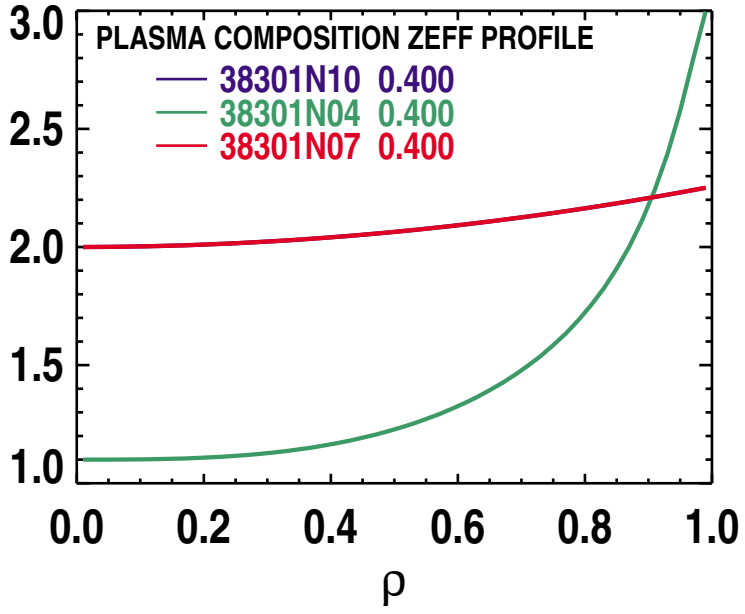
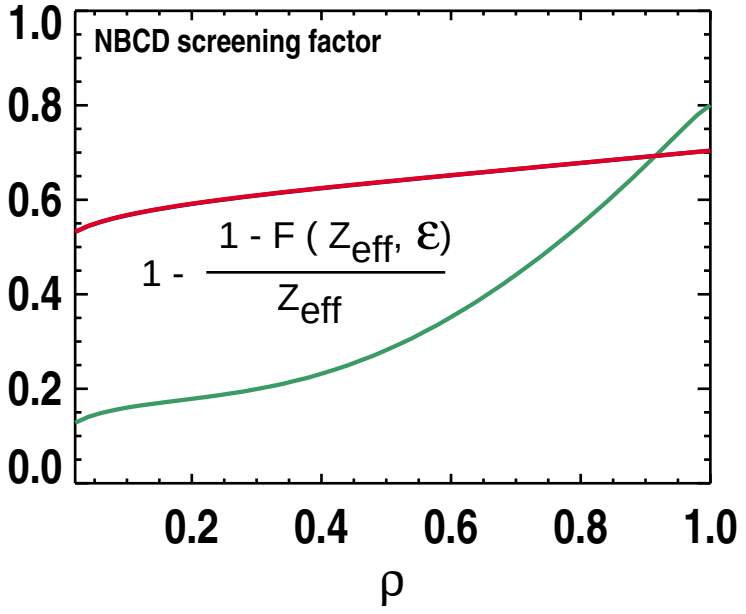
Further Examination of iota and A comparison of li383 to the 80% device

