



**THE UCLA ACTIVITIES ON  
BLANKET R&D**

Presented to

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Annual IPFR Guest Lecturer

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## UCLA Fusion Technology Group

### CURRENT ACTIVITIES

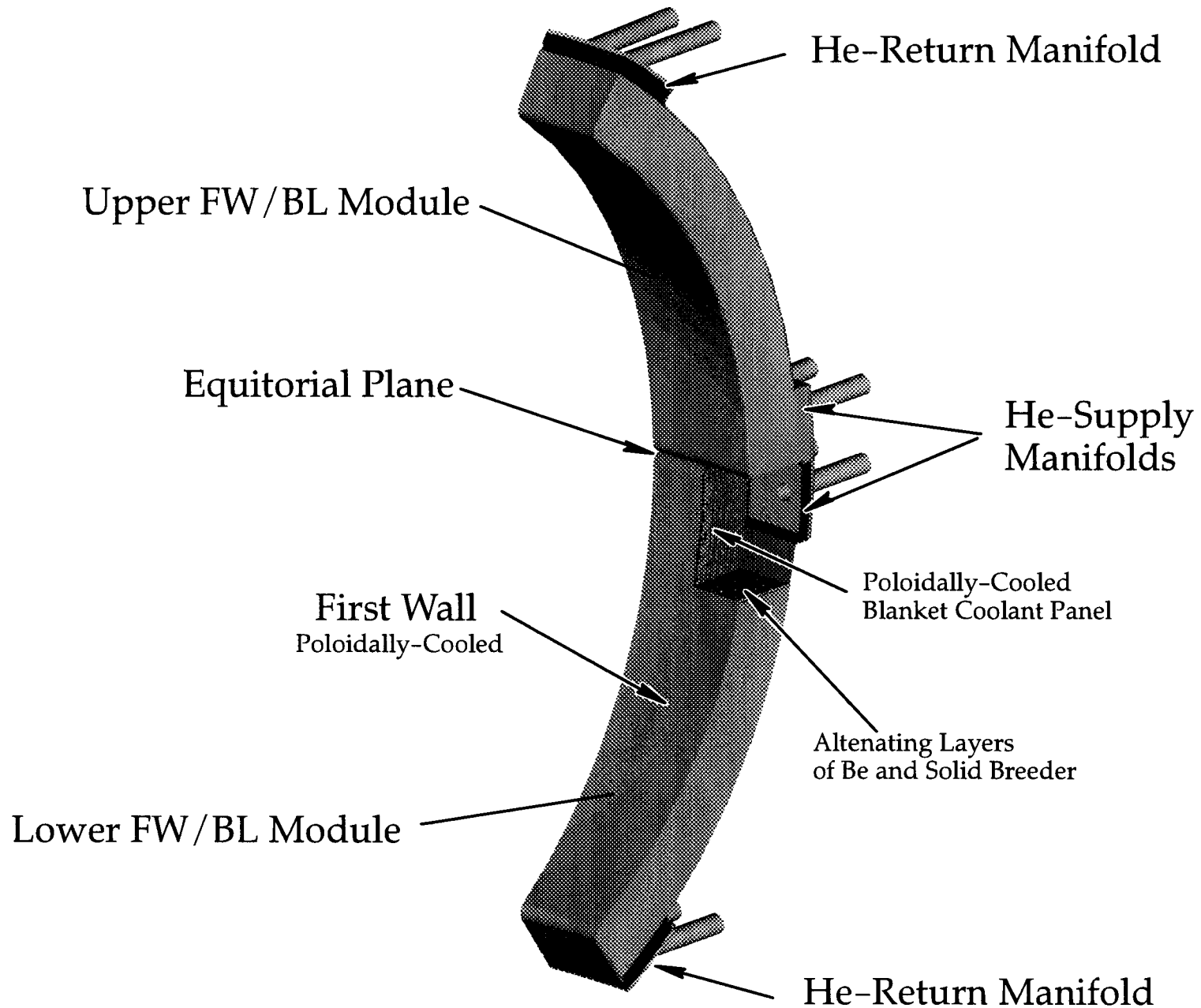
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- Design
- Tritium Fuel Cycle Dynamic Modeling
- Solid Breeder Blanket
- Liquid Metal Blanket
- Neutronics
- Blanket Safety

UCLA has a major role in Solid Breeder Blanket Design and R&D,  
Tritium Modeling, and Neutronics R&D.

