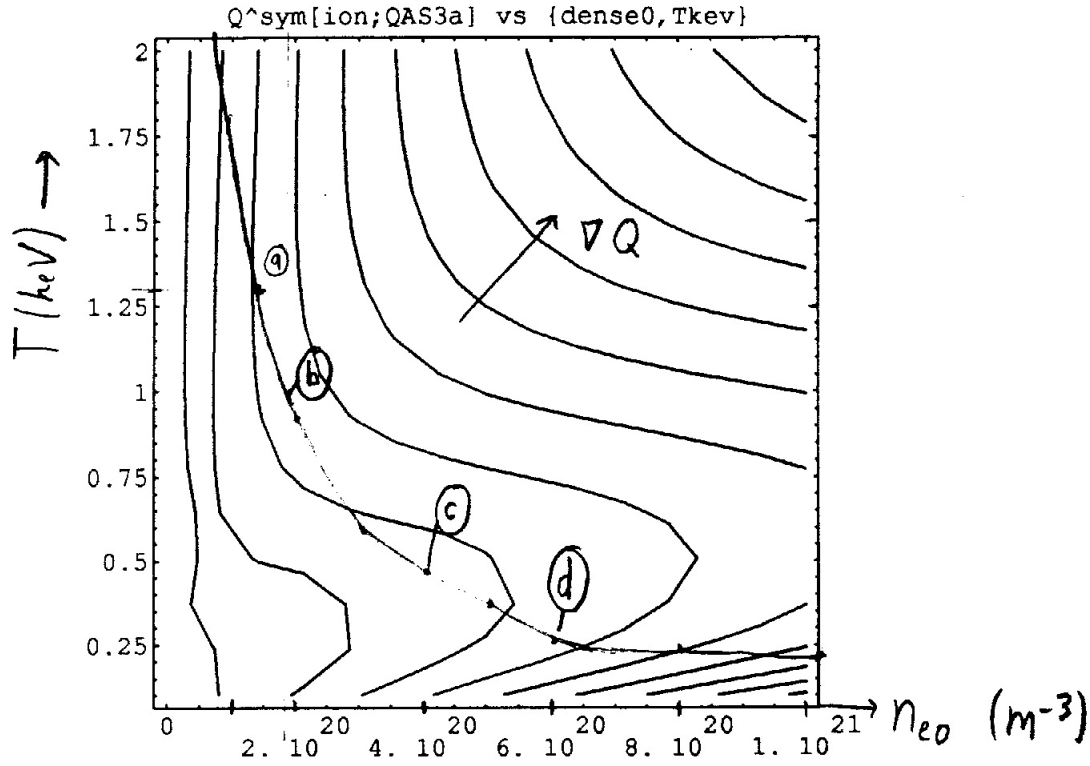
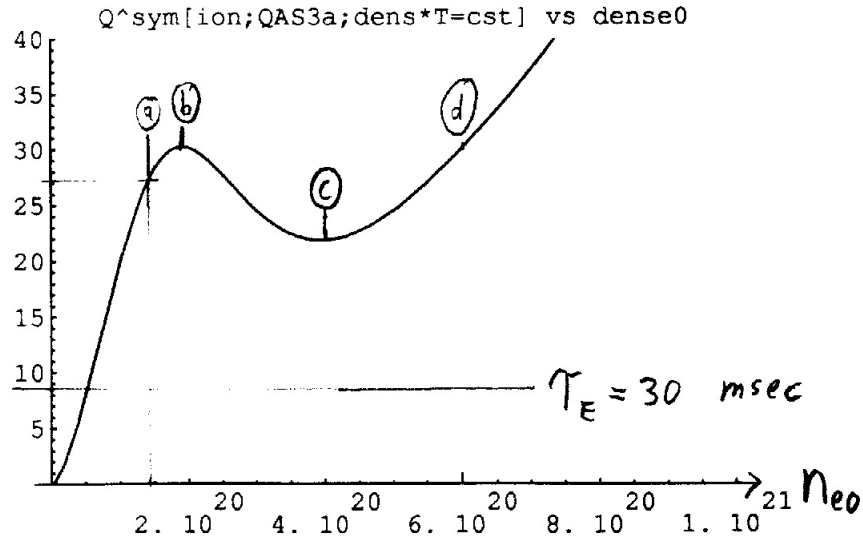