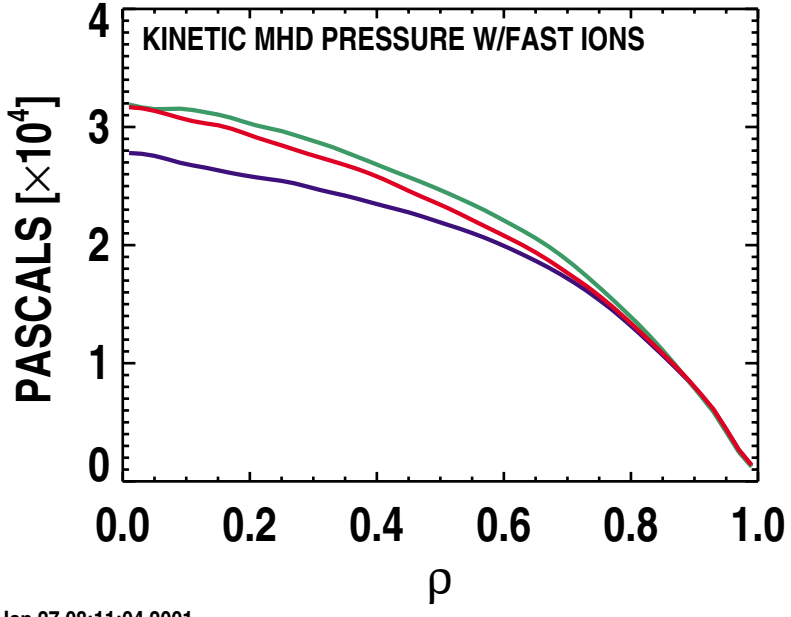
Ed Lazarus
Oak Ridge National Laboratory

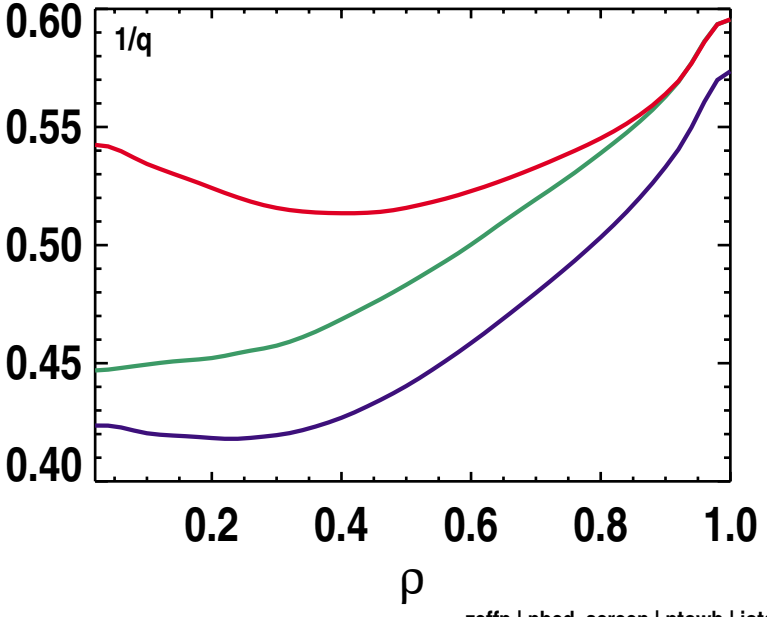
Presented at the January 30, 2001 -NCSX Project Meeting

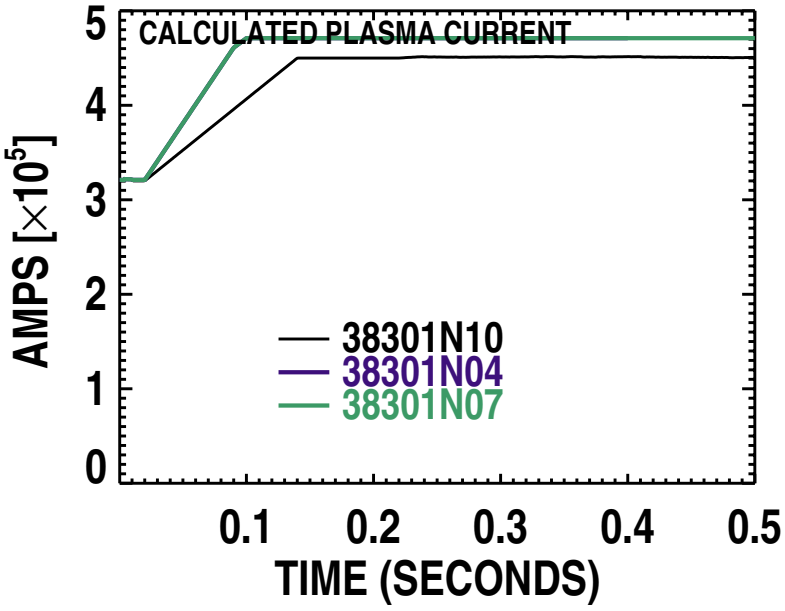
- **Z_{eff} & NBCD & iota**
- **NB losses from TRANSP**
- **A smaller device – iota again**
- **Beam Deposition vs Heating profiles**

