SNS Linac Technical Memo

AC Toroid in DTL Endwall Outgassing Rate

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WBS 14.5.2.3 (Diagnostics – Toroid)

Vacuum Loads for SNS AC Toroid in DTL Endwall
Summary : In order to do the initial design of the D-plate vaccuum system a calculation was done to estimate the out-gassing load from the AC Toroid. The Toroid for the D-plate is being developed under WBS 1.4.5.2.3, since it will be used elsewhere in the accelerator. Also note that as the designs of these devices become more mature, the responsible person should update these values and pass the information on to the vacuum system designers, especially if the new values exceed these presented here.

The assumptions made were:
Device consists of metal housing having OD, ID, and width.
Inner core is potted in epoxy, there is a small area of epoxy exposed to the vacuum.

Conclusion
The estimated out-gassing rate for the AC toroid is 4.101 x 10^-7 torr*L/s

Toroid in DTL endwall
Toroid OD, ID, and width

$tor_{od} := 2.6 \cdot in$

$tor_{w} := 1.378 \cdot in$

$tor_{id} := 1.0 \cdot in$

$tor_{metalSA} := \pi \cdot tor_{w} \cdot \left(tor_{od} + tor_{id} \right)$

$tor_{metalSA} = 100.547\ cm^2$

$LR_{ss} := 1. \cdot 10^{-10} \cdot \frac{torr \cdot L}{sec \cdot cm^2}$

Surface area of epoxy as per Bob Schafer's direction

$$tor_{epoxySA} := 2 \cdot cm^2$$

$$LR_{epoxy} := 2.0 \cdot 10^{-7} \cdot \frac{torr \cdot L}{s \cdot cm^2}$$

$$LR_{dtl\_tor} := LR_{ss} \cdot tor_{metalSA} + LR_{epoxy} \cdot tor_{epoxySA}$$

$$LR_{dtl\_tor} = 4.101 \times 10^{-7} \frac{torr \cdot L}{s}$$