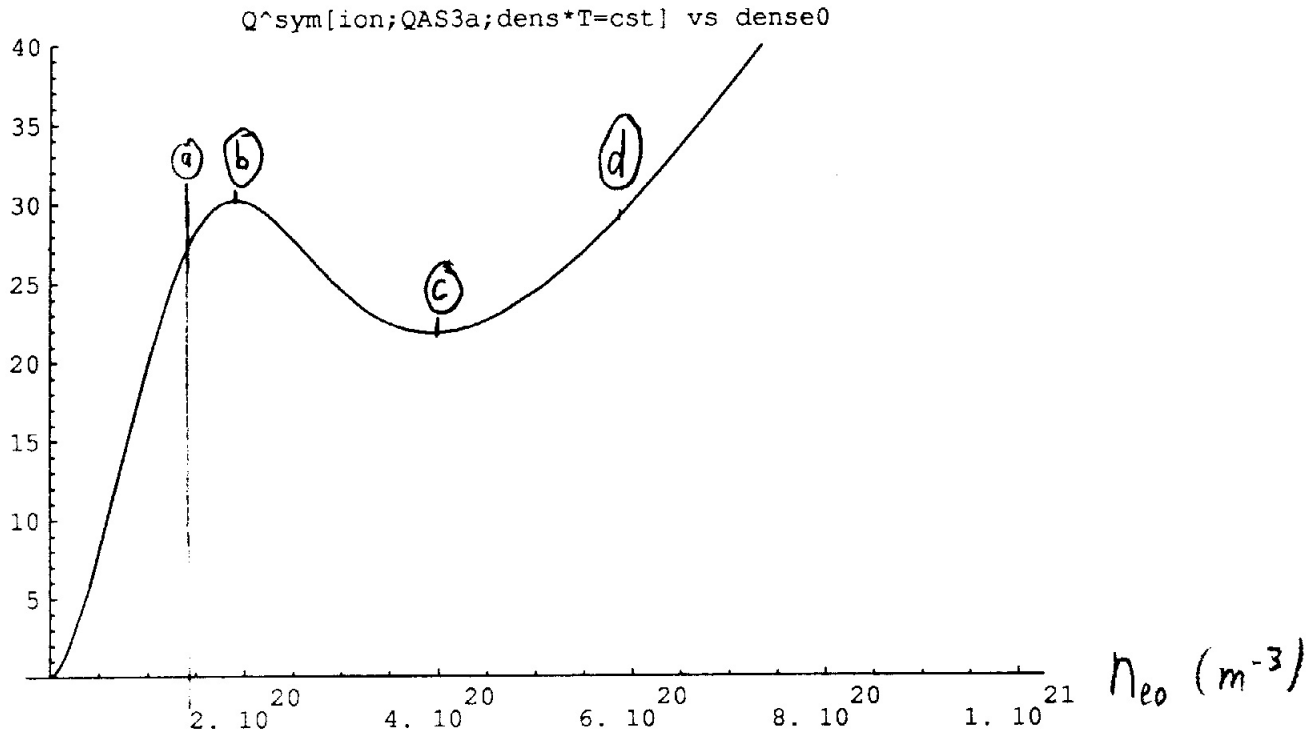
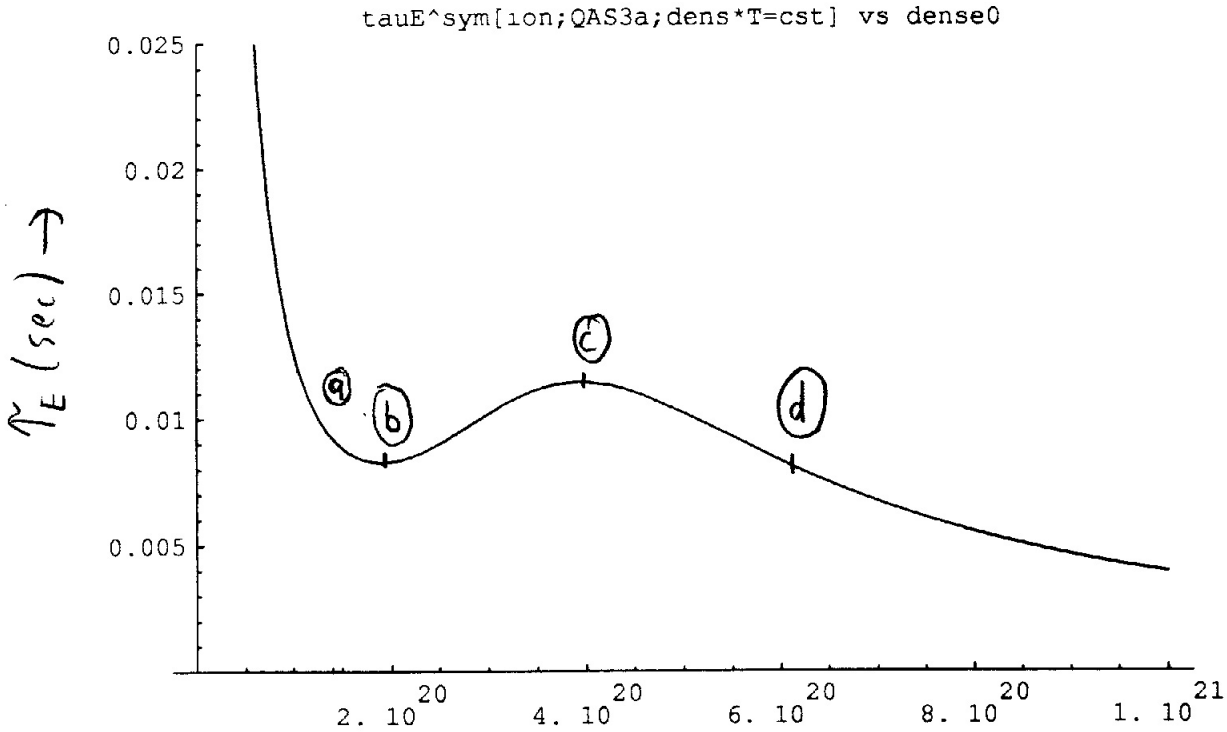
The search for adequate τ_E :