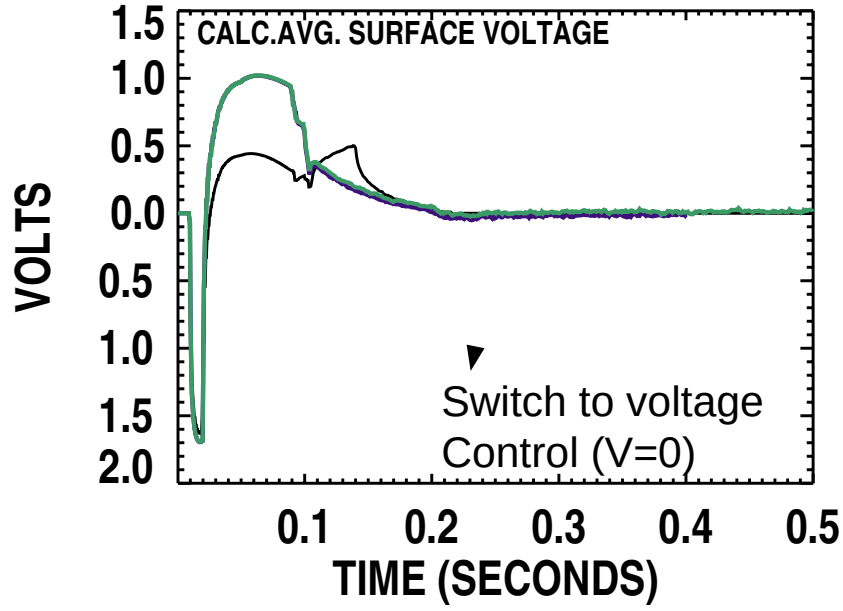

PLASMA COMPOSITION ZEFF PROFILE
38301N10 0.400
38301N04 0.400
38301N07 0.400
3.0
2.5
2.0
1.5
1.0
0.0
0.2
0.4
0.6
0.8
1.0
ρ

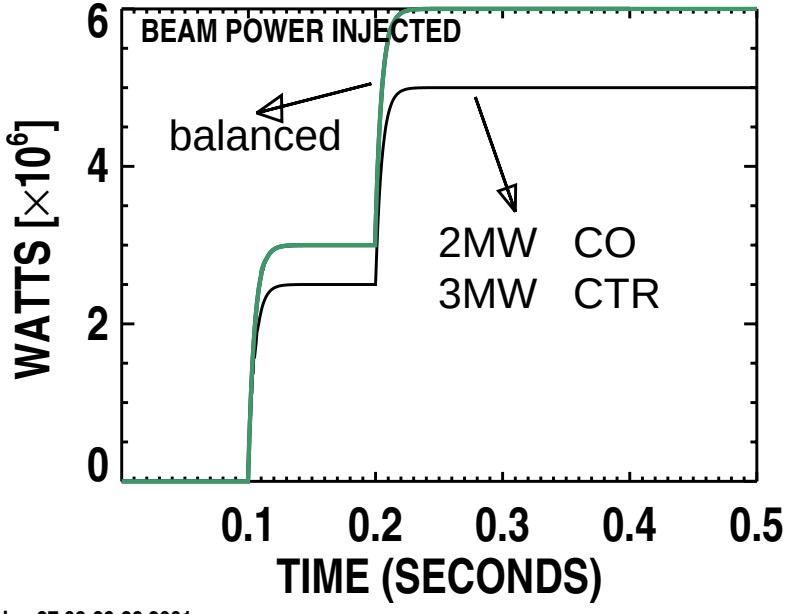

NBCD screening factor
1 - F (Zeff, ε)
1 -
Zeff
1.0
0.8
0.6
0.4
0.2
0.0
0.2
0.4
0.6
0.8
1.0
ρ

