

Alpha confinement with collisional ANTS (part 2)

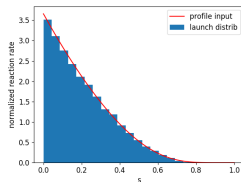
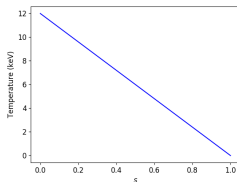
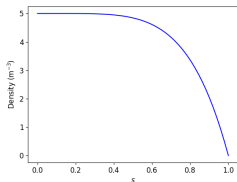
A. Bader

Wistell Meeting, Jan 24, 2020

Calculation of collisionless losses with different equilibria

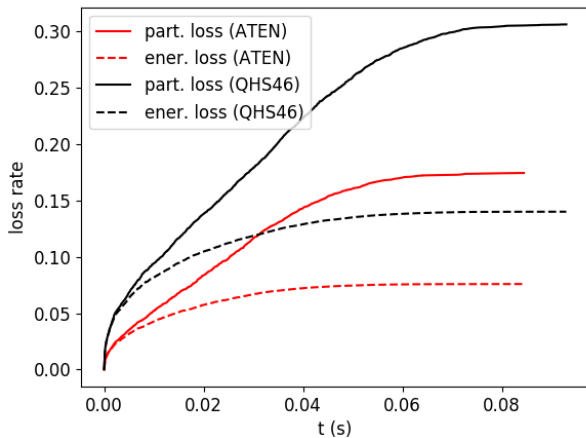
- QHS46 configuration
- ATEN configuration with different size/field
- BILA

Temperature, density and alpha source profile

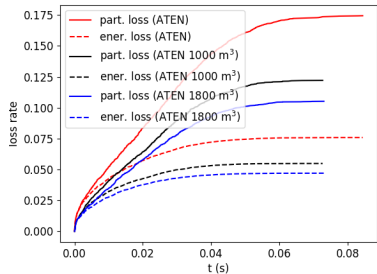
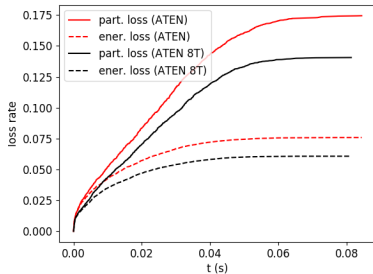


- Temperature is linear in s : $T = T_0(1 - s)$; $T_0 = 12$ keV
- Density is mostly flat: $n = n_0(1 - s^5)$; $n_e = 5 \times 10^{20} \text{m}^{-3}$

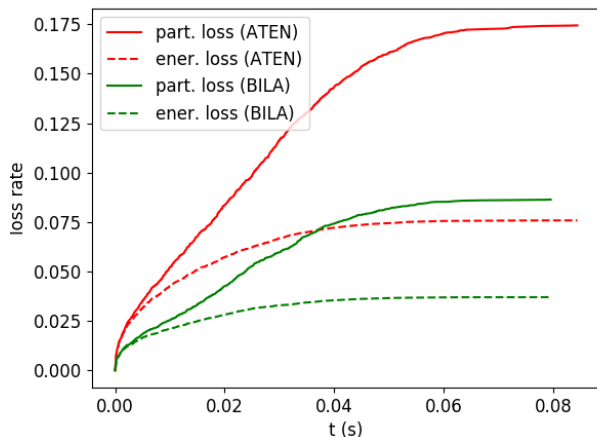
ATEN results show improvement of QHS46



Slight improvements with increased field/size



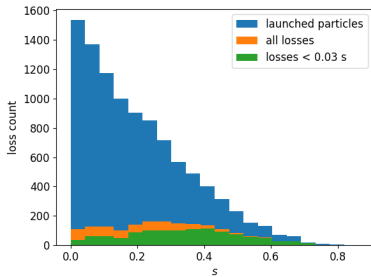
BILA (5 field period device) outperforms ATEN



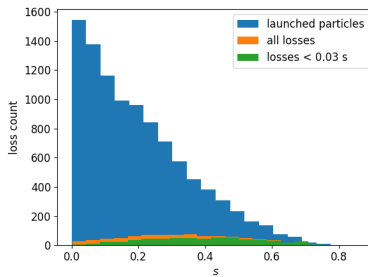
Note: we have yet to find a good coil set for BILA that reproduces this behavior (unlike ATEN)

In both cases, fractional losses increase with s

ATEN

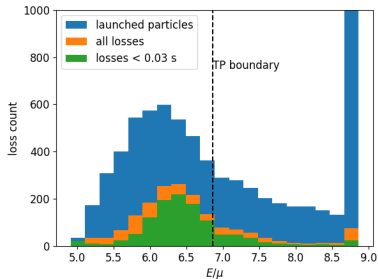


BILA

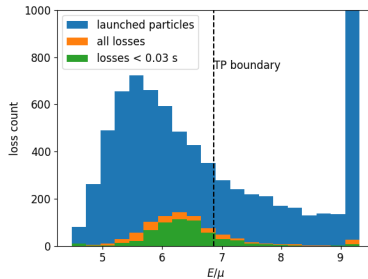


Most losses occur near the trapped passing boundary

ATEN

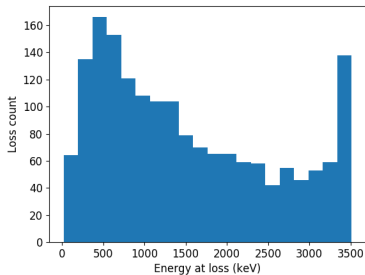


BILA

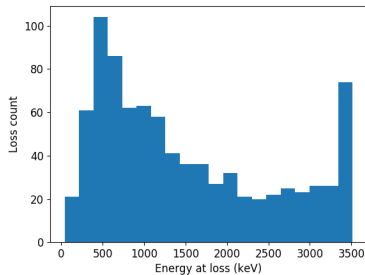


Large spike of prompt losses, then most losses at longer times

ATEN



BILA



Some takeaways

- Is BILA good enough? It seems hard to do better than it, but maybe possible
- Can we find a configuration with BILA-type confinement, a magnetic well, and coils? This is the EP trifecta
- BILA outperforms (the questionable) published ARIES-CS data, 5% energy loss