H. Mynick
10/8/98







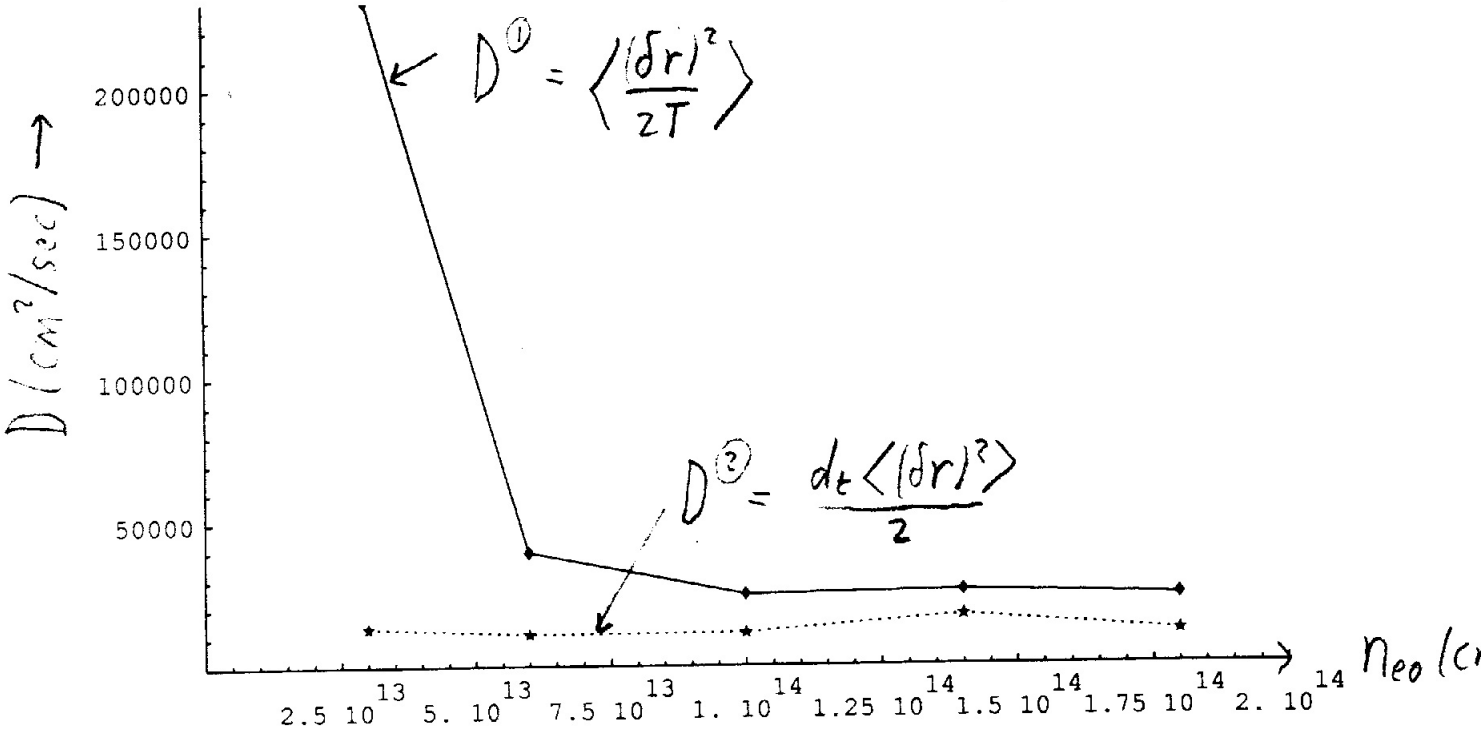


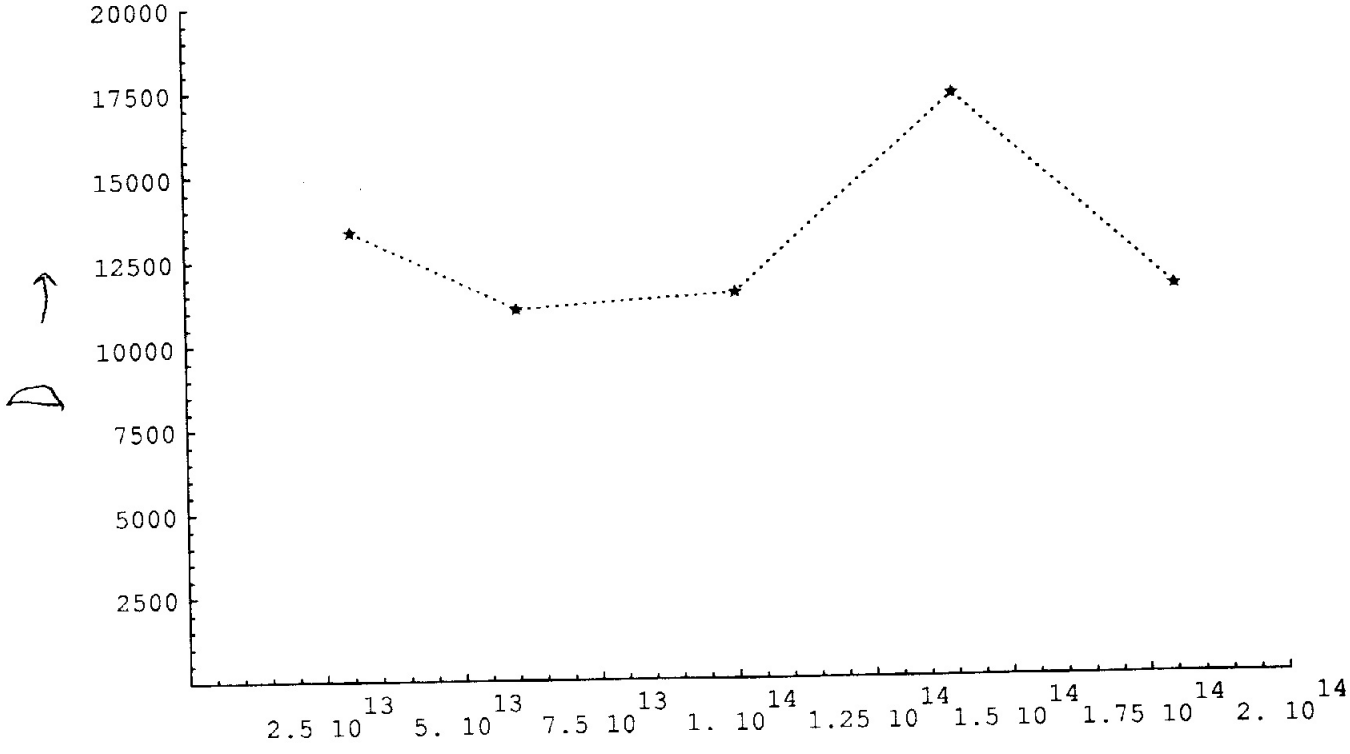
· Calibrate: For PBX, $n_{e0} \simeq 10^{20}$, $T \simeq 1.6$ keV gives $\tau_E^{sym} \simeq .119$ sec, close to experimental estimate $\tau_E^{sym,exp} \simeq 2 \times \tau_E^{exp} \simeq .100$ sec