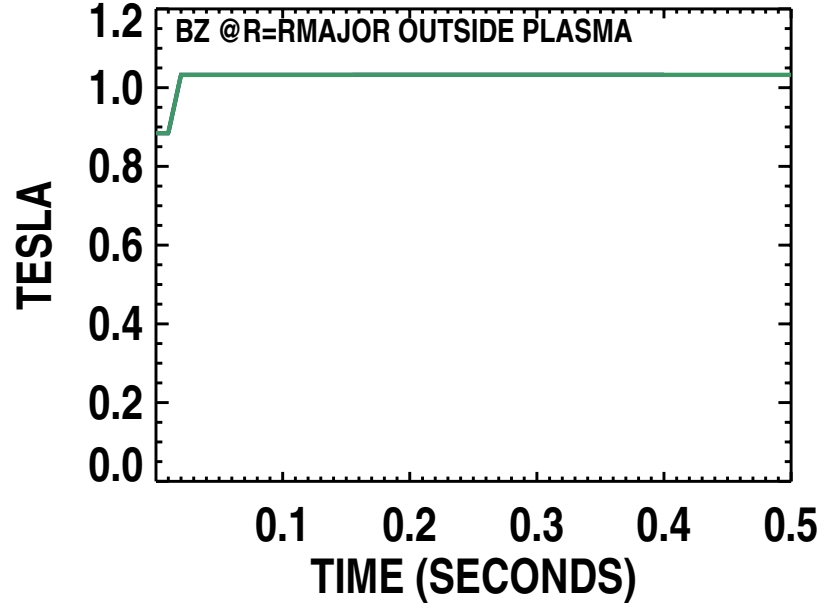

KINETIC MHD PRESSURE W/FAST IONS
PASCALS [×10^4]
4
3
2
1
0
0.0
0.2
0.4
0.6
0.8
1.0
ρ

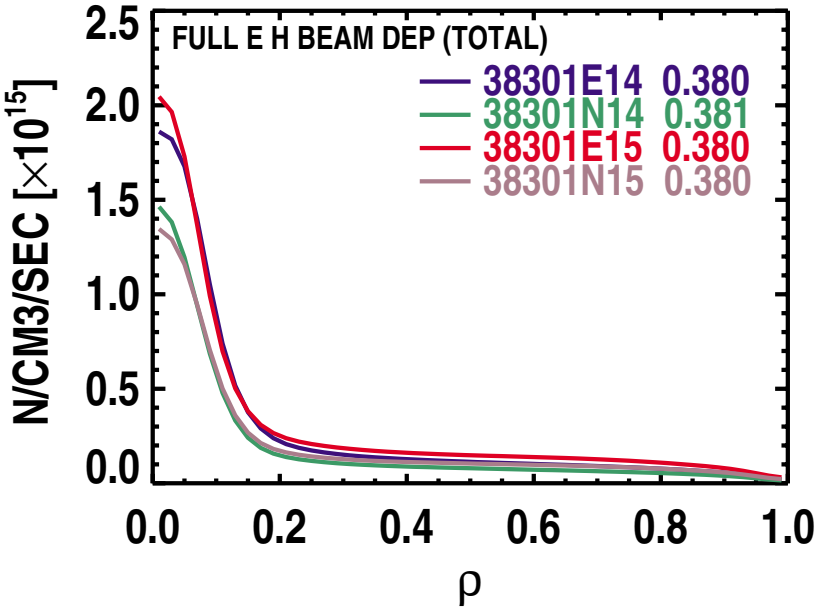

1/q
0.60
0.55
0.50
0.45
0.40
0.2
0.4
0.6
0.8
1.0
ρ

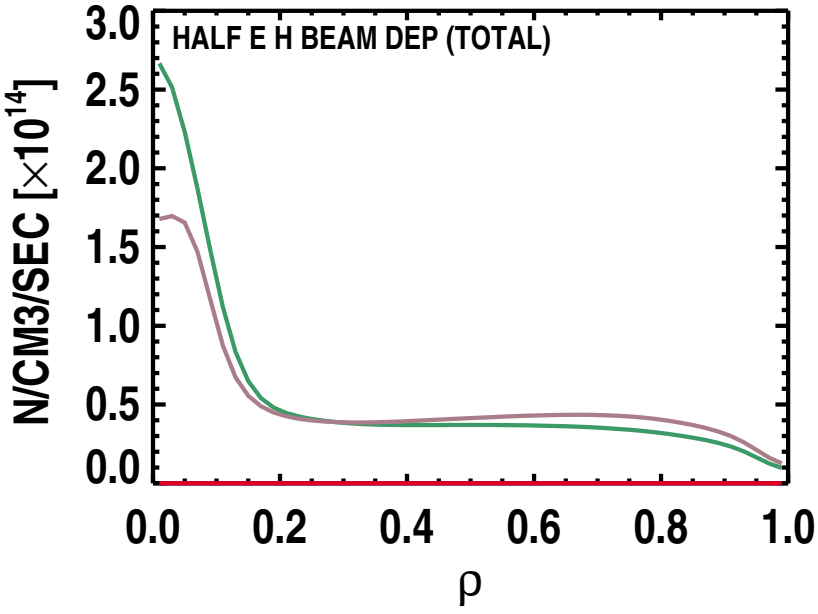

CALCULATED PLASMA CURRENT
AMPS [×10^5]
