



Advanced Energy Systems, Inc.

A Polarized SRF Gun for ILC

D. Holmes, H. Bluem, T. Schultheiss

Advanced Energy Systems, Inc., Medford NY USA

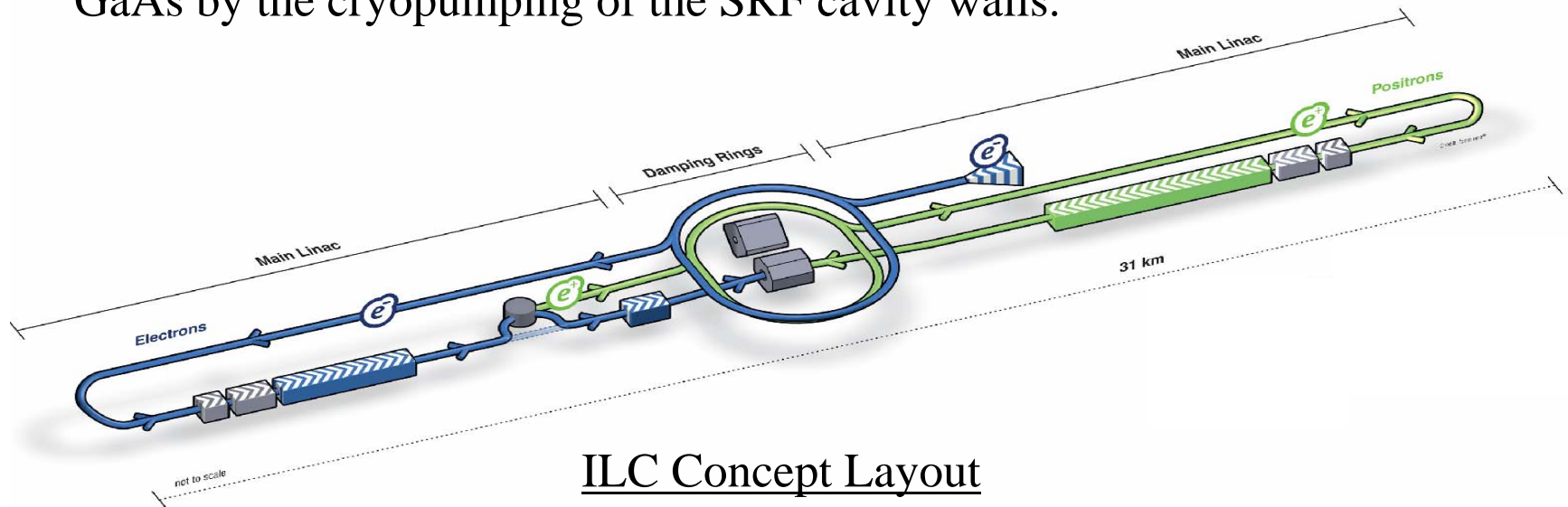
J. Kewisch, I. Ben-Zvi, A. Burrill, D. Pate, T. Rao, R. Todd

Brookhaven National Laboratory, Upton NY USA

Opportunity

Advanced Energy Systems, Inc.

- To date only DC guns have been used to provide polarized electron beams because of the high vacuum required for Gallium Arsenide (GaAs) cathode material.
- An RF gun capable of producing polarized electron beams may eliminate the need for the electron beam emittance damping ring planned for the International Linear Collider (ILC).
- A Superconducting RF gun cavity may provide the vacuum required for GaAs by the cryopumping of the SRF cavity walls.



ILC Concept Layout

SBIR Work Plans



Advanced Energy Systems, Inc.

- Design and manufacture hardware in support of experiments to process and test cesiated GaAs cathode material in an SRF gun environment.
- Develop conceptual design of a SRF gun/cathode system that incorporates a solenoid magnetic field on the GaAs cathode that would allow the generation of a flat beam (transverse).

