H⁰-H⁻ PSB INJECTION VACUUM REQUIREMENTS

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Outline

• PSB $H_0$-$H^-$ injection vacuum layout;
• Graphite Vs SiC dump: resume;
• Update on simulations with new cooling system;
• Conclusions and actions.
PSB H- Injection: vacuum layout

Linac 4 H-
PSB ring
RF shield
75 l/s SIP
Stripping foil
SiC or Graphite Internal dump
PSB H0 H- injection review meeting, 18th April 2013
Previous results resume

**Graphs:**
- **Dump at 50°C**
  - Graphite: $P = 3 \times 10^{-9}$ mbar
  - SiC: $N_2$ equivalent

- **Dump at 175°C**
  - Graphite: $P = 6 \times 10^{-9}$ mbar
  - SiC: $P = 3 \times 10^{-9}$ mbar

**Table:**

<table>
<thead>
<tr>
<th>ACTION</th>
<th>GRAPHITE</th>
<th>SiC</th>
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<tbody>
<tr>
<td>Vacuum firing</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IN situ Bake –out (after each venting)</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Active Cooling</td>
<td>Yes</td>
<td>Yes</td>
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Influence of the new cooling system

Max. steady state temperature on chamber/flange:
88 °C for SiC and 83 °C for Graphite
Influence of the new cooling system

Many parameters are involved in the definition of an acceptable temperature from the vacuum point of view: the materials, the heating rate, the pumpdown time.

- Water vapor outgassing at 100 hours of pumpdown (a week of pumping);
- Outgassing at 75 °C from the SiC;
- BSW4 surfaces at 80 °C and 50 °C;
After a transient of few days of heating, the water vapor is released by the surfaces: $H_2$ from the bulk is leading ($H_2$ stainless steel outgassing).

The difference between the two temperature is very low.

BSW4 at 80°C - steady state

BSW4 at 50°C - steady

The difference between the two temperature is very low.
Actions and conclusions

The influence of the temperature has been studied in order to evaluate the vacuum impact: the choice of the final material of the vacuum chamber, the pumpdown time before beam impact, the heat rate are playing a fundamental role;
With the boundary conditions considered above, only an active cooling leading to a surface temperature around 50 °C allows to stay within the vacuum requirements from the early stage of the heating;
Finally some outgassing loads are still unknown (stripping foil mechanism) and need to be evaluated.
Period 1 (new injection)

- 8 x Sector valves (new)
- 8 x Ion pumps (new)
- 8 x Gauges (new)

Pumping group

- 4 x Pumping group (new)
- 4 x Venting system (new)

Gauges and pumps (old)

Sector valves (old)

Pumping group

Venting system (old)
Period 1 (new injection proposal)

Advantage:
- More room for shielding.
- Easy to vent and pumps without breaking foils. (big volume)
- Leak detection, venting and pumping away from hot zone.

Sector approximately 9 meters (Fast Wire scanner not part of sector so only fragile object is the striping foil).