Simmons
B358, NCSX

NCSX Transport Update

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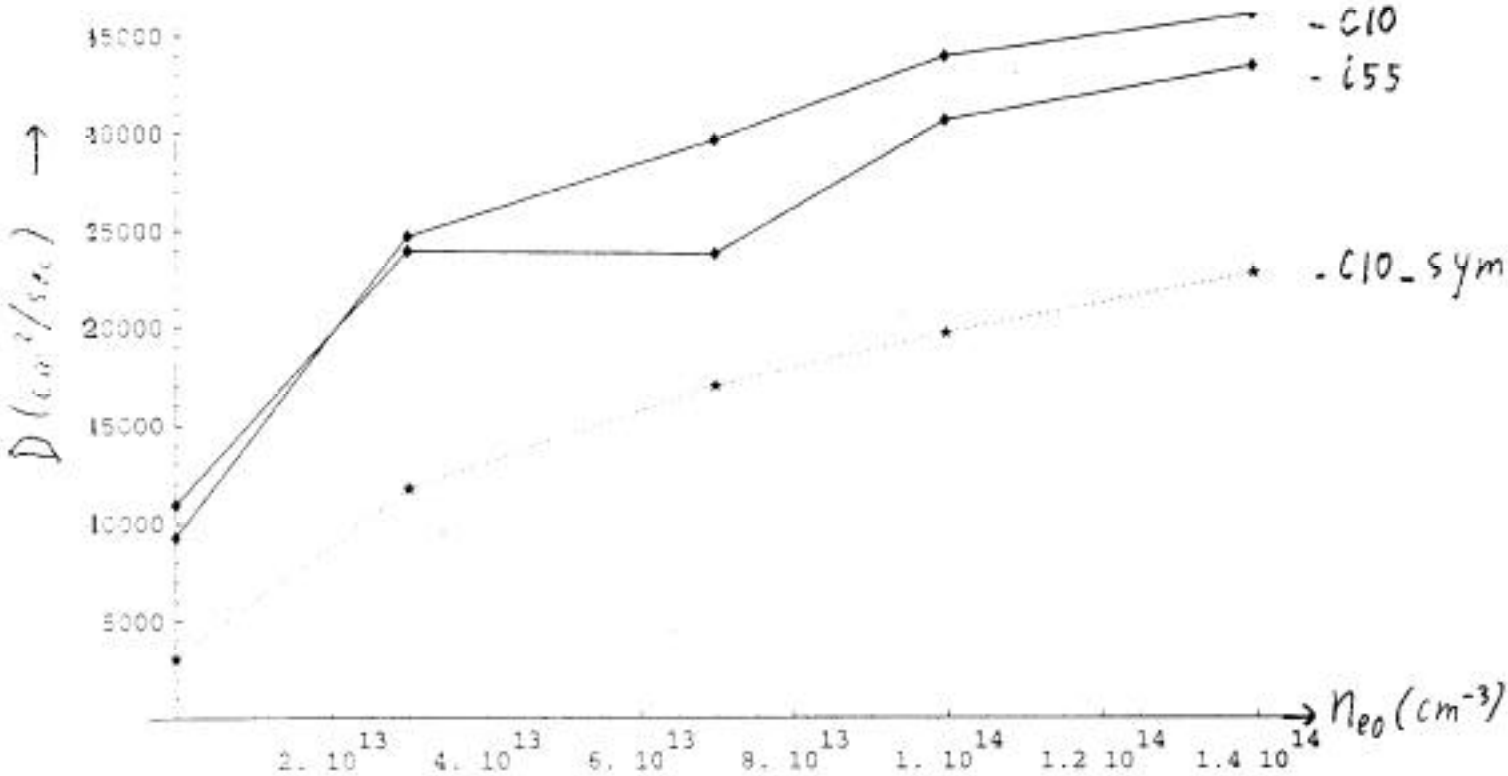
1/14/99