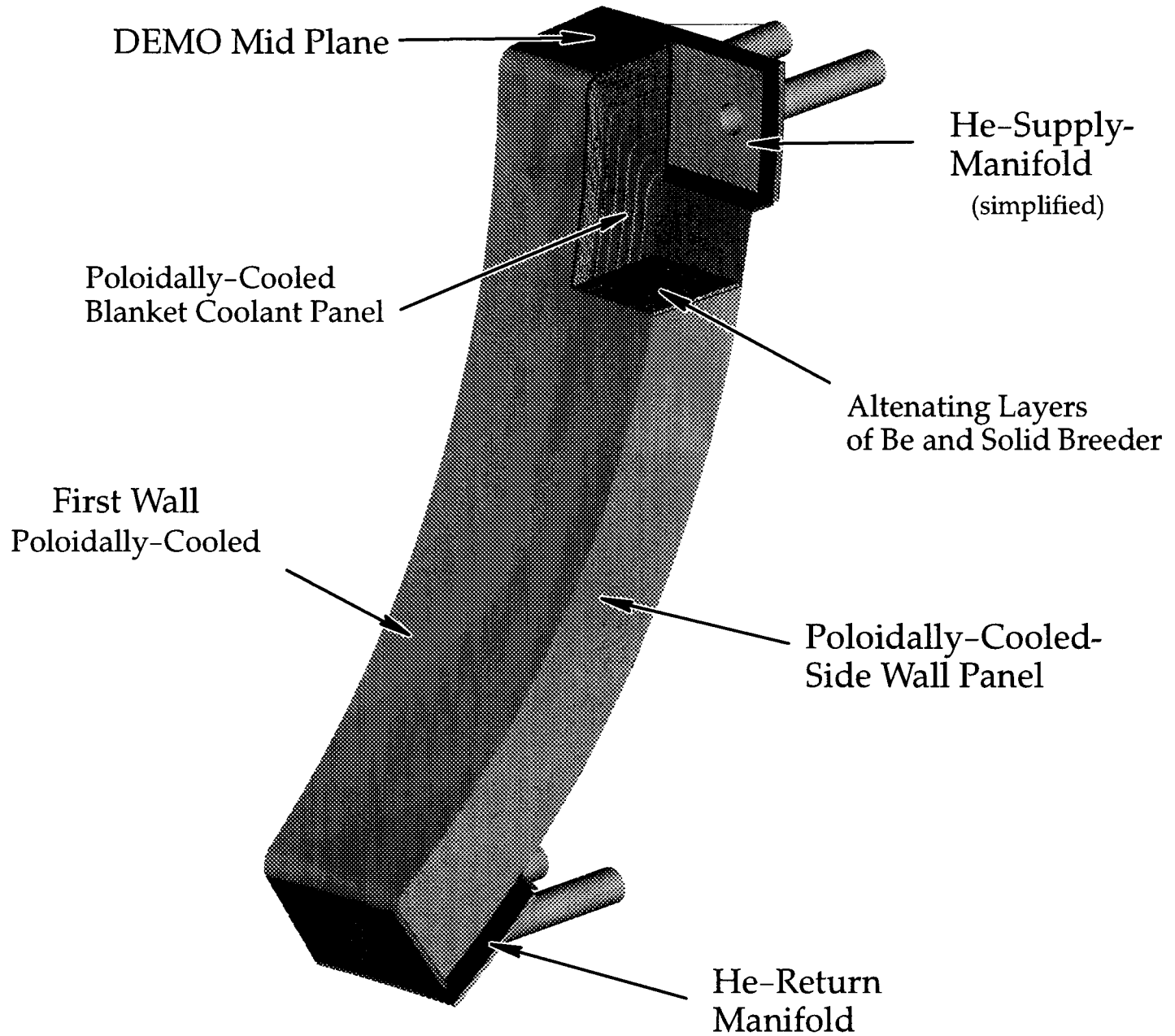
# U.S. DEMO He-Cooled Solid Breeder Reference Blanket