Experiment Setup Hardware



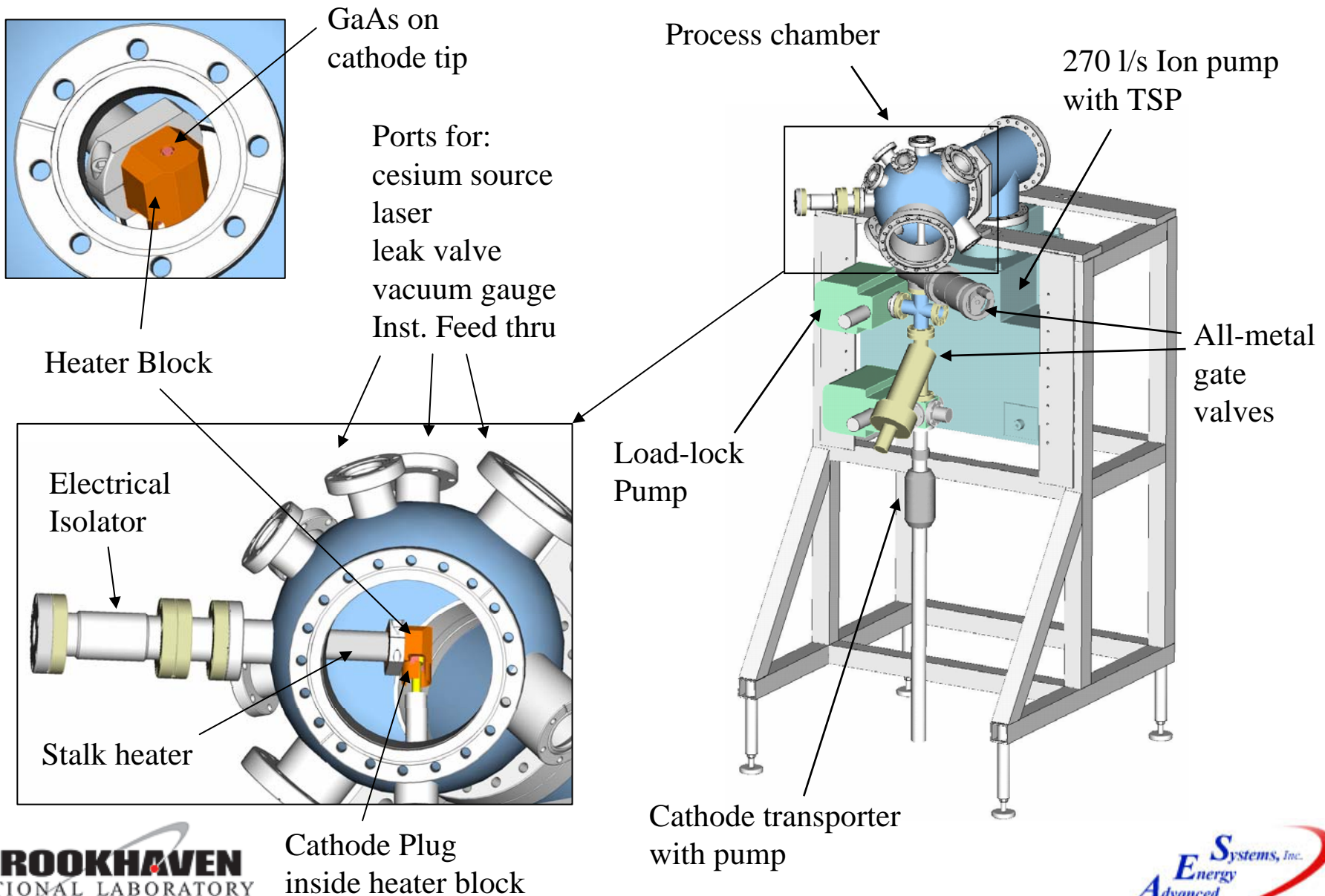
Advanced Energy Systems, Inc.

- Gallium Arsenide cathode process system
 - GaAs cathode heating
 - GaAs cathode cesiation
 - In-situ quantum efficiency measurement
 - 10^{-11} scale vacuum
- Cathode transport system
 - Magnetically coupled motion feed through
 - Load-lock capabilities with process system and SRF cavity
 - Detachable cathode arrangement
- SRF cavity
 - 1.3 GHZ cavity with receptacle for cathode plug insertion
 - Cathode clamp mechanism
- Experiment Setup
 - Vertical test dewar
 - Beam pipe with NEG plenum
 - High temperature superconducting solenoid.
 - Bend magnet
 - Beam profiling
 - Faraday cup



Process Chamber System

Advanced Energy Systems, Inc.



