Hollow Electron Beam Profile in RHIC

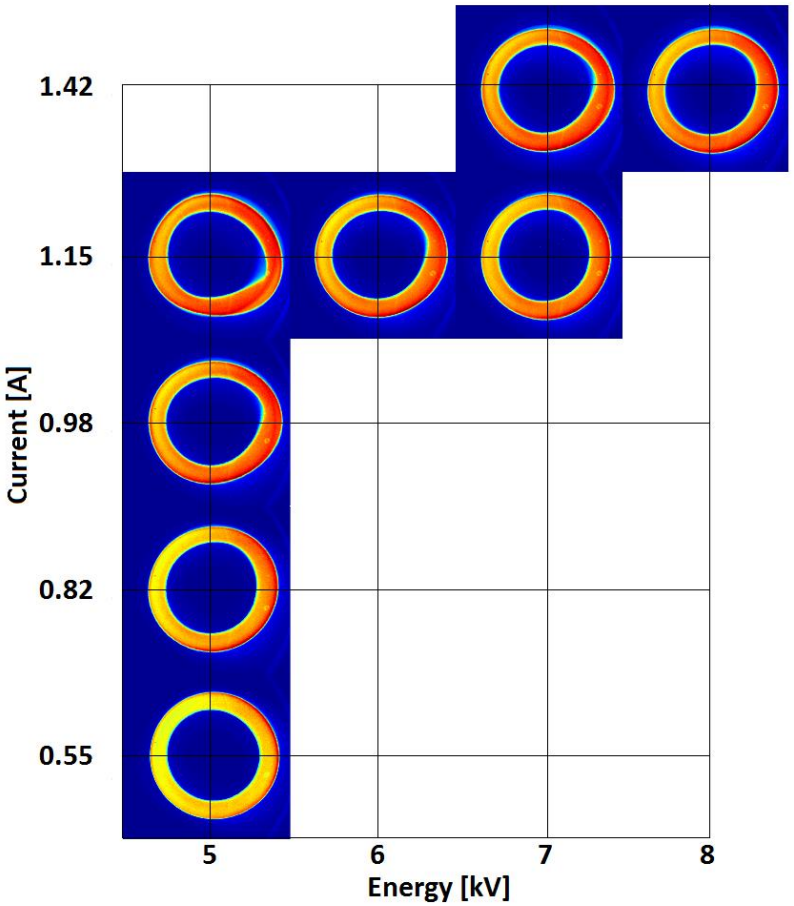
Xiaofeng Gu, Wolfram Fischer

BROOKHAVEN NATIONAL LABORATORY

a passion for discovery

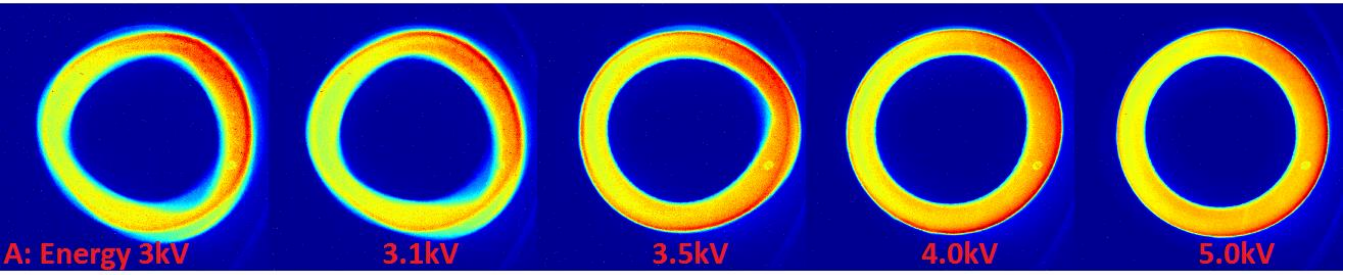
Office of Science
U.S. DEPARTMENT OF ENERGY

Beam Energy and Diocotron Instability

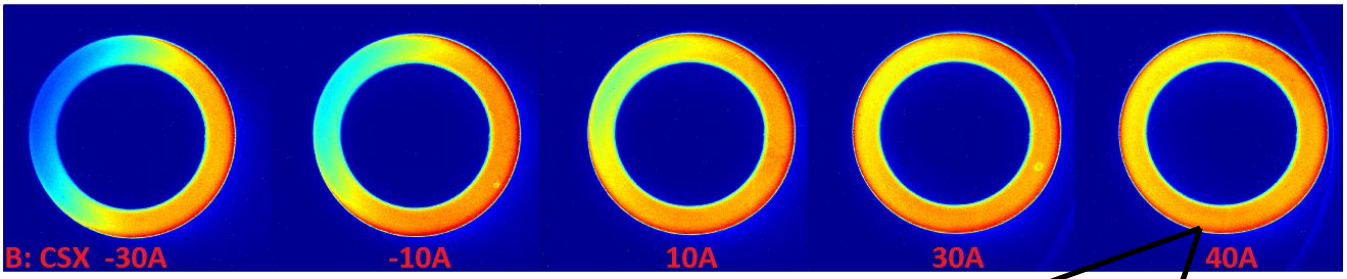


A The hollow e-bema diocotron instability can be reduced by increasing beam energy.