• Monte-Carlo runs for $n_{eo}\bar{T} = const = 1.4e14 \times 1.3$

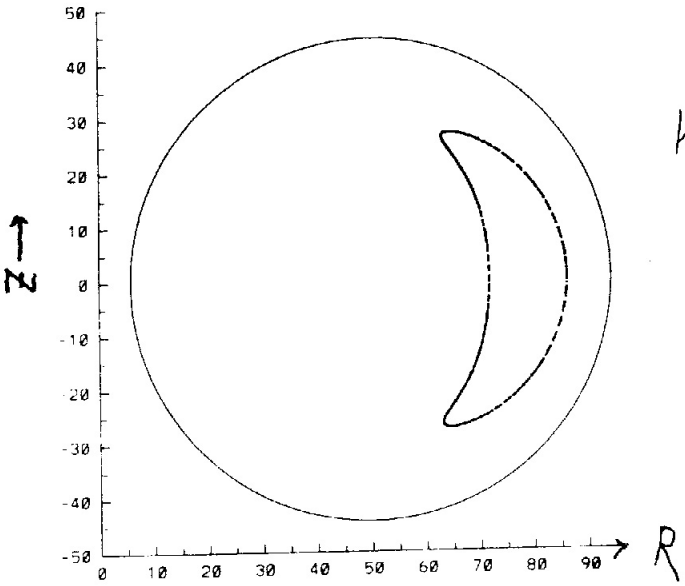
$n_{eo} = [.3, .6, 1, 1.4, 1.8] \times 10^{14}\ cm^{-3}$

$T = [6.07, 3.03, 1.82, 1.3, 1.01]\ keV$

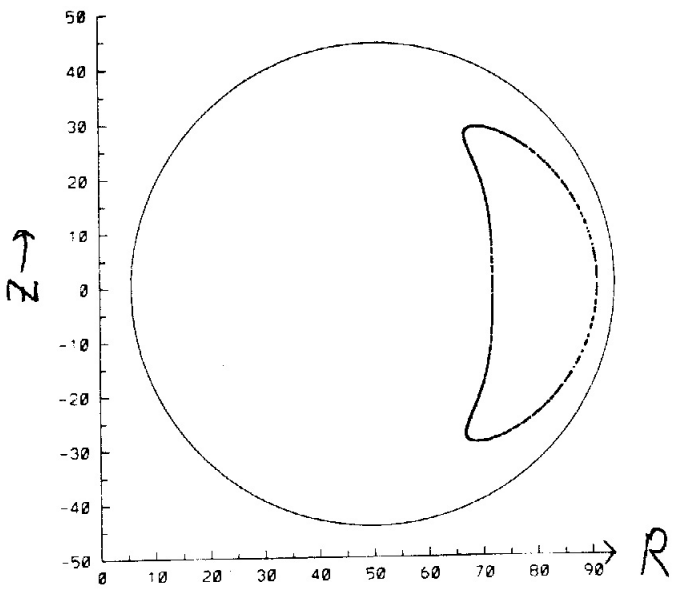




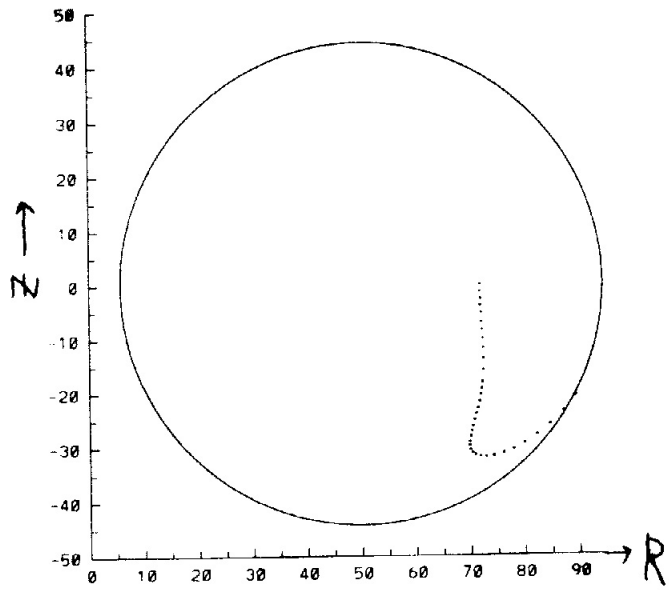
Very large ρ_b/a at high energies invalidates usual diffusive neoclassical picture:



$K = 2 \times 1.3$ keV



$K = 2 \times 3.03$ keV



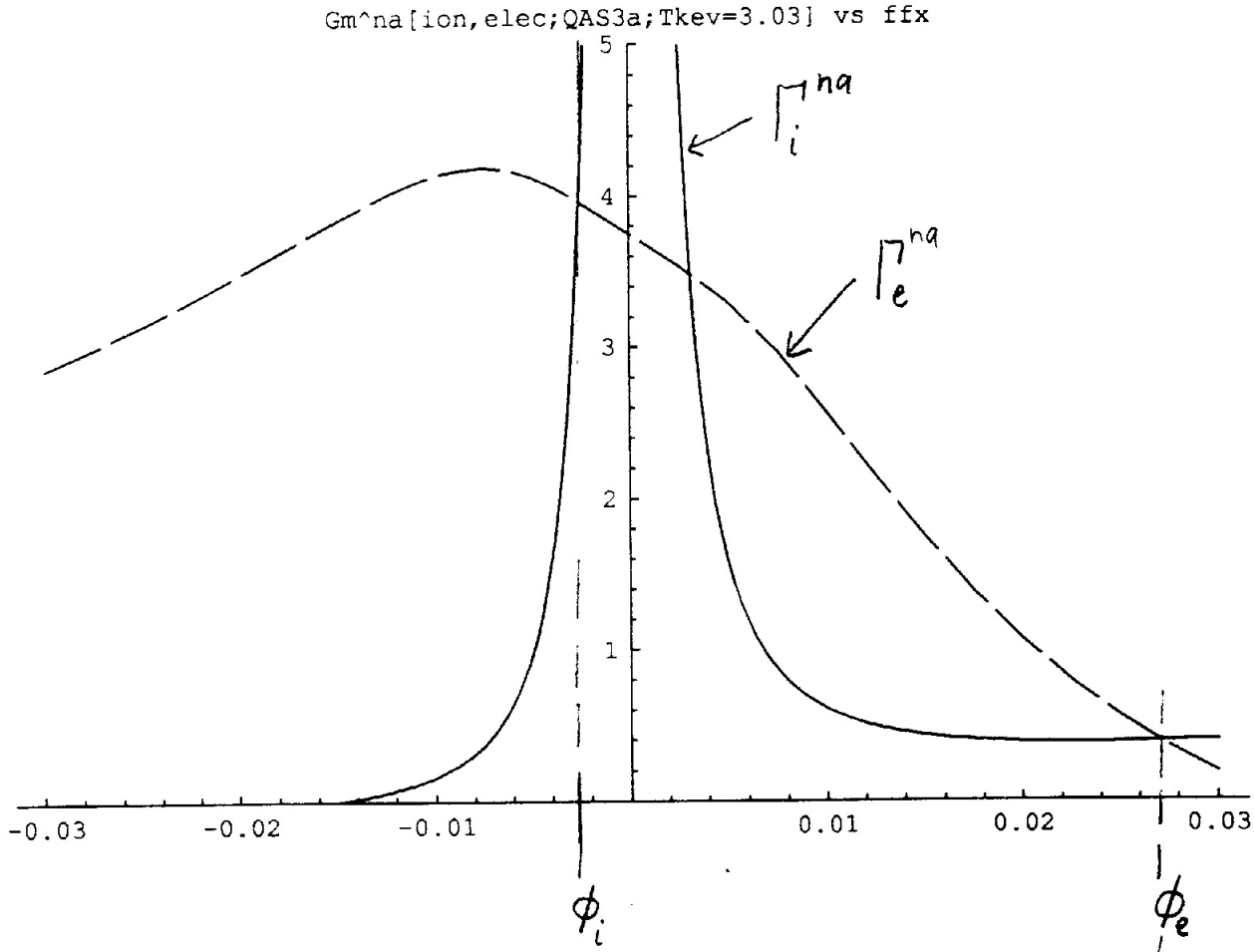
$K = 2 \times 6.07$ keV

[ρ_b (trapped, 12 keV) $\simeq \frac{a}{2}$ consistent with MZ estimate ρ_b (passing, 40 keV) $\simeq \frac{a}{4}$]

$\Rightarrow$ Take $T = 3.03$, $n_{e0} = .6e20$ as 'best hope'.

At this high T, low n, have <u>both</u> an ion and electron root

$[T = 3.03\ keV,\ n_{e0} = .6e20\ m^{-3}]$:



$$\hat{\phi}_i \equiv \frac{e_i E_r a}{T_i} \simeq -.88 \qquad \hat{\phi}_e = 9.2$$

· For $\phi = 0$;

