The Center for BRIGHTBEAMS
A National Science Foundation Science & Technology Center

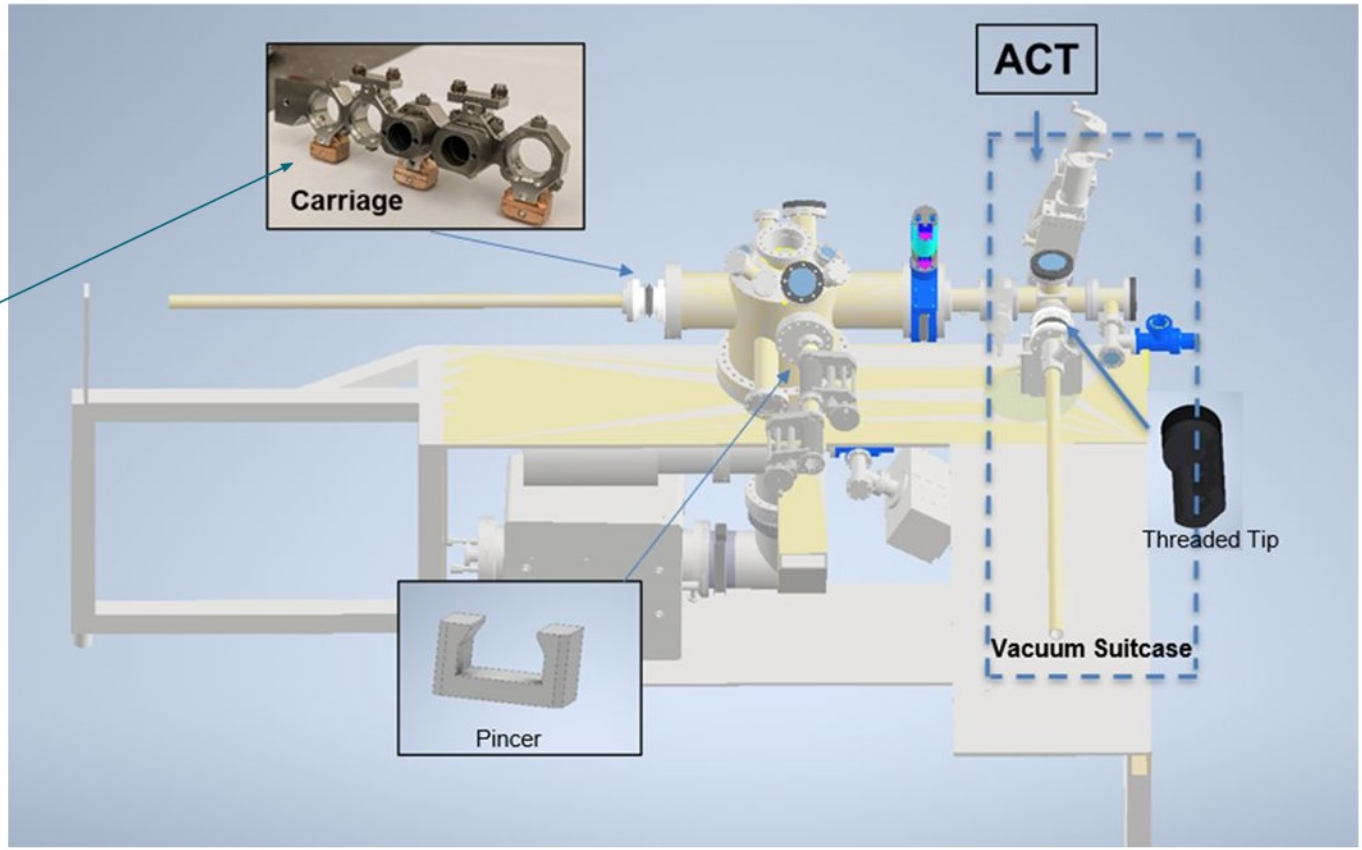
Alkali Antimonide Photocathodes Testing and Characterization at Argonne Cathode Test-Stand (ACT)