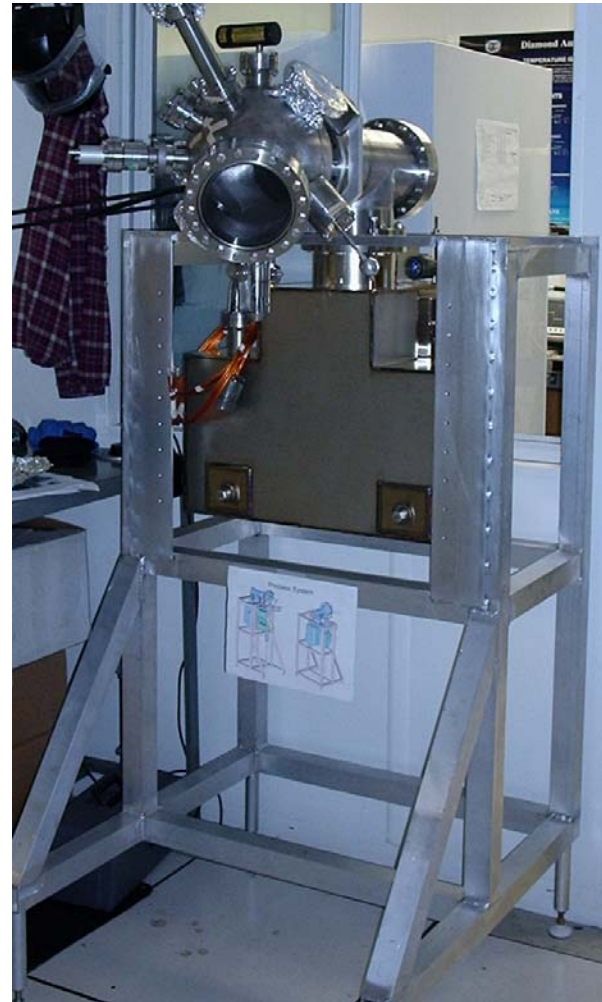
Process Chamber System



Advanced Energy Systems, Inc.



Magnetically Coupled Transporter
and Valve

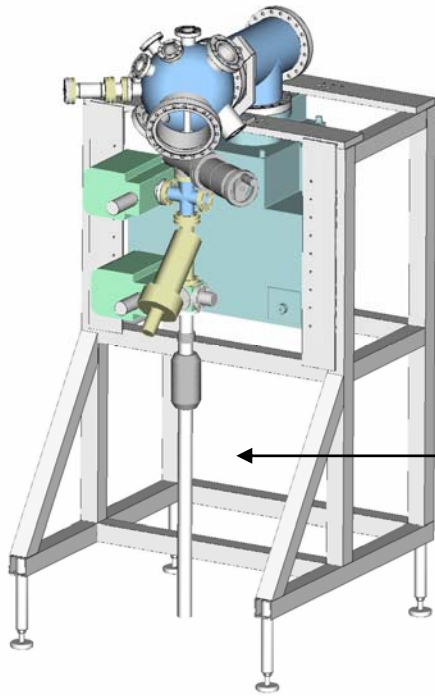


Process System

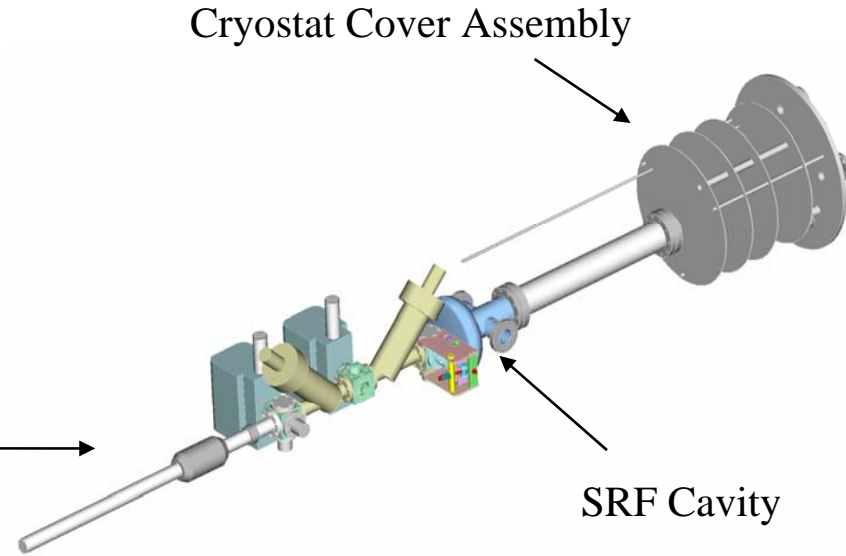
Cathode Transport



Advanced Energy Systems, Inc.