## View of One Complete First-Wall/Blanket Segment



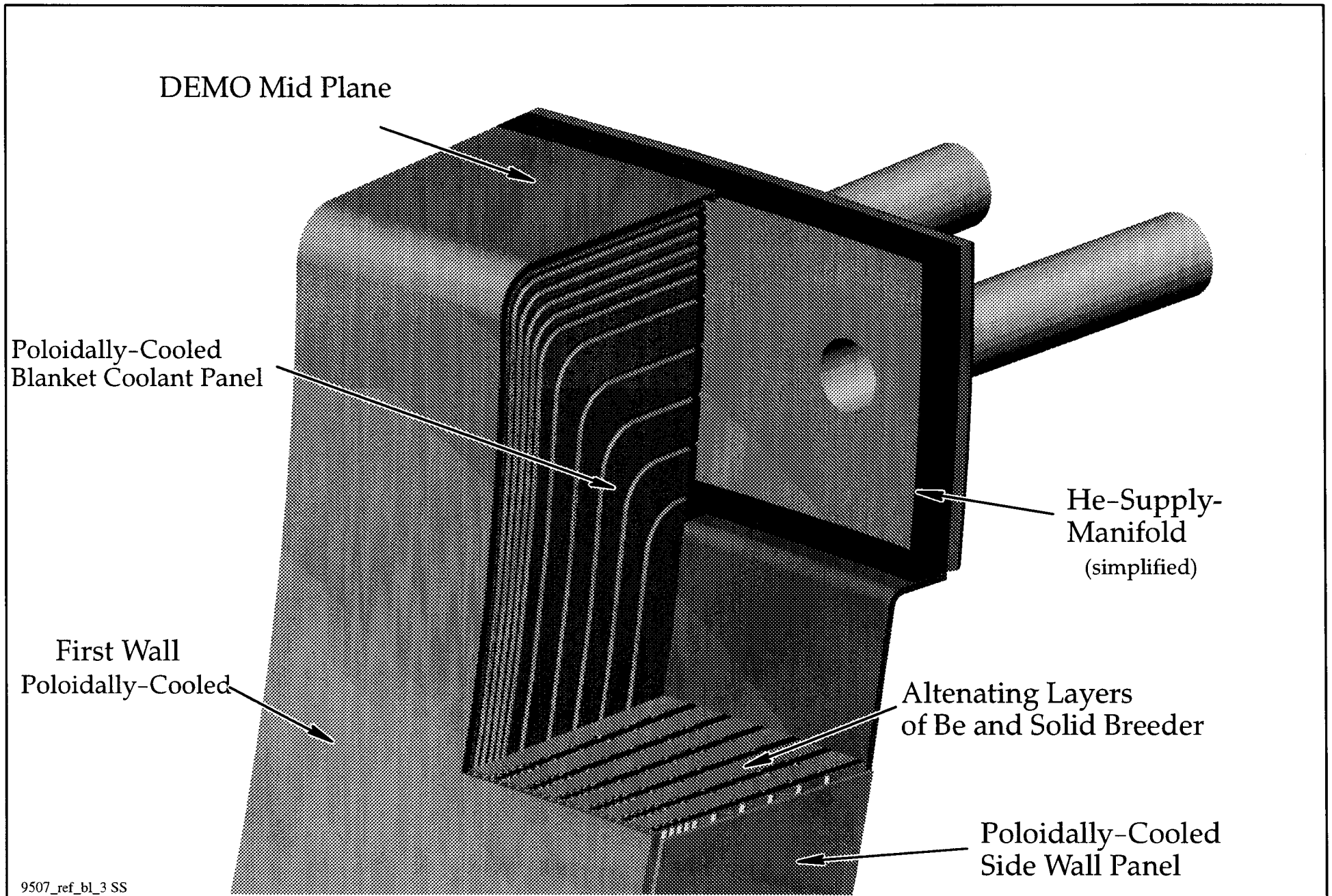
# U.S. DEMO He-Cooled Solid Breeder Reference Blanket