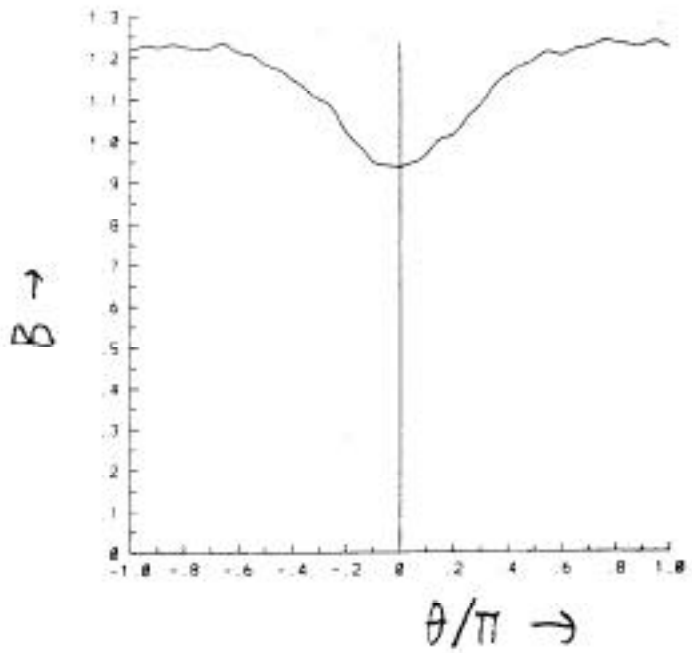
○Monte-Carlo Results: Compare c10 and i55:



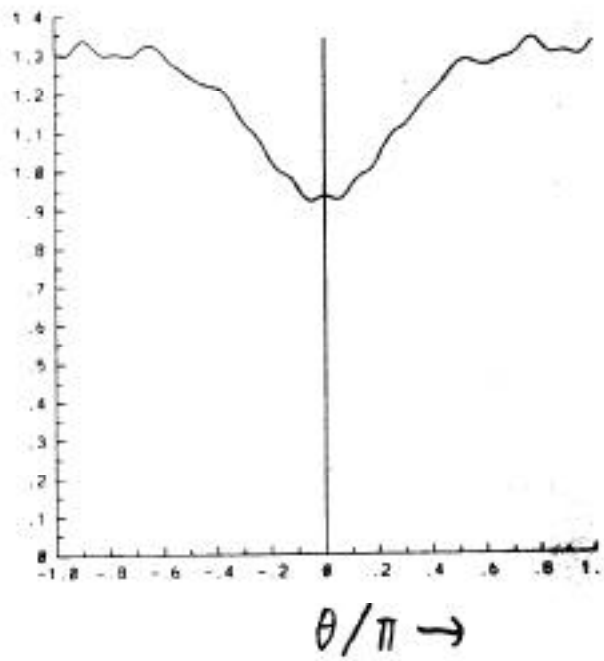
($K = 2 \cdot T = 2 \times 1.3$ keV, $R = 1.5$ m, $B_0 = 1$ T)

Plot $B(s_{\parallel})$:

c10



i55



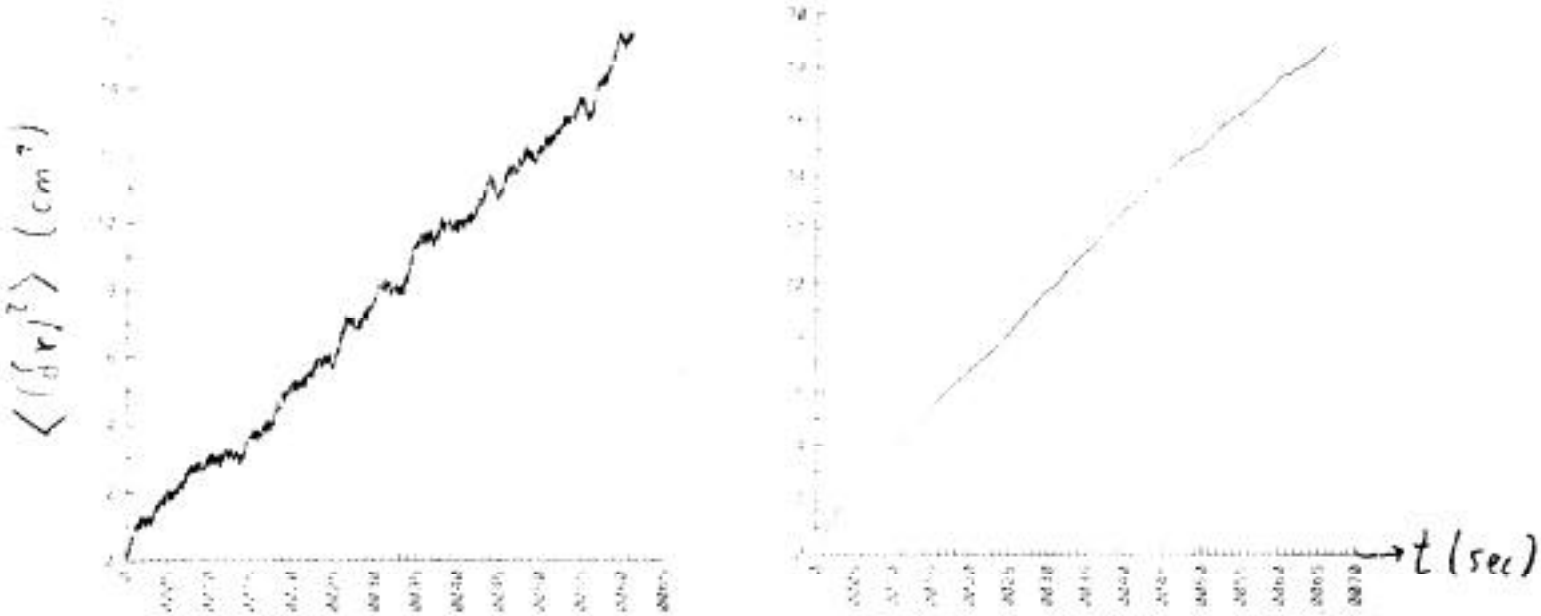
∘GC3/GTC Benchmarking:

·QAS3a_sym (= equiv. tok for 4m base case):

·Results similar for $\rho_b/\bar{a} \ll 1$ $\quad D \simeq \frac{1}{2} d_t \langle (\delta r)^2 \rangle$

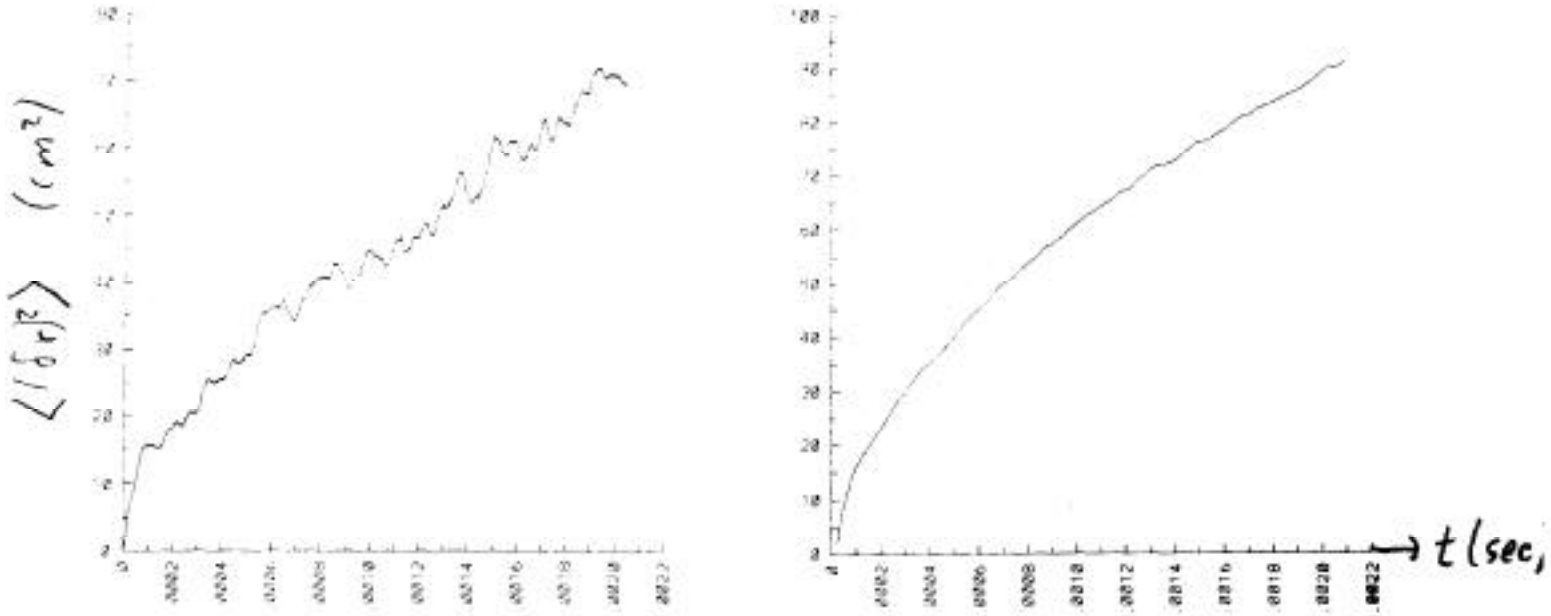
$(n_{e0} = 1.4 \times 10^{12}, K = 2 \times .13 \text{ keV})$:

GC3 (N_{part} = 352) GTC (N_{part} = 10e3)



·Some oddity appears in GTC $\langle \delta r^2 \rangle$ when $\rho_b/\bar{a} \sim 1$

$(n_{e0} = 1.4 \times 10^{14}, K = 2 \times 1.3 \text{ keV})$:

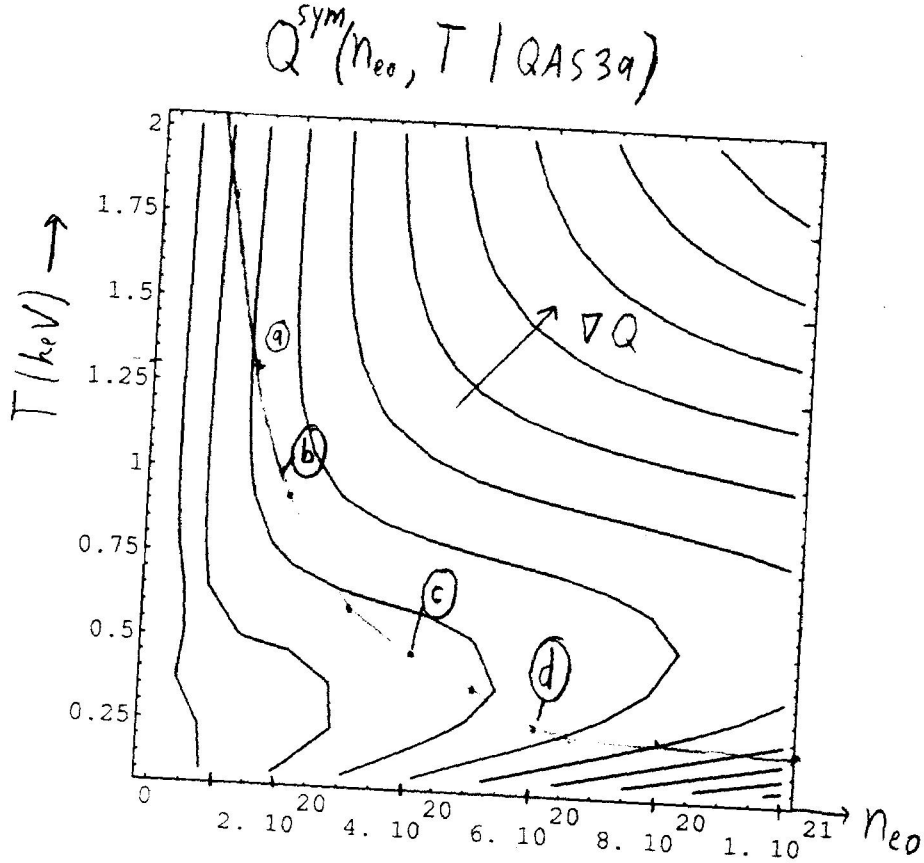


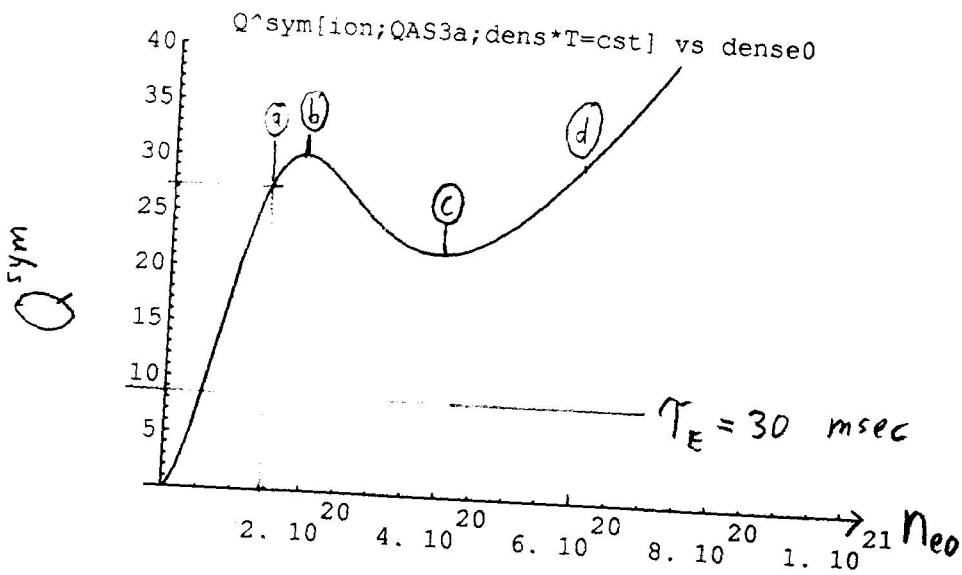
∘Recall earlier efforts to boost τ_E(c10) ran into difficulties for $r \to a$, due to large ρ_b, direct orbit loss:
·GC3 calculations include finite ρ_b, but computed local transport coefs (at $r/a = .5$).