Cathode transporter coupled with process chamber



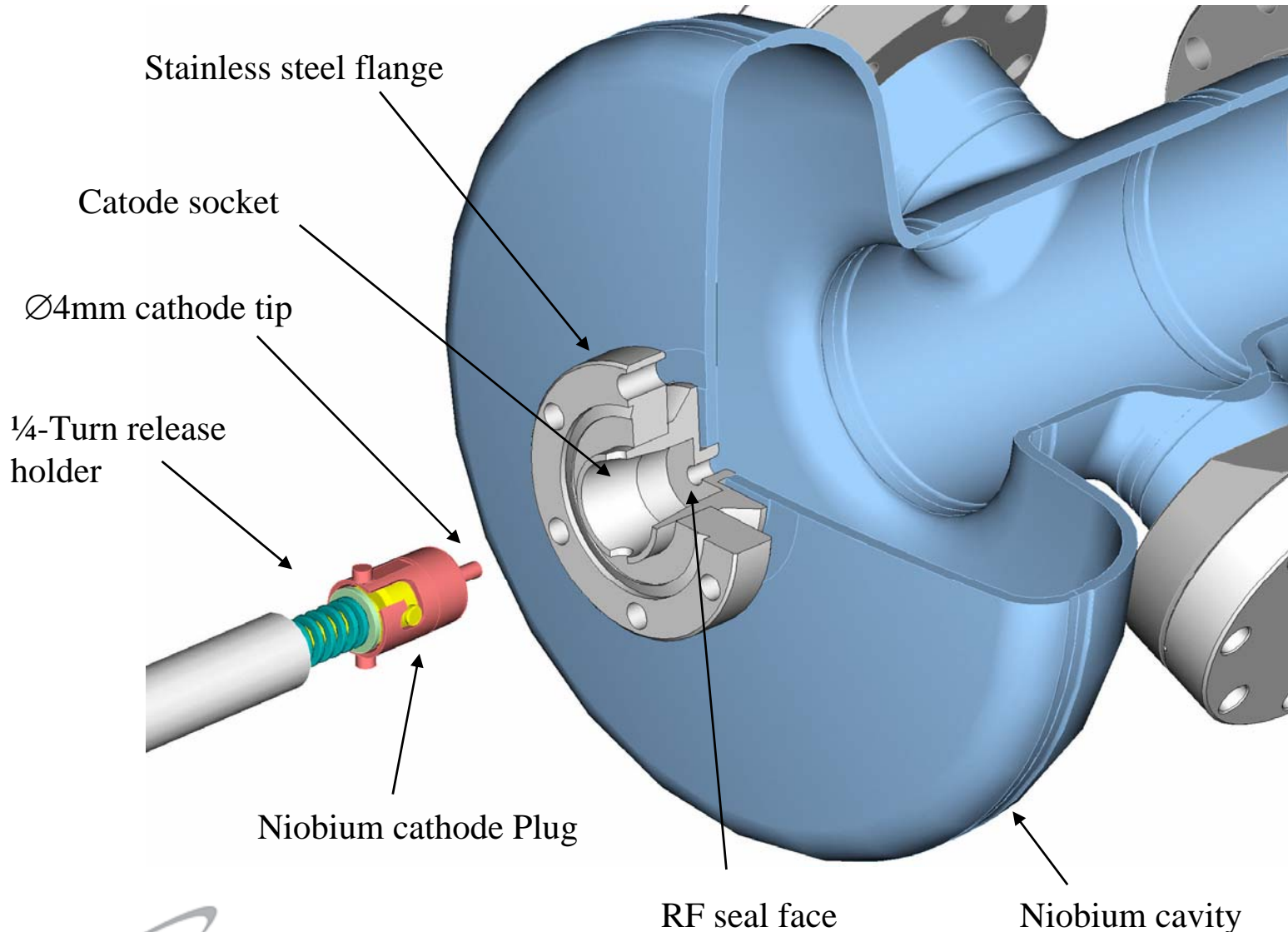
Cathode transporter coupled with cavity hermetic string