Tariqul Hasan

Supervisor: Oksana Chubenko

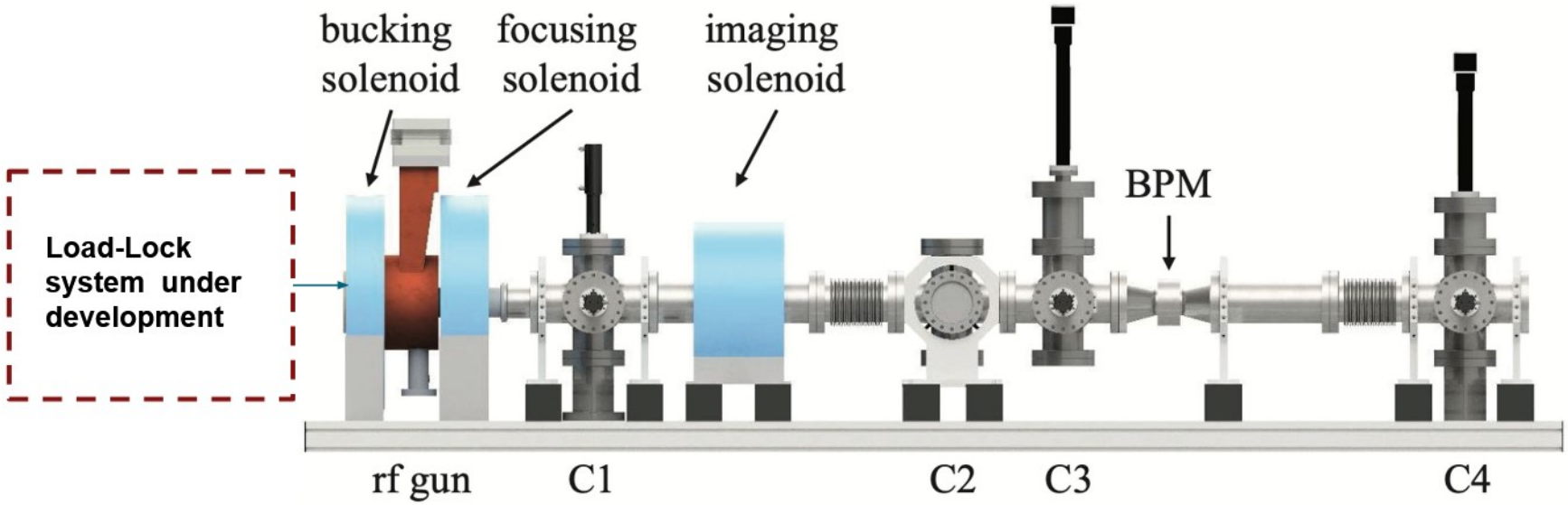
NIU Growth Chamber and Load-Lock System

INFN Plug



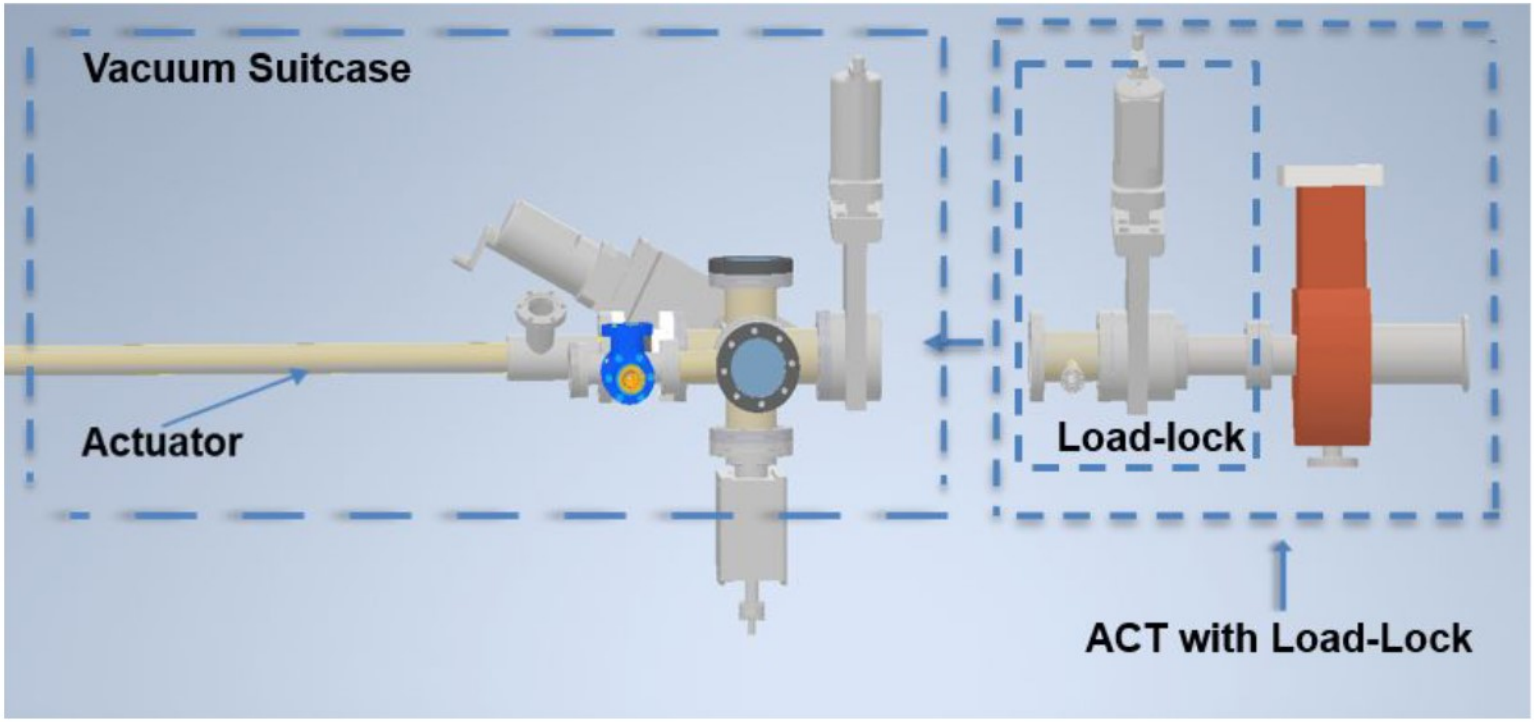
Argonne Cathode Test-stand (ACT)

