Preliminary design of CIADS cryogenic system

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Introduction

The Accelerator of CIADS (China Initiative Accelerator Driven System) will be built in the nearly future at IMP in China. All the superconducting cavities will be running at 2K. A helium cryogenic system has been designed according to the requirements of the CIADS Accelerator. Total heat load of the cryogenic system is about 3kW at 2K, 1.6kW at 4.5K and 5.8kW at 60K. And the total 4.5K cooling power is 12.84kW. A 15kW/4.5K helium refrigerator is needed.

Cryogenic system design

The preliminary design is considered reasonable by peer reviewers. Engineering design will be finished in the middle of next year.

Heat load

<table>
<thead>
<tr>
<th>Facility</th>
<th>2K</th>
<th>4.5-6K</th>
<th>50-65K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cryomodule</td>
<td>2843</td>
<td>1418</td>
<td>5176</td>
</tr>
<tr>
<td>Valve box</td>
<td>80</td>
<td>80</td>
<td>200</td>
</tr>
<tr>
<td>Transfer line</td>
<td>100</td>
<td>120</td>
<td>395</td>
</tr>
<tr>
<td>Sum</td>
<td>3023</td>
<td>1618</td>
<td>5771</td>
</tr>
<tr>
<td>Heat load /4.5K</td>
<td>12.84kW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.5K equivalent 15kW/4.5K

Flow diagram

J-T Valve + heat exchanger + Sub-atm

Cold compressors

Heat exchanger

J-T Valve

cryomodules

Conclusions

• The preliminary design is considered reasonable by peer reviewers
• Engineering design will be finished in the middle of next year