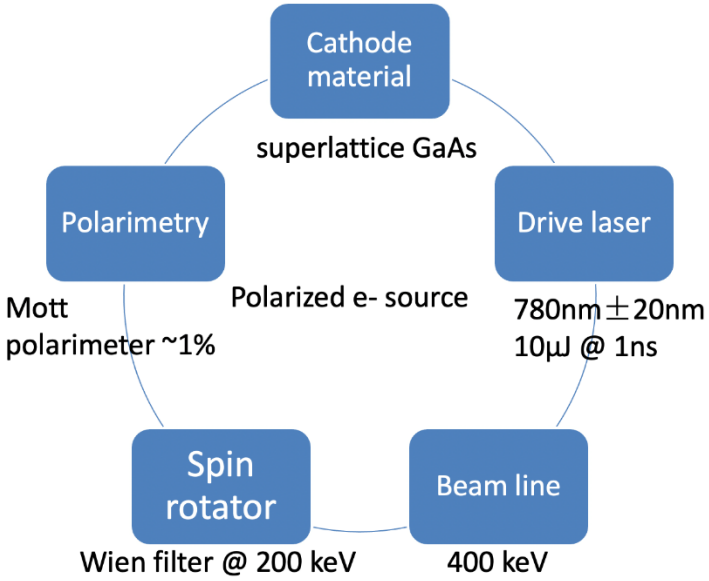
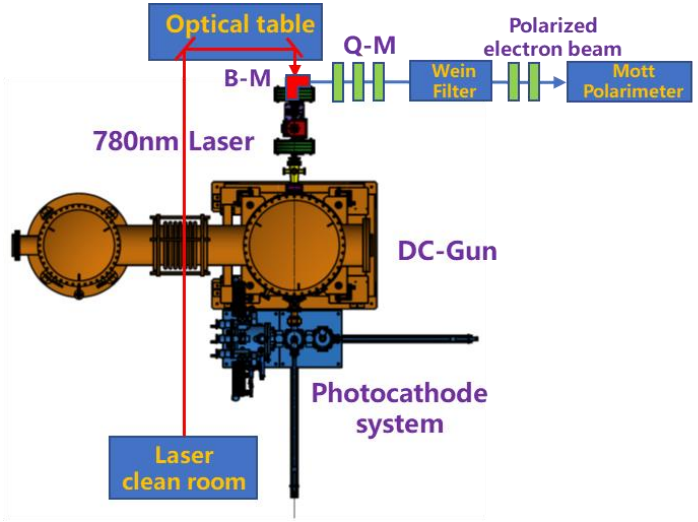
Polarized electron source R&D @IHEP

Polarized electron source R&D for CEPC at IHEP

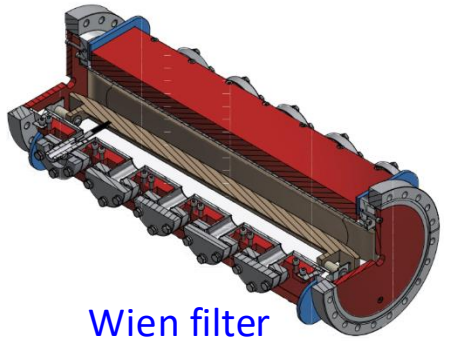
- Research goals: Generation of electron beams with high bunch charge (≥1nC) and high polarization (≥85%)
- Based on a photocathode DC gun already developed by IHEP with an extremely high vacuum (10^{-10}Pa)
- Beam line setup and design of key components such as Wien filter and Mott polarimeter has been carried out
- Expect beam commissioning scheduled in 2027



