Estimated QMB Deposition Rate Due to LLD Evaporation

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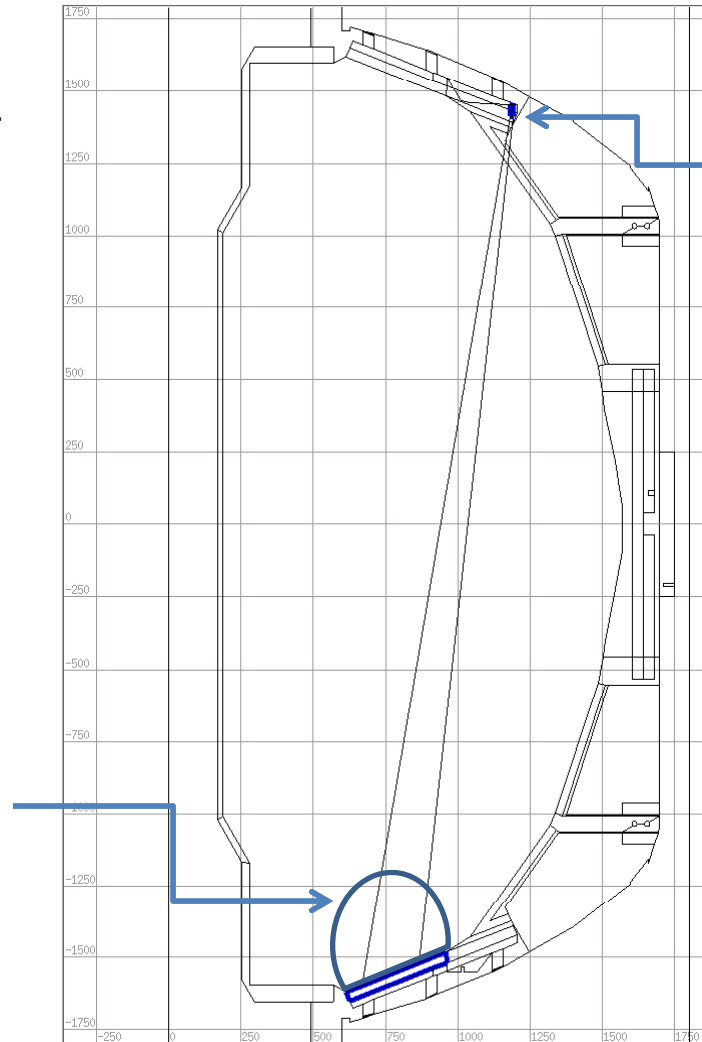PPPL