Fig. 35

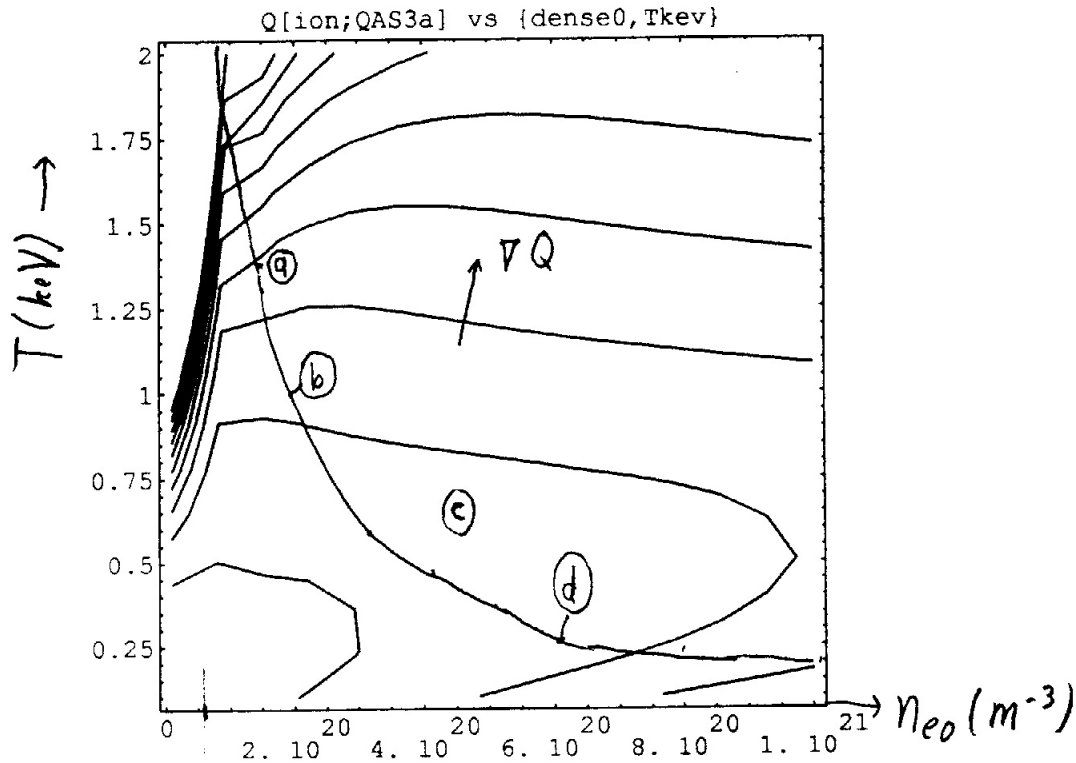
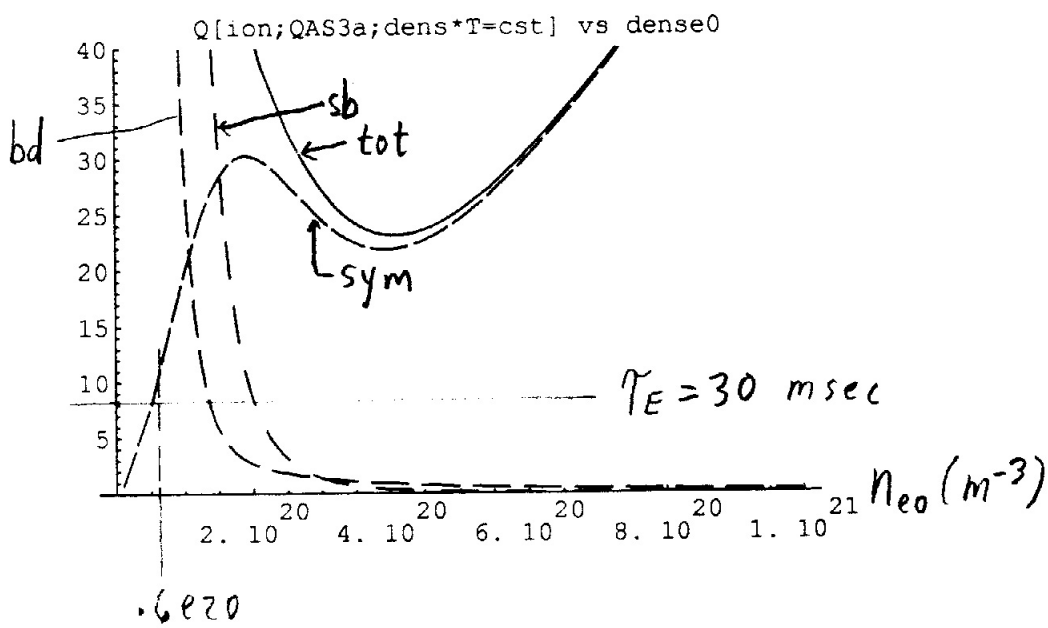
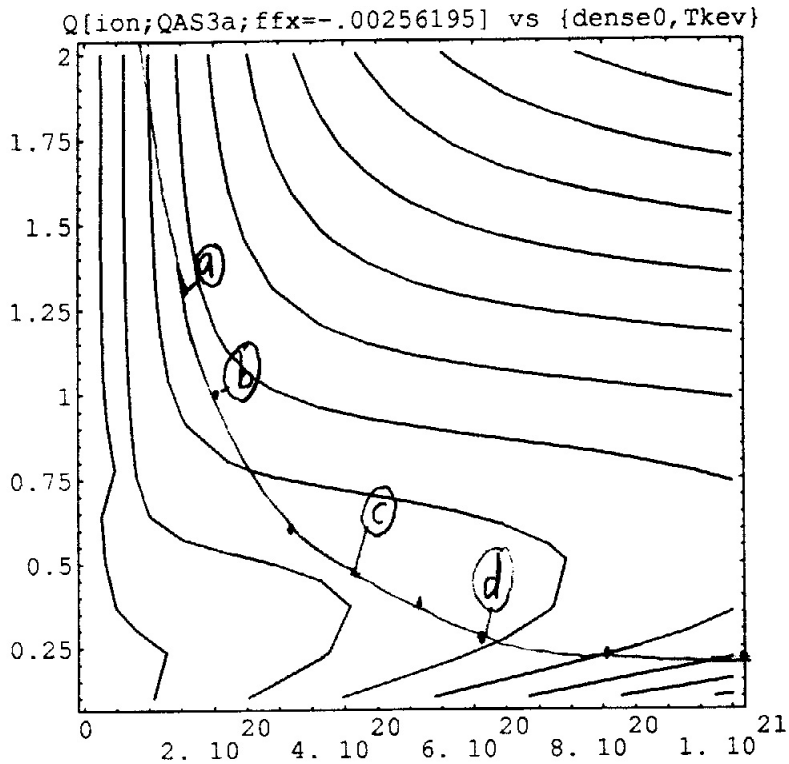
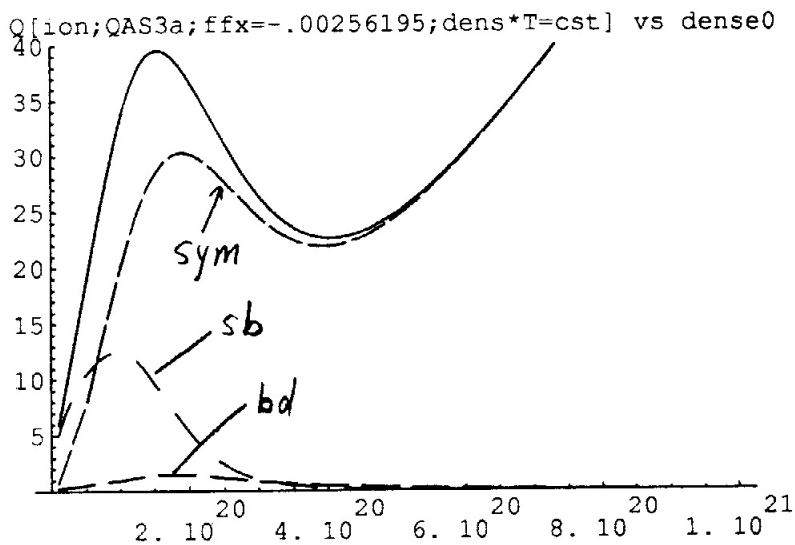