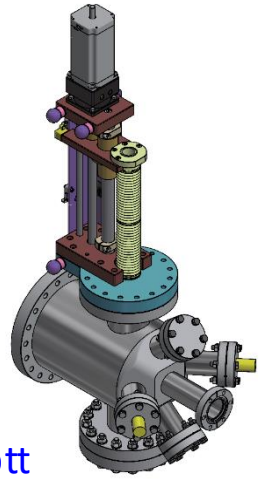
A photocathode DC gun @IHEP



Scheme of PES R&D based on DC gun



Wien filter



Mott polarimeter

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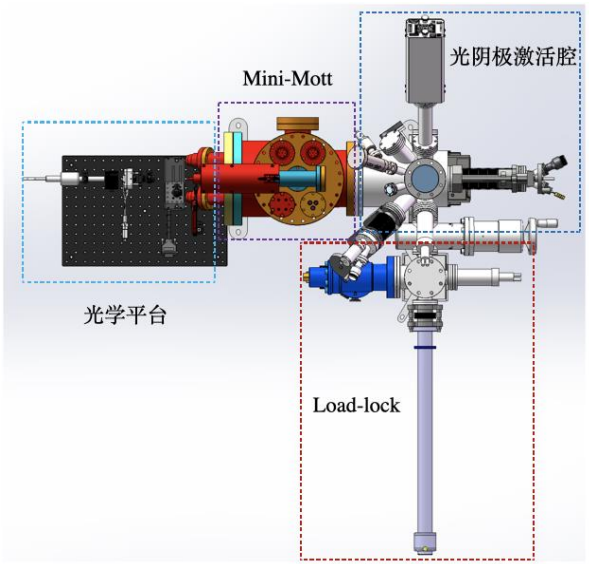
Domestic R&D on the superlattice GaAs cathode

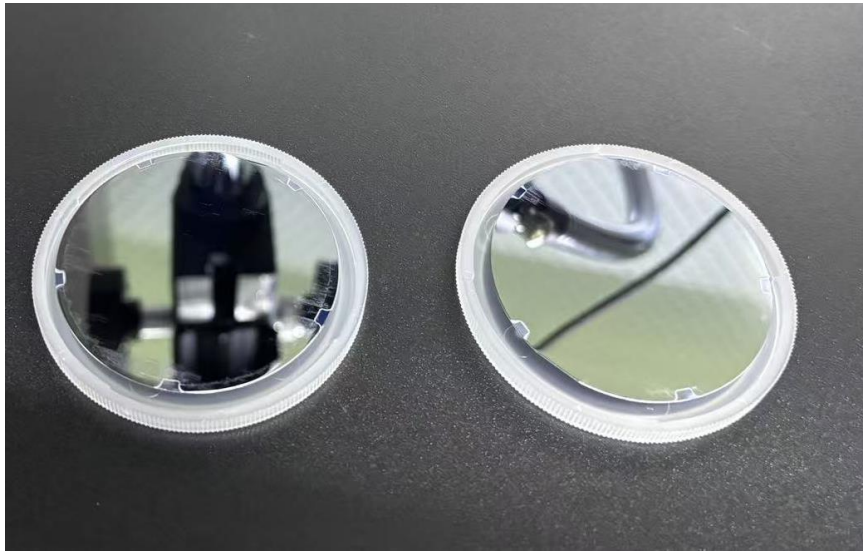
- Since the beginning of this year, we have been starting the R&D of the most important part for PES: Photocathodes
- In collaboration with a domestic company Acken Optoelectronics Ltd. @ Suzhou
- Superlattice GaAs photocathode will be produced by MBE: Polarization **> 85%**, QE > **1%**
- Build a platform for photocathode performance test (both pol & QE), this platform has been designed and is currently under development
- The first photocathodes have been produced and will be tested soon

GaAs	5 nm	$p=5\times10^{19}$ cm^{-3}
GaAs/GaAsP SL	(4/3 nm) ×14	$p=5\times10^{17}$ cm^{-3}
$GaAsP_{0.35}$	2750 nm	$p=5\times10^{18}$ cm^{-3}
Graded $GaAsP_x$ (x = 0~0.35)	5000 nm	$p=5\times10^{18}$ cm^{-3}
GaAs buffer	200 nm	$p=2\times10^{18}$ cm^{-3}
p-GaAs substrate ($p>10^{18}$ cm^{-3})		

Structure of Superlattice layers



Platform for cathode test: ESP & QE



Samples of superlattice GaAs/GaAsP