifications are required to let gamma beam go through...



Electron detector location



The pot together with the bellow creates a resonant RF cavity for the beam running along the axis of the Roman Pot. Measurements of the beam coupling impedance have been performed in the lab where a metallic wire was strung through the RP [11]. A vector network analyser generated current pulses to simulate the beam and measured the complex transmission coefficient. The bare RP (without any ferrites mounted) shows several resonances in its longitudinal beam-coupling impedance Z_L . The dominant line at 740 MHz has an impedance of 1.2 k Ω corresponding to a broad-band value $Z/n = 18$ m Ω with $n = f_{\text{resonance}}/f_{\text{LHC}} = 740 \text{ MHz} / 11 \text{ kHz}$. This value was still well below but uncomfortably close to the LHC limit of $Z/n = 0.1 \Omega$. However, a 2 mm thin collar of ferrites fixed on the external wall of the pot insertion (figure 4.4, left) removes all the resonances within the frequency domain relevant for the LHC, i.e. 0 – 1.5 GHz.

Need to have a first sketch of the chamber to assess impact on beam impedance

Conclusion

- Rough design of laser interaction point need validation in terms of beam impedance (see Demin's presentation)
- Sketch of electron detector chamber required to iterate on design to reduce potential effect on beam impedance
- These informations have been updated in the WhiteReport polarimeter document
<https://www.overleaf.com/9326578811gbpzcdnprnyv>