Fig. 32

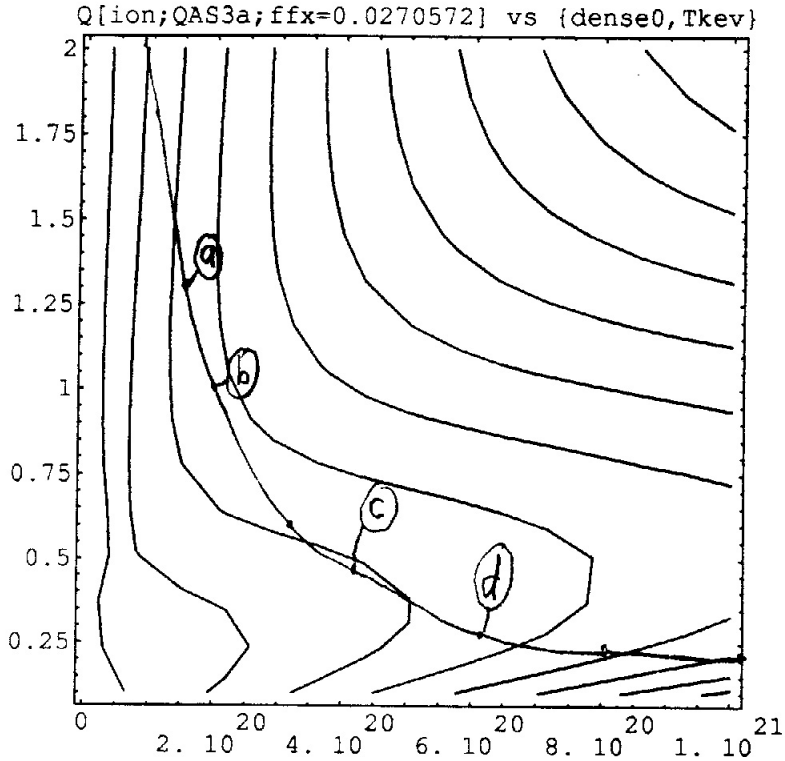


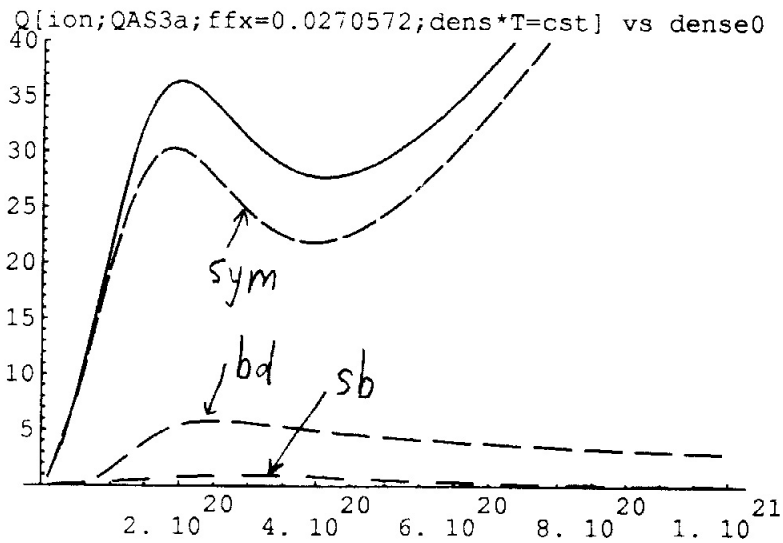
· At $\phi = \phi_{i'}$:

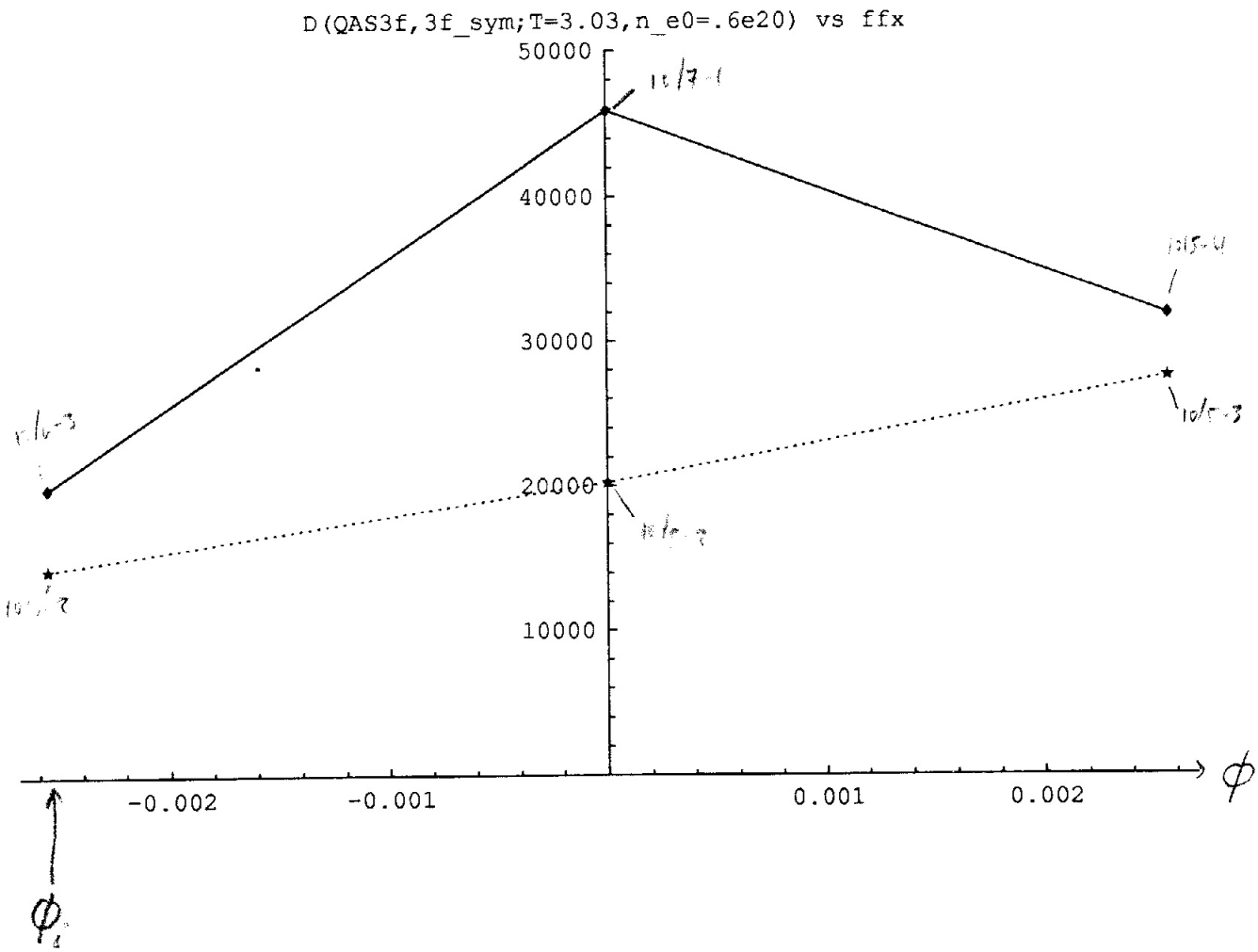

Q[ion;QAS3a;ffx=-.00256195] vs {dense0,Tkev}
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
2. 10^20
4. 10^20
6. 10^20
8. 10^20
1. 10^21
a
b
c
d


Q[ion;QAS3a;ffx=-.00256195;dens*T=cst] vs dense0
40
35
30
25
20
15
10
5
2. 10^20
4. 10^20
6. 10^20
8. 10^20
1. 10^21
sym
sb
bd

· At $\phi = \phi_e$:


Q[ion;QAS3a;ffx=0.0270572] vs {dense0,Tkev}
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
2. 10^20
4. 10^20
6. 10^20
8. 10^20
1. 10^21
a
b
c
d


Q[ion;QAS3a;ffx=0.0270572;dens*T=cst] vs dense0
40
35
30
25
20
15
10
5
2. 10^20
4. 10^20
6. 10^20
8. 10^20
1. 10^21
sym
bd
sb


D(QAS3f,3f_sym;T=3.03,n_e0=.6e20) vs ffx
50000
40000
30000
20000
10000
-0.002
-0.001
0.001
0.002
ϕ
ϕ_1

∘Summary:

- The $A \simeq 3.4$ QAS3's we've been studying appeared to have Q's a factor of 3–4 times the values needed for $\tau_E = 40$ msec.
- Going to lower n, higher T to reduce Q^{sym} has problems because of $\rho_b/\bar{a}$ becoming too large, but may be marginally adequate. Increasing ι would help alot ($\tau_E^{bn} \sim \iota^4$ at fixed power).
- A self–consistent $E_r = -\Phi'$ to reduce Q^{na} can make $Q^{na} \ll Q^{sym}$, so question is whether can get Q^{sym} down.
- An NBI–induced E_r to attempt to have Q^{sym} *cancelled* by $Q^{na} \sim D^{na}(E_r)[\kappa_n - E_r + ()\kappa_T]$ won't help, because $D^{na}(E_r) \sim 1/E_r^2$, so $Q^{na} \overset{eE_r\bar{a}/T \gg 1}{\rightarrow} 1/E_r$.