Transporter hardware (ion pump not shown)

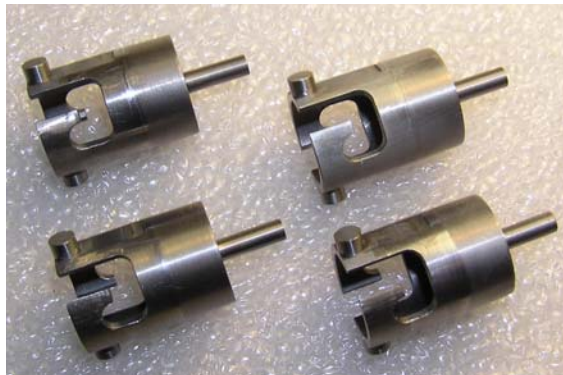
Cathode Plug Arrangement

Advanced Energy Systems, Inc.



Cavity Configuration

Advanced Energy Systems, Inc.



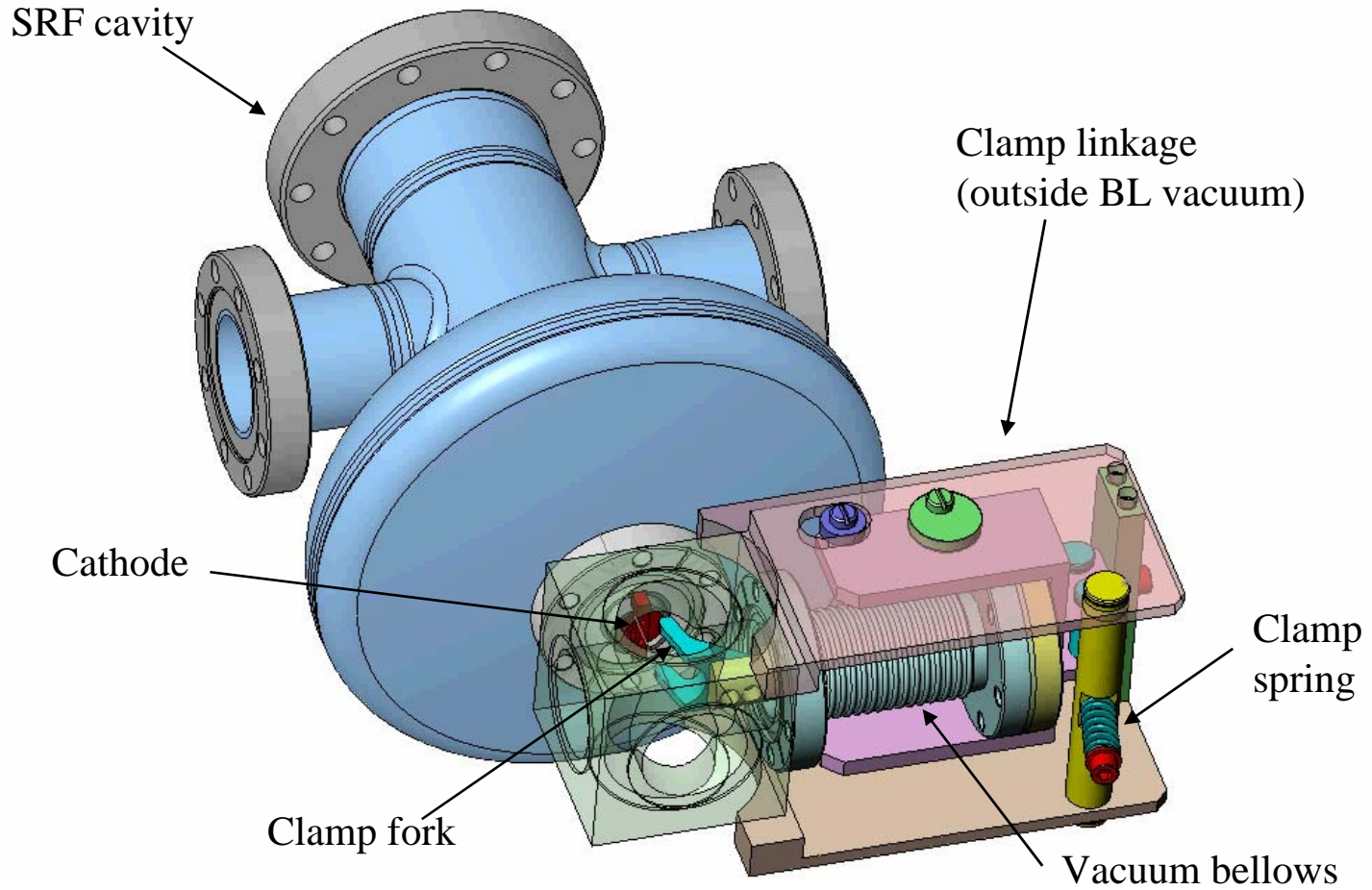
Cathode Plugs



Cavity Assembly

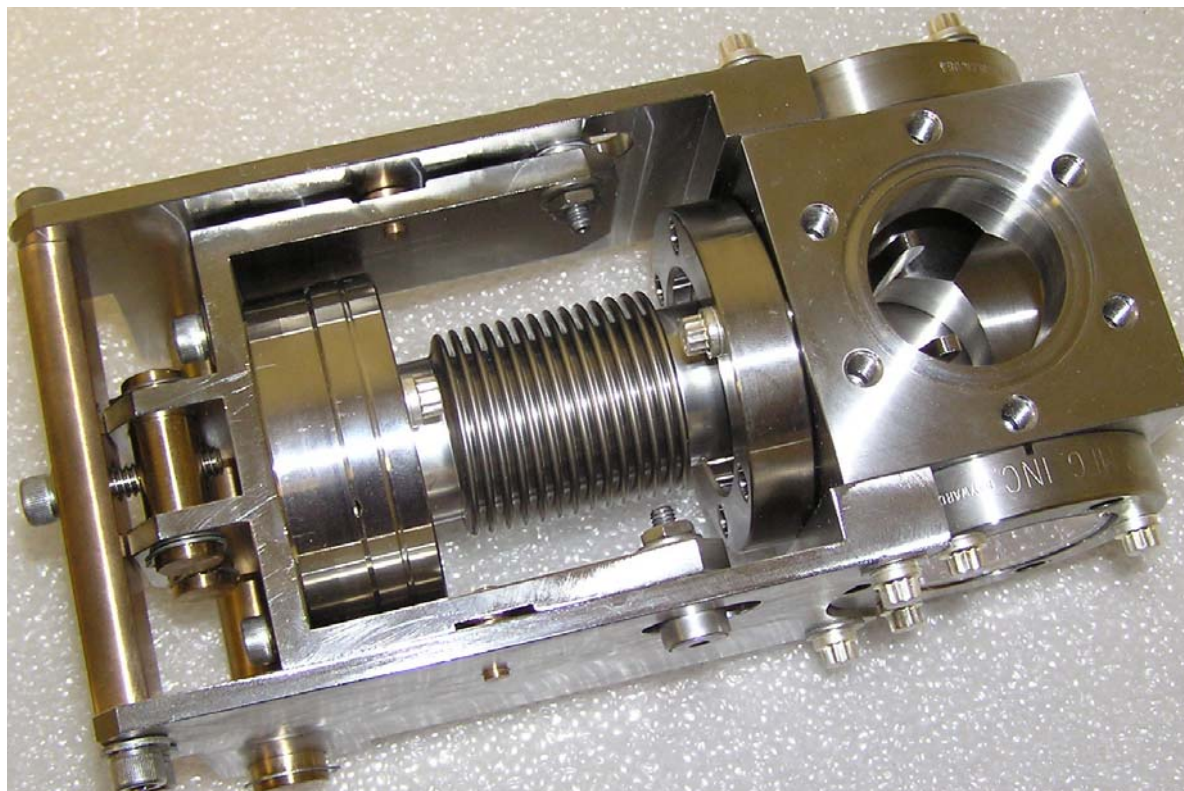
Cathode Clamp Arrangement

Advanced Energy Systems, Inc.