38301N10
38301N04
38301N07
TIME (SECONDS)

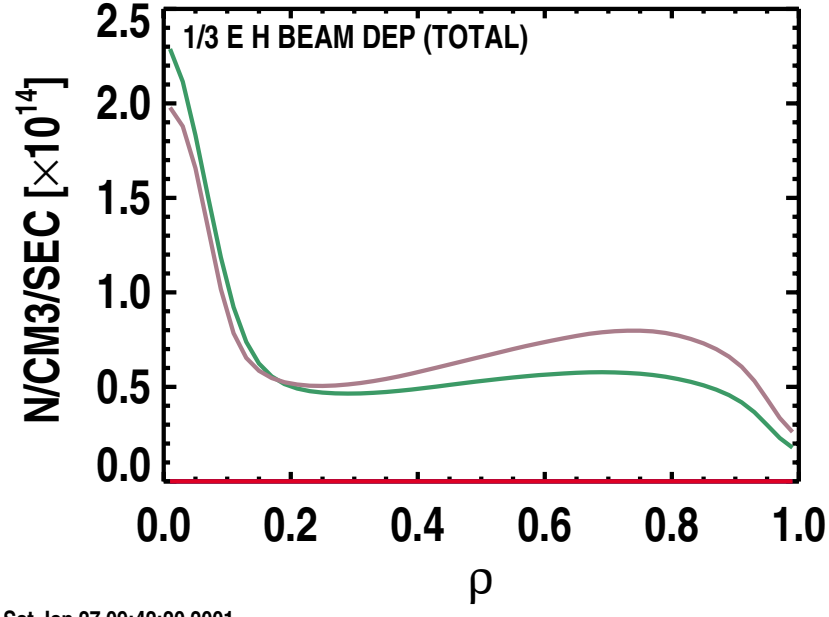

CALC.AVG. SURFACE VOLTAGE
VOLTS
Switch to voltage
Control (V=0)
TIME (SECONDS)


BEAM POWER INJECTED
WATTS [×10^6]
balanced
2MW CO
3MW CTR
TIME (SECONDS)


BZ @R=RMAJOR OUTSIDE PLASMA
TESLA
TIME (SECONDS)