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DEGAS 2 Simulation Uses Same 3-D Vessel & Physics Model as Li – He Calculations
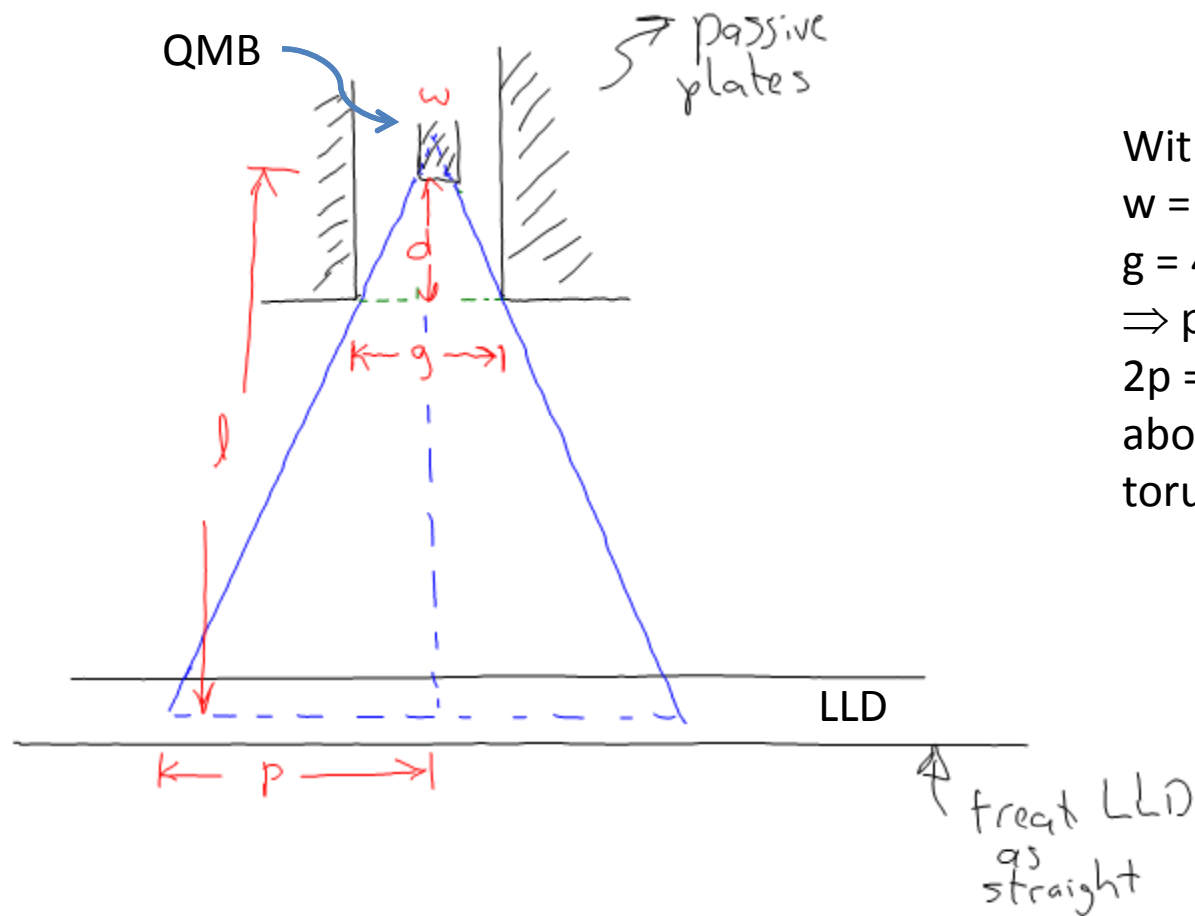
He pressure = 10^{-8} torr

Simulated Bay E upper QMB

Cosine distributed source on outer divertor plate

Estimate Toroidal Extent of LLD
Visible from QMB

With:
w = 1 cm, d = 15 cm,
g = 4.7 cm, l = 300 cm,
$\Rightarrow$ p = 37 cm.
2p = 74 cm corresponds to
about 57° in a "straight"
torus.

Code Results

- Output from calculations is P_{QMB} = probability of source atom striking QMB.
- Initial simulation with source localized to same 0.5° toroidal sector as QMB:
  - $\Rightarrow P_{QMB}$ = 3 x 10^{-6}.
- Extend source to $\pm$ 40° on either side of QMB:
  - $\Rightarrow P_{QMB}$ = 2.8 x 10^{-6} .
- Extend source all the way toroidally:
  - $\Rightarrow P_{QMB}$ = 2.3 x 10^{-6} .
  - Getting significant contributions from other side of torus!
    - Otherwise, would be reduced by ~80 / 360.
  - $\Rightarrow$ simple (2-D) model is not going to get this result.

Evaporation Estimate

- Evaluate Moir formula at 320° C,
  - $\Rightarrow$ evaporation rate = 10^{19} Li / (m^2 s).
- Area of LLD = 1.0 m^2.
  - $\Rightarrow$ Total Li source = 1.0 x 10^{19} Li/s.
- Use P$_{QMB}$ = 2.3 x 10^{-6} ,
  - $\Rightarrow$ 2.3 x 10^{13} Li/s are striking QMB.
  - Simulated QMB area = 1 cm^2 $\Rightarrow$ also 2.3 x 10^{13} Li/(cm^2 s).
- Critical assumption is cosine distribution of source,
  - Should be isotropic?
  - Actual distribution related to "effective area"?