## View of One Lower First-Wall/Blanket Segment



# U.S. DEMO He-Cooled Solid Breeder Reference Blanket

## Cutout View of One Lower First-Wall/Blanket Segment



## Thermomechanics of Solid Breeder Blankets: Experiments, Modeling, and Analysis (UCLA)

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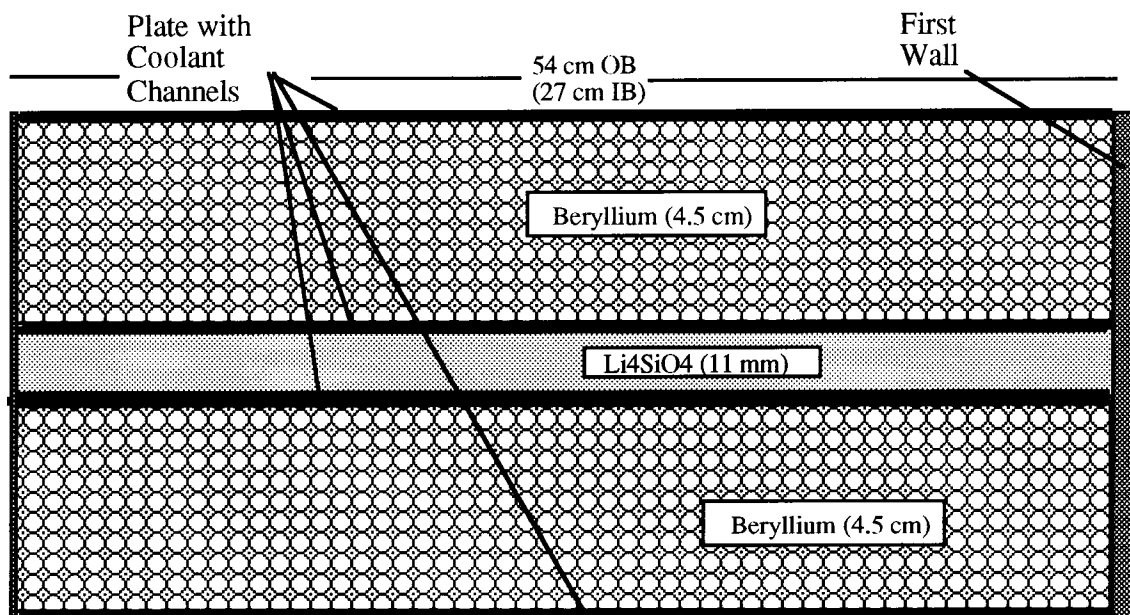
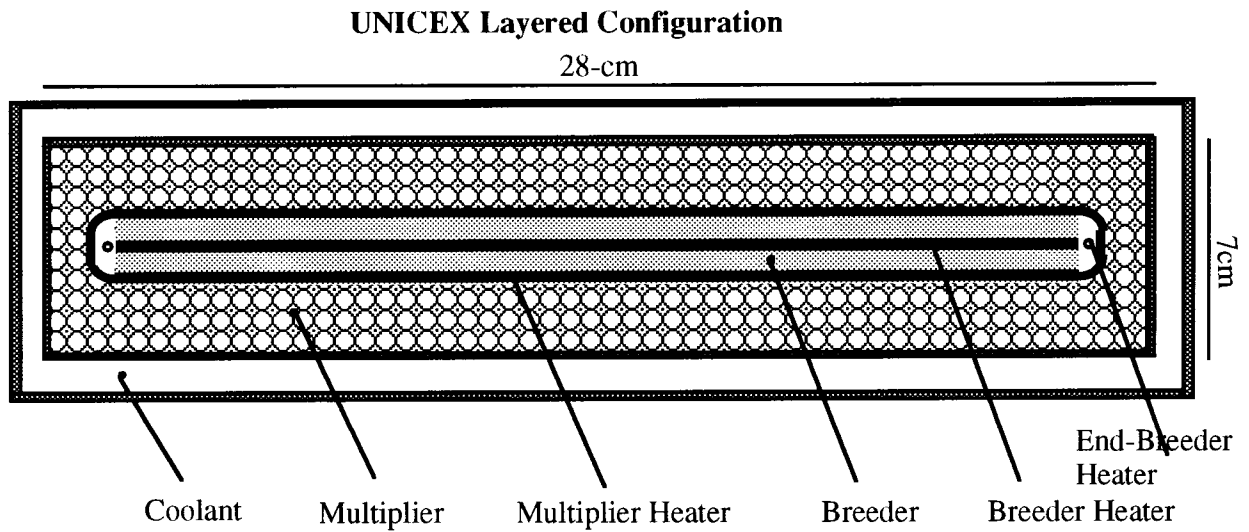
### PARTICLE BED HEAT TRANSFER EXPERIMENTS AND MODELING

Experiment	Description	Issues	Comments
<b>PBX</b>	Pebble Bed Heat Transfer Experiment at Low Temperature	<ul style="list-style-type: none"> <li>• Gas Phase Control</li> <li>• Effective Bulk Conductivity</li> <li>• Wall Conductance</li> <li>• Pressure Drop</li> </ul>	Basic Properties
<b>ICE</b>	Interface Conductance Experiment	<ul style="list-style-type: none"> <li>• Be With Surface Roughness</li> <li>• High Contact Pressure</li> <li>• Variable Heat Flux</li> <li>• Control of Gas Phase</li> </ul>	Basic Properties
<b>HTBX</b>	Pebble Bed Heat Transfer at High Temperature	<ul style="list-style-type: none"> <li>• Mechanical Response to Thermal Expansion</li> <li>• Effect of Mechanical Constraints on Heat Transfer</li> </ul>	Basic Properties & Separate Effects
<b>HiTeC</b>	High Temperature Cyclic Heat Transfer in Prototypic Solid-Breeder Blanket Geometry	<ul style="list-style-type: none"> <li>• Be or Ceramic Pebble Beds</li> <li>• Independent Control of Temperature and Gradient</li> <li>• Bulk Conductivity</li> <li>• Wall Conductance</li> <li>• Effect of Bed or Clad Deformation</li> </ul>	Separate Effects
<b>UNICEX-B</b> <b>UNICEX-S</b> (under design)	Solid Breeder Blanket Unit Cell Experiment	<ul style="list-style-type: none"> <li>• Thermomechanical Interactions</li> <li>• Breeder &amp; Multiplier at Prototypical Conditions</li> <li>• Simulation of Bulk Heating</li> <li>• He Coolant, He purge</li> </ul>	Multiple Effects

UNICEX-B: Packed Bed Experiments

UNICEX-S: Sintered Block Experiments

# Cross Sectional View of the UNICEX SB-Blanket Concept:



**EU-BOT SB-Configuration**