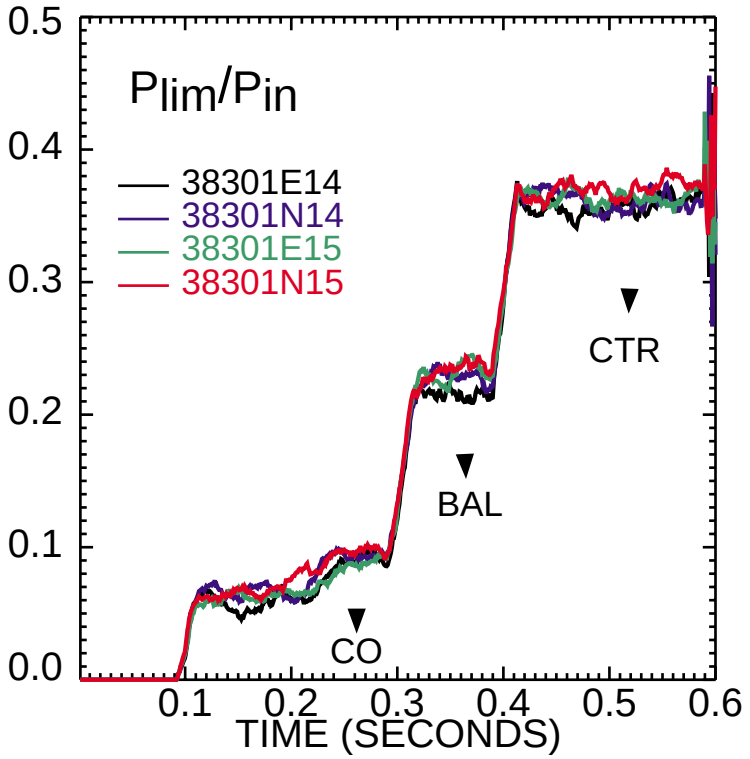


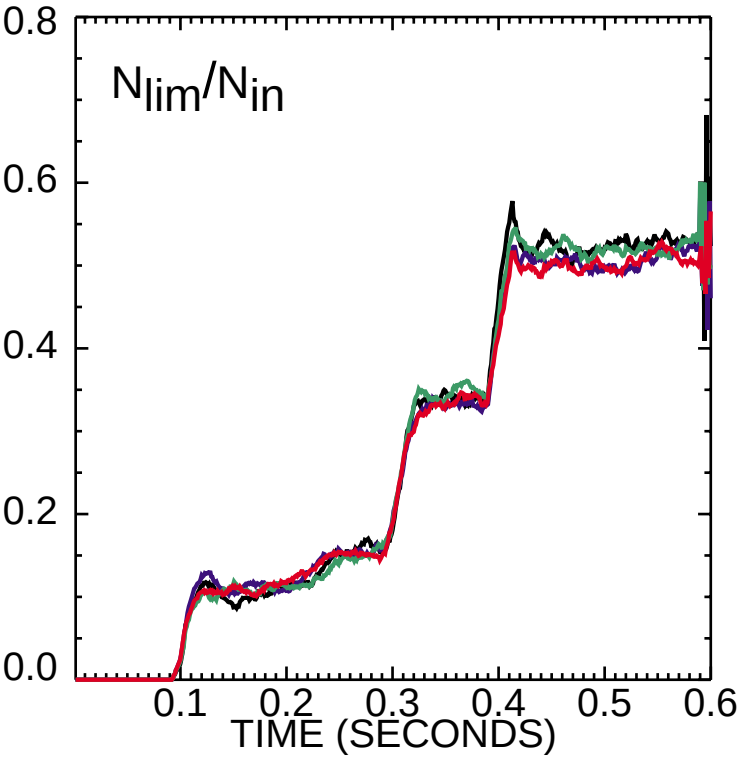


E14 - monoenergetic 50 keV
N14 - 50/20/30 mix 50 keV
E15 - monoenergetic 40 keV
N14 - 50/20/30 mix 40 keV