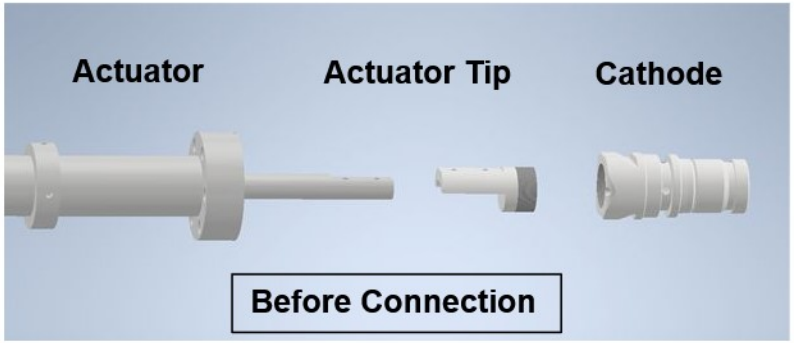
- L-band normal-conducting high gradient single-cell rf gun.
- unique imaging system to precisely locate emitters on surface with a resolution of 20 um.
- Depending on cathode shape, a cathode electric field up to 700 MV/m is achievable for emission study.
- Various cathode properties, such as emission current, current density, uniformity, quantum efficiency, emittance, lifetime, could be characterized with well-developed diagnostics.
- Flexible running schedule

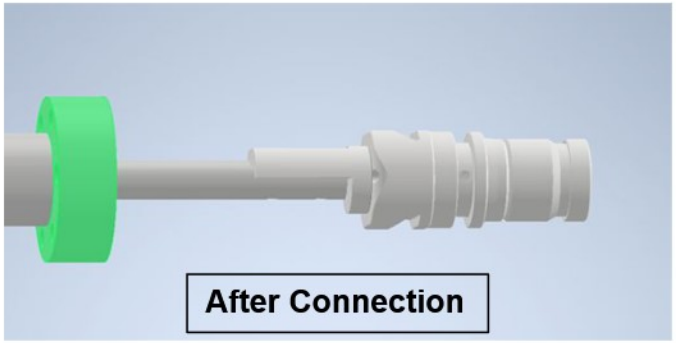


- The Load-lock system is under development.
- The pumping system will be updated to reach 10^{-10} Torr pressure.

Plug Insertion into the Gun







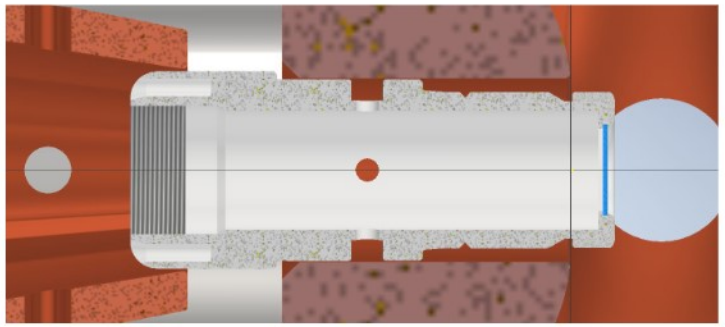
Plug Modification

- Old INFN style plug was used in the NIU growth chamber.
- ACT used air-stable Cu made plug.
- A new plug design has been developed which is compatible with both facilities and allow us to grow photocathodes on lattice matched semiconductor substrates.

INFN Plug

ACT Cu Plug

Modified Plug



Modified plug in the ACT gun

Future work

- Currently, working on RF simulation of the fields inside the gun for newly designed geometry of the plug.
- Once satisfactory field maps are obtained, those will be used for beam simulation to estimate various beam properties such as emittance and the plug design will be finalized.
- After the finalized plug is machined, the photocathode will be grown, and first test will be performed.