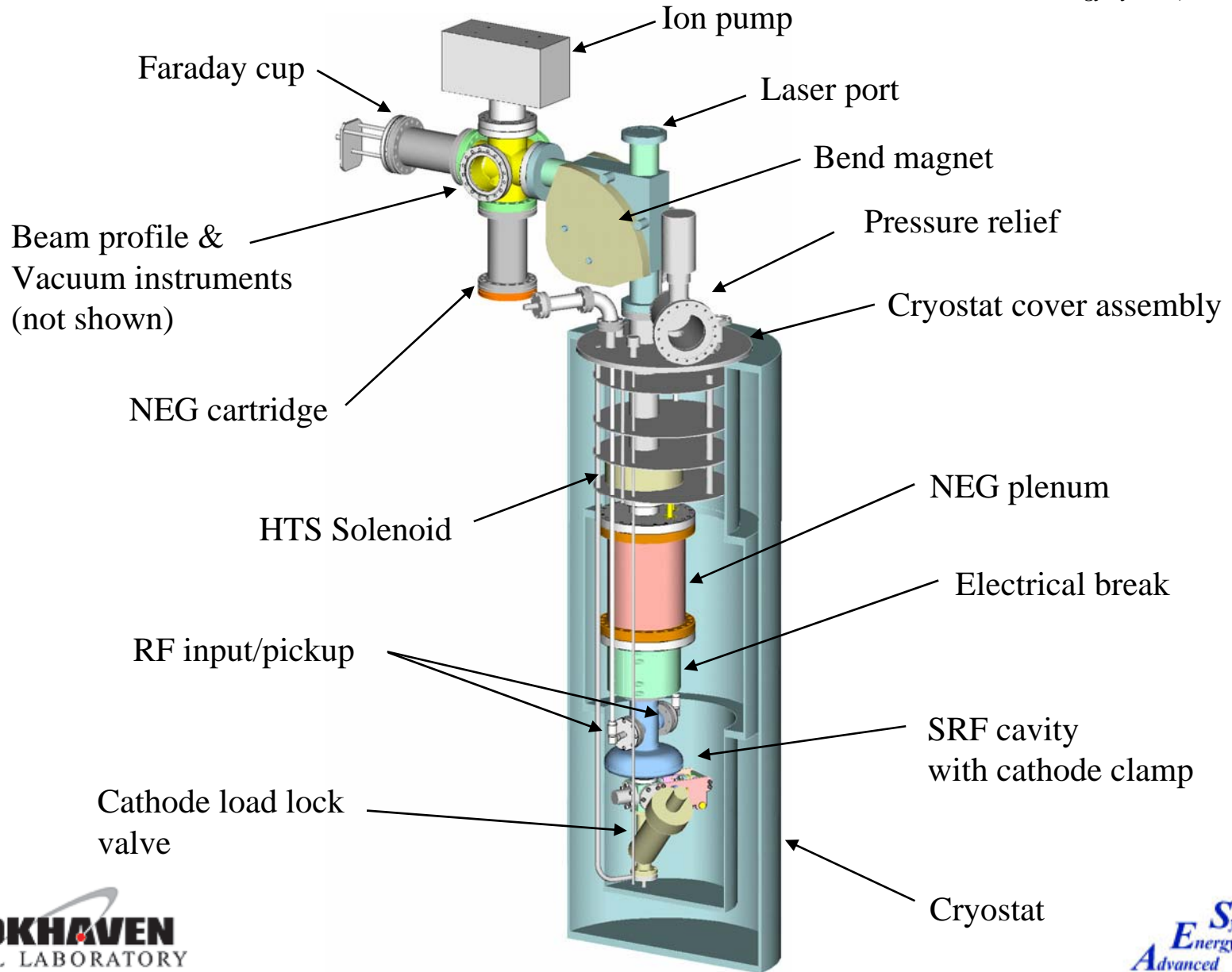
Cathode Clamp

Advanced Energy Systems, Inc.



Experiment Arrangement

Advanced Energy Systems, Inc.



Experiment Hardware



Advanced Energy Systems, Inc.



Dewar



1st Hermetic Assembly



HTS Solenoid

Experiment Status



Advanced Energy Systems, Inc.

- Design work of process chamber system, cathode transporter, and SRF cavity experiment setup is complete
- Much of the hardware fabrication is complete
- Assembly of process system and experiment setup has begun
- Initial tests of gun without cathode completed
- Work to continue to support tests in FY09