(Energy Fractions 0.75, 0.15, 0.11)

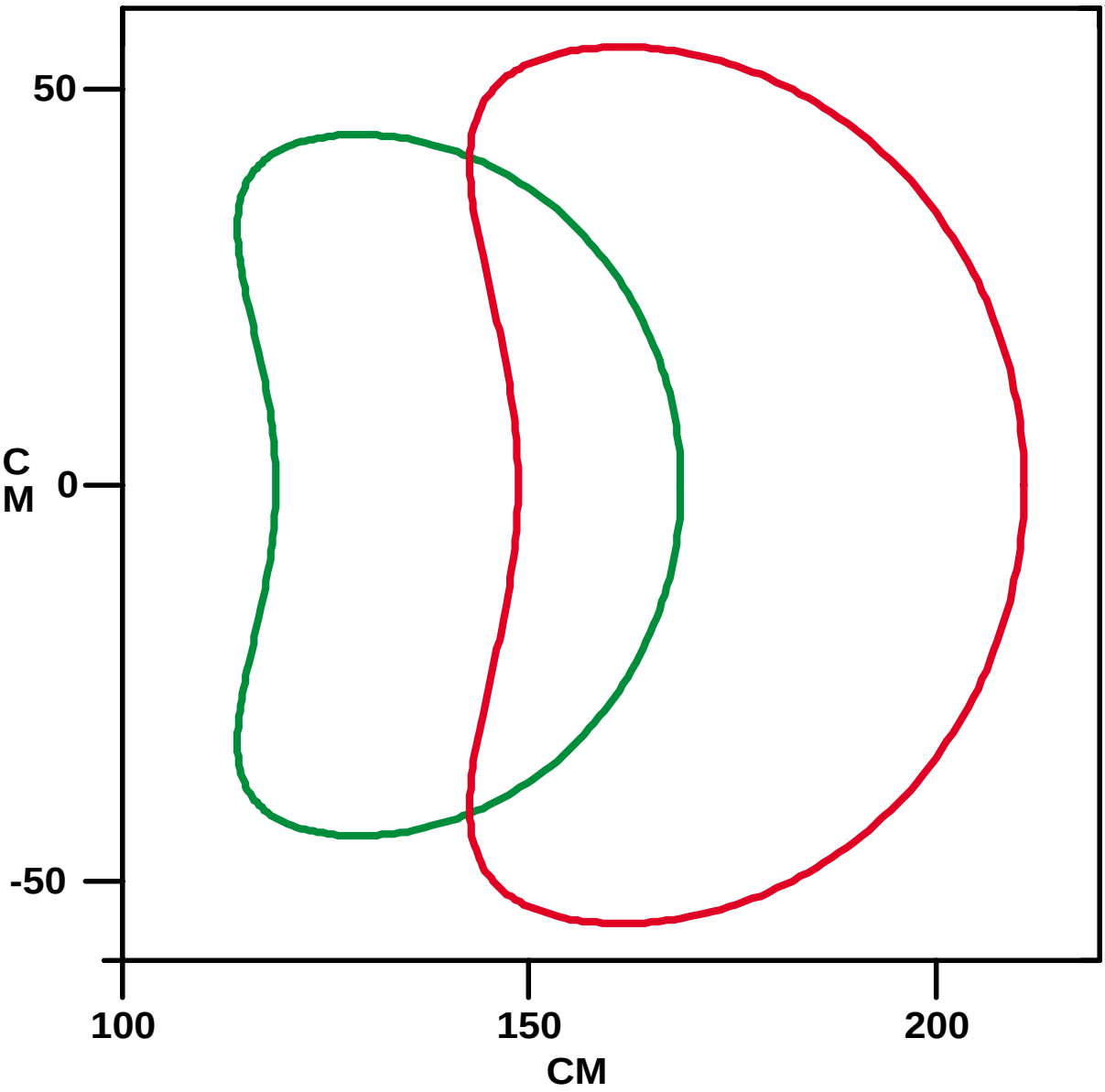
Losses appear independent of beam energy.
#loss > energy loss ==> part of loss is after slowing
Counter loss is about what Don Spong calculates, Co loss is much smaller





