Cooling Water, Electrical Isolation and Fire Extinguisher Requirements for the Sector 20 Alcove

David Dowell
Author

Signature
June 21, 2005

Eric Bong
Injector/Linac WBS Manager

Signature
June 21, 2005

Cecile Limborg
System Physicist

Signature
June 21, 2005

David Schultz
E-Beam Systems Manager

Signature
June 28, 2005

Darren Marsh
Quality Assurance Manager

Signature
June 23, 2005

Paul Emma
Accelerator Physics Team Leader

Signature
June 22, 2005

John Galayda
Project Director

Signature
June 28, 2005

Brief Summary: This design document describes the water and electrical shielding and fire extinguisher requirements for the drive laser bay at Sector 20 Alcove.

Keywords: Drive Laser, Sector 20, S20, Injector Laser, injector housing, water, electrical grounding, fire extinguisher

Key WBS#s: 1.2.2
Electrical Isolation Requirements:

The laser bay and the Sector 20 alcove do not require high frequency (RF) shielding of the walls, ceiling or floor. However a good grounding system, meeting SLAC standards and good electrical practices should be installed. This grounding system should connect all electronics racks, laser tables, laser power supplies and cable trays to a single point ground. In addition, the HVAC system should be electrically isolated from the S20 alcove power. Power transients in the HVAC should not be allowed to propagate via the power lines into the S20 Alcove. And there should be good isolation between the klystron pulse power systems and the laser power.

Drive Laser Bay Water and Air:

The drive laser system requires water for the heat exchangers on the closed-loop chillers for the diode pump lasers, TiS laser heads and cryogenic helium compressors for two lasers. In addition we request 3 gpm of 27-deg-C maximum temperature water in the Load Lock Room. Therefore the S20 alcove has the following water requirements:

<table>
<thead>
<tr>
<th>Device/Location</th>
<th>Water flow/unit</th>
<th>Number of Units for 2 Laser Systems</th>
<th>Total Water Flow (min)</th>
<th>Max Water Pressure</th>
<th>Water Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>JEDI Pump Lasers</td>
<td>8 L/m (2.1 gpm)</td>
<td>6 (3 for each laser)</td>
<td>48 L/m (12.6 gpm)</td>
<td>5 bar</td>
<td>5 to 25 deg C</td>
</tr>
<tr>
<td>Cryo-Mech compressors</td>
<td>3 L/m (0.8 gpm)</td>
<td>2 (1 for each laser)</td>
<td>6 L/m (1.6 gpm)</td>
<td>-</td>
<td>27 deg C max</td>
</tr>
<tr>
<td>Load Lock Room</td>
<td>11.3 L/m (3 gpm)</td>
<td>-</td>
<td>11.3 L/m (3 gpm)</td>
<td>-</td>
<td>27 deg C max</td>
</tr>
</tbody>
</table>

The total minimum water required for the Laser Bay is 54 L/m (14.2 gpm).
The Load Lock Room requires 11.3 L/m (3 gpm).
Therefore the total S20 Alcove minimum water flow requirement is 65.3 L/m (17.2 gpm).

According to the specifications of the ThermoTek P307W-W water-to-water chiller used for the JEDI lasers, the primary cooling loop water quality requirements are:

- Filtered less than 80-micron particles
- Less than 200 mg/Liter chlorine concentration

The data sheets for the ThermoTek and CryoMech units should be referenced for further details.

This water does not have to be low conductivity since it is being used in the external loop of the heat exchangers (i.e. the internal loop is closed and circulates low conductivity water). The heat exchangers are contained inside the chillers which are part of the laser system. This water should be clean to minimize the maintenance of the chiller pumping system, and SLAC requires this to be a closed-loop system. The manifolds for this system should be located in the Laser Bay and Load Lock areas as shown in Figure 1 below. These areas are also where the manifolds for the dry, clean nitrogen gas are located. This gas is used to continuously purge the laser enclosures and to vent
UHV equipment. Gas lines will be installed by SLAC and run from the valve manifold to the laser tables in the overhead cable trays.

Figure 1: Conceptual layout of the Sector 20 alcove showing where the water and dry nitrogen manifolds should be located.

Fire Extinguisher System:
The S20 alcove rooms, the RF Hut and the injector housing will be protected from fire using VESDA alarm/smoke detection and sprinkler systems. The VESDA will be used to turn off equipment with the early detection of any fire. The sprinkler is the standard, wet pipe system activated by heat and is not a pre-action system.