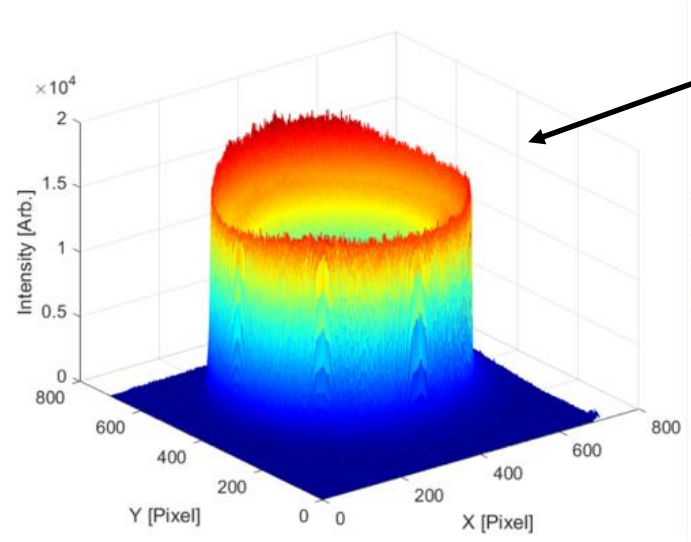
Asymmetry of Hollow Beam

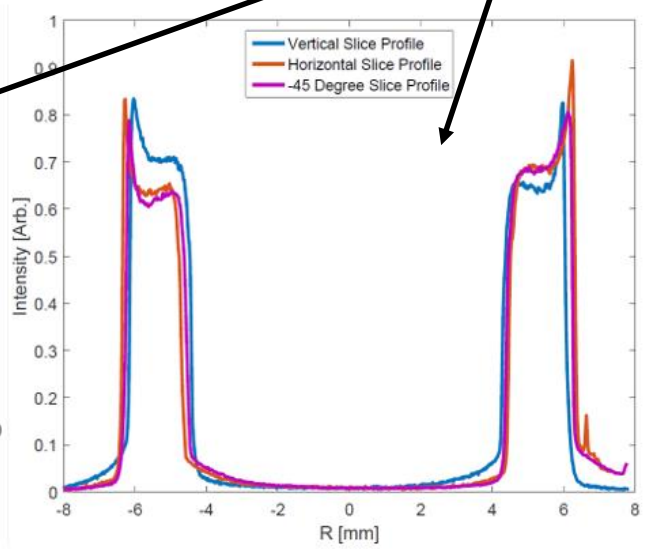


A same as previous slide



B Asymmetry becomes better after moving beam Horizontally.





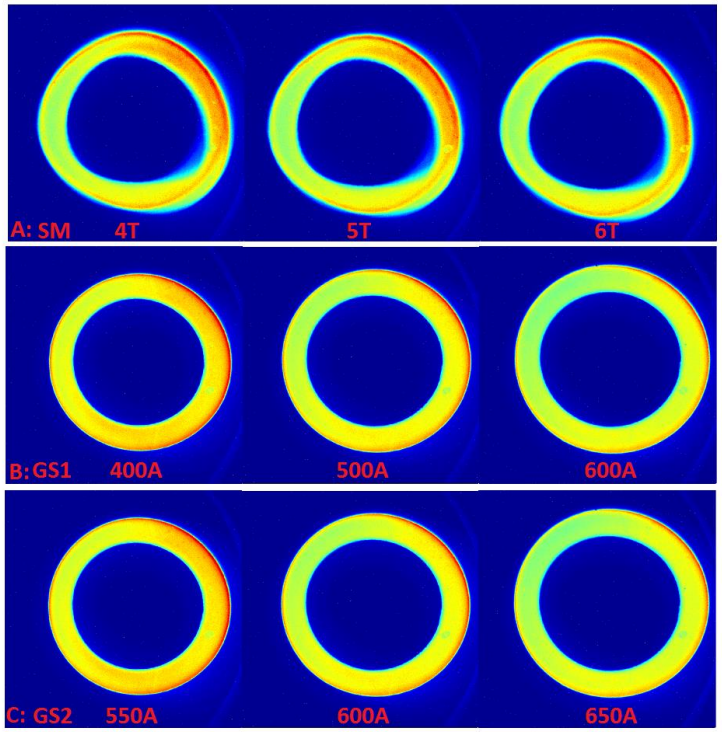
To find better symmetry beam, will move GSX (gun side) when have e-beam again.

Magnetic Field and Diocotron Instability

For the magnetic field effect, after conbine Eq. 1 and Eq. 8, one can find that the temporal evolution frequency and instability growth rate can be re-written as:

$$\omega \propto n_{cathode}(r)/B_{cathode} \quad (8)$$

$$\gamma \propto n_{cathode}(r)/B_{cathode} \quad (9)$$



C-1 e-beam current and cathode field are two factors for diocotron instability development, besides beam inner-out radius and vacuum pipe radius.

Seems the superconducting field doesn't affect instability: demonstrates C-1 indirectly?

Cathode field is too higher to demonstrate C-1. Will repeat is again.

No instability to repeat the demonstration.

Hollow Beam Simulation Plan

It is planned to do some simulation with CST for the peer-view paper about hollow e-lens in RHIC.

It is good to collaborate with CERN for the simulation: we can provide magnet geometry and beam geometry.

A Simulation hollow beam with bend region.

B Simulation hollow beam with bend region and with off-set to beam pipe

C Simulation diocotron instability with different current, energy, cathode field and other field.