Detector magnets need to be moved during maintenance. Flexible bus bars prevent disassembly and assembly of these bus bars during each maintenance run.

Maintenance and operation of the cryogenic plant and the power converter is more practical on the surface.

Current leads go from the surface 400 meter down to the detector magnet. Bus bars based on the CORC CICC conductor are lighter and take less space.

Detector magnets need to be moved during maintenance. Flexible bus bars prevent disassembly and assembly of these bus bars during each maintenance run.

In the case of power/refrigerator failure, cold liquid can be stored in the side cavern to cool the CORC bus bars during magnet ramp down.

Several variants of detector magnets are investigated. The stored energy of these magnet systems ranges from 13.8 to 68 GJ, with currents between 30 and 80 kA.

**Motivation**

**CORC CICC Bus Bar Design**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>ATLAS Bus Bars</th>
<th>Future Normal Bus Bars</th>
<th>Future SC Bus Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (kA)</td>
<td>20</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Material</td>
<td>Aluminium</td>
<td>Aluminium</td>
<td>REBCO CORC</td>
</tr>
<tr>
<td>Length (m)</td>
<td>300</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Cross-section (cm²)</td>
<td>400</td>
<td>1600</td>
<td>200</td>
</tr>
<tr>
<td>Stabilizer (A/mm²)</td>
<td>0.5</td>
<td>0.5</td>
<td>10</td>
</tr>
<tr>
<td>Mass (kg)</td>
<td>33.000</td>
<td>430.000</td>
<td>80.000</td>
</tr>
<tr>
<td>Voltage @ Operation (V)</td>
<td>8</td>
<td>28</td>
<td>-</td>
</tr>
<tr>
<td>Power @ Operation (kW)</td>
<td>160</td>
<td>2240</td>
<td>-</td>
</tr>
</tbody>
</table>

**Conclusion**

- CORC Six-Around-One Bus Bar is in development.
- Bus bar can be scaled up to 100 kA depending on detector magnet size.
- CORC bus bar greatly reduces power converter requirements.
- CORC bus bar reduces weight of the bus bars.
- Bus bars are protected by the fast-dump resistor of the magnet system.

**Requirements**

- The bus bars need to carry 80 kA at 50 K and 1 T.
- Bus bars are cooled by the return gas of the magnet’s liquefier.
- Bus bars require flexibility for opening and closing of the magnet system.
- Survive quench in the detector magnets.
- Survive quench in bus bar itself.
- Survive cooling failure.

**Thermal Stability**

- Hot spot temperature in bus bar in case of a quench in the 80 kA Twin Solenoid magnet is about 150-300 K, the fast-dump is initiated and the bus bars are heated without heating the magnet (R_Dump > 1600 V).
- The 30 kA / 14 GJ detector magnet allows less copper stabilizer or a lower dump resistor to achieve the same hot spot temperatures.

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