

## Reviewers Executive Summary of PSB H0/H- Dump Review held on 18.04.2013

The reviewers acknowledge the project for the extensive material presented and for the complementary information received after the review, including the additional information complementing thermo-mechanical results.

These were essentially reported in the form of PowerPoint presentations by means of colour plots and summary tables.

Analysis reports or technical specification were not submitted, therefore the conclusions provided below are only based on the information drawn from plots or tables. Validity of results could not be cross-checked.

1. A variety of load cases, ranging from nominal to degraded or abnormal operating conditions, were studied both numerically and analytically.  
The reviewers recommend that this set of load cases be thoroughly verified, specifically ascertaining the consistency with the Functional Specification and that out of these a dimensioning design case be defined.  
It is also advised that the design choices be documented and substantiated in an official Technical Specification.
2. The alternative design options of active cooling and passive (radiative) cooling were studied extensively.
3. The relevance of inductive heating and grazing beam load should be assessed.
4. Best practices suggest to avoid combining multiple functions in one component whenever possible. In particular, it would be advisable to keep the dump design separated from that of the beam monitor.
5. The beam monitor and the dump are integral parts of a PSB kicker magnet. The engineering design of this assembly should be integrated:
  - a. Thermal and structural response of this assembly should be assessed as a whole.
  - b. Design choices should be consistent (e.g. presence of metallic parts in the beam monitor vs. absence in the dump)
  - c. Synergies between components could open new design possibilities (e.g. indirect cooling of the dump/vacuum chamber by the magnet cooling system).
6. The possibility to use high-Z materials (e.g. Molybdenum) as an alternative to low-Z SiC or Graphite should be considered in view of removing (the largest part of) the dump from the PSB kicker magnet.
7. A risk of swelling for SiC was mentioned during the review, but little information was initially provided concerning the expected effect on mechanical behavior in function of the expected radiation damage over the cumulative life of the dump. Reference papers were provided after the review, confirming the increased interest for SiC in nuclear industry and providing data on swelling and thermal conductivity of high-purity CVD SiC over an irradiation temperature range of 200–1600°C, on swelling of beta silicon carbide in the lower irradiation T range 333 K – 873 K, on thermal conductivity degradation for CVD SiC between 200 °C and 1000 °C irradiation, etc.
8. A more targeted synthesis of the available information on radiation damage in view of the operating conditions of the dump should nevertheless be provided. We suggest that the project summarizes in one slide the effects of the expected radiation damage and irradiation-induced swelling on the mechanical and thermal properties of the material (estimated with the best reasonable and conservative assumptions) and on dimensional stability, in order to assess on this basis the viability of the dump over its lifetime.