Notes on simulation suggestions for AstroBEAR.

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In the table each column represents a different simulation. The parameters in dark blue are dimensions and simulation setup instructions. The parameters in light blue are experimentally measured parameters for the plasma and obstacle. The rest of the parameter (white) are calculated using formulars from refs 1 and 2. There is a separate power point with the setup images which shows the layout of the obstacles and the direction of the magnetic field, the relevant figure is referenced in cell 5.

The first two simulations we are interested in are a comparison of the same initial setup with and without radiative cooling. In our experiments we observe that the plasma temperature does not drop much below 12eV. However, a calculation of the cooling time suggests that within our experimental time frame we should see cooling. This could be due to a heating mechanism, such as ohmic heating. We are therefore interested to know whether a simulation with a realistic cooling time or one with no radiative cooling at all better resembles our data. The cooling time I have suggested for simulation 1 is taken from the Al cooling curves presented in ref 3 using the ni, Te and $\overbar{Z}$ values shown in the table. For simulations 2 I have suggested the same experiment with no radiative cooling. The experimental setup is one that we have used several times and have very good data for.

Once we see the results from these two simulations we will have other suggestions but we would like to understand the roll of radiative cooling in the simulations first.

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2. Huba JD. NRL Plasma Formulary. IEEE Electr Insu Mag. 2013;
3. Suzuki-Vidal F, Lebedev S V., Ciardi A, Pickworth LA, Rodriguez R, Gil JM, et al. Bow shock fragmentation driven by a thermal instability in laboratory astrophysics experiments. Astrophys J [Internet]. 2015;815(2):96. Available from: http://dx.doi.org/10.1088/0004-637X/815/2/96