·TRANSP computes global τ_E, but ignores finite orbit effects. Sanguine picture from TRANSP ($\tau_E \sim 80$ msec) contrasts with problems from direct orbit loss in GC3.

∘Getting a global τ_E from a GC code requires large ensembles.
⇒Effort pursued with Z. Lin to use GTC to compute a global τ_E, close to way computed experimentally:
$\tau_{Ei}(r) = W_i(r)/q_i(r)$, $q_i(r) = -d_t W_i(r) + S_E(r)$.

∘Appears ambipolar field E_r may play important role for c10. (More later.)

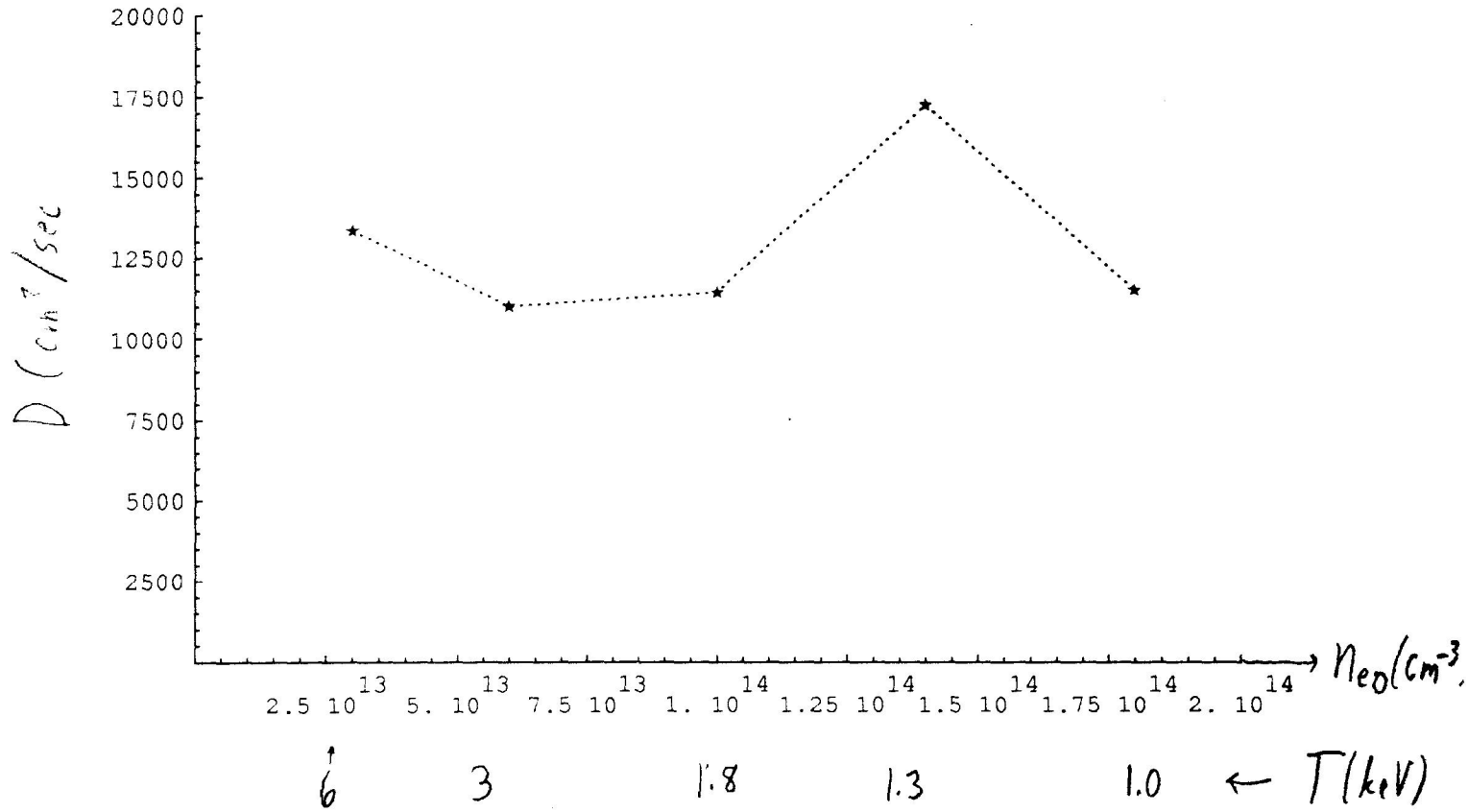
Try to reduce D^{sym} by changing n, T while keeping $nT =$ constant:



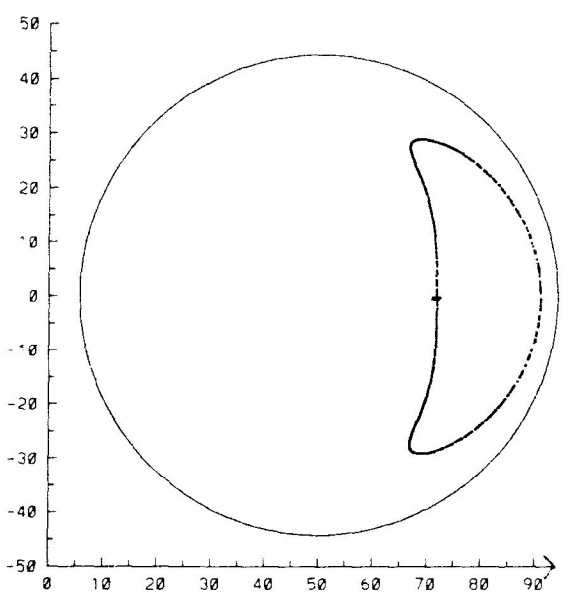


∘Monte–Carlo runs

do not follow analytic theory down to $n_{e0} = 0$: (QAS3f_sym

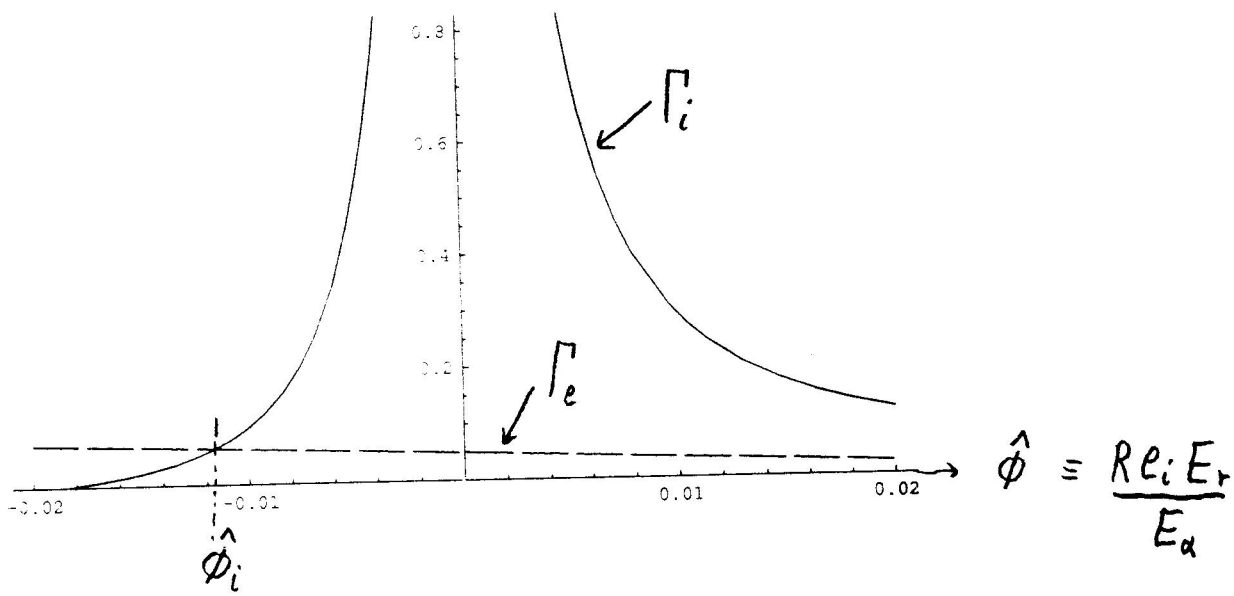
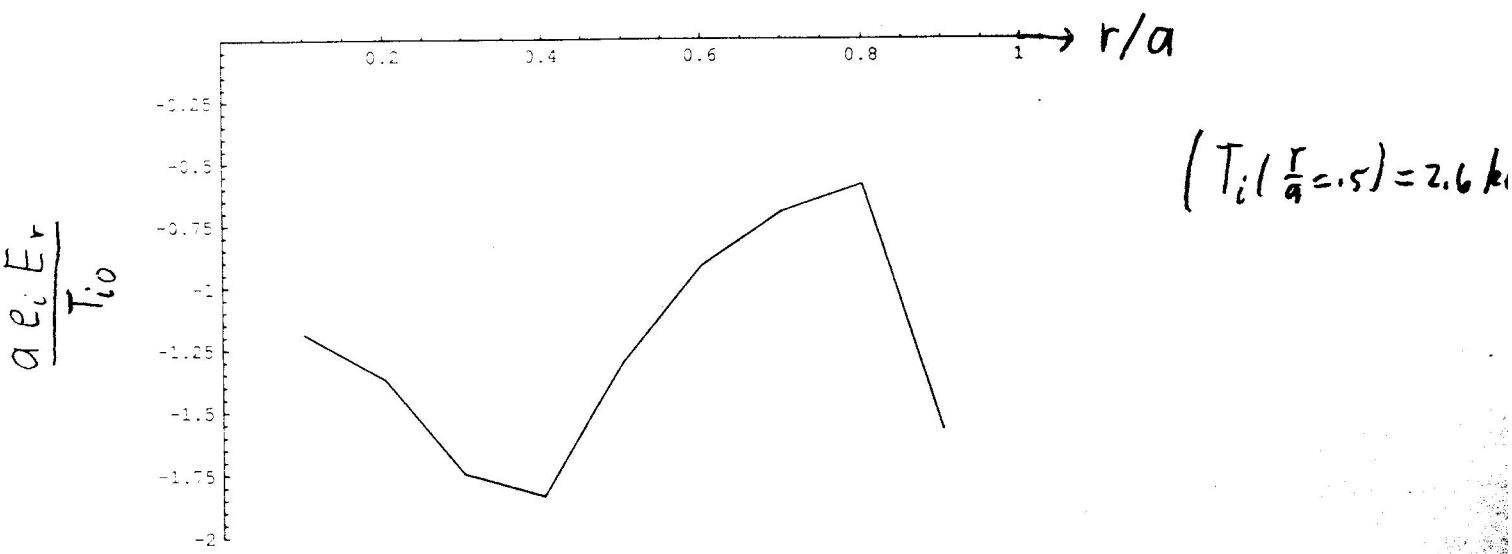


·Reason: Very large $\rho_b/\bar{a}$ at high energies invalidates usual diffusive neoclassical picture:



: K = 2 × 3.03 keV

∘Incorporation of ambipolar field $E_r(r)$:

Current approaches: Rough methods to impose ambipolarity $\sum_s e_s \Gamma_s = 0$:

·Analytic theory.
·Using GTC on electrons to determine Γ_e, then determining $\Gamma_i(E_r)$ from the E_r needed to satisfy ambipolarity.