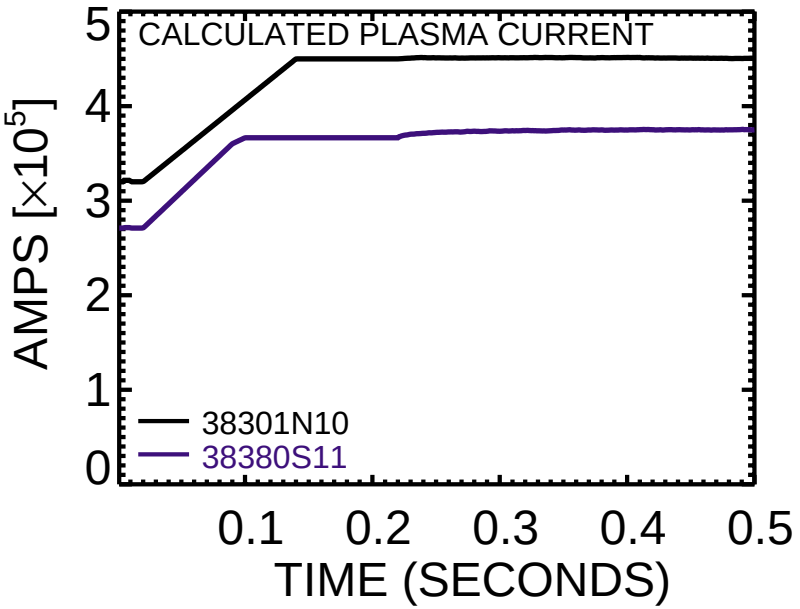
E14 - monoenergetic 50 keV
N14 - 50/20/30 mix 50 keV
E15 - monoenergetic 40 keV
N14 - 50/20/30 mix 40 keV

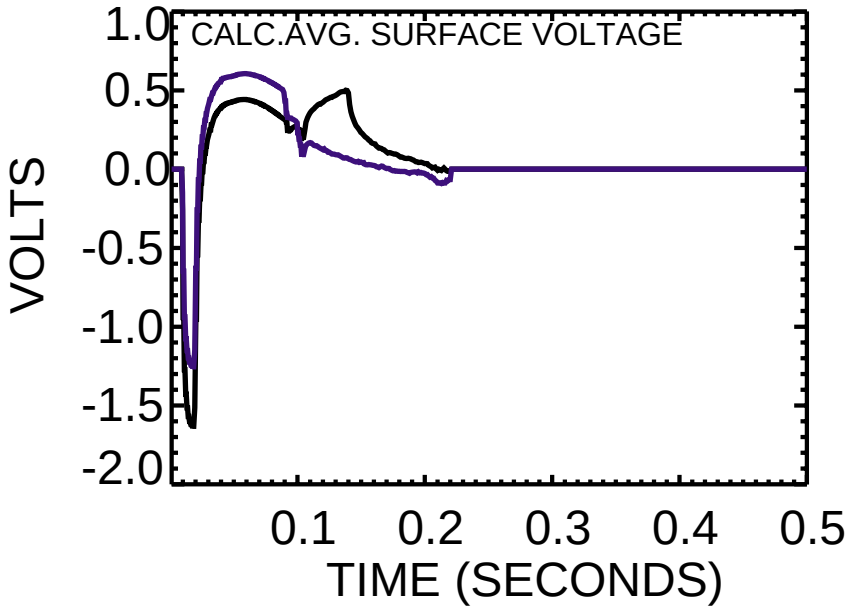
Compare LI383 with 80 % device - 38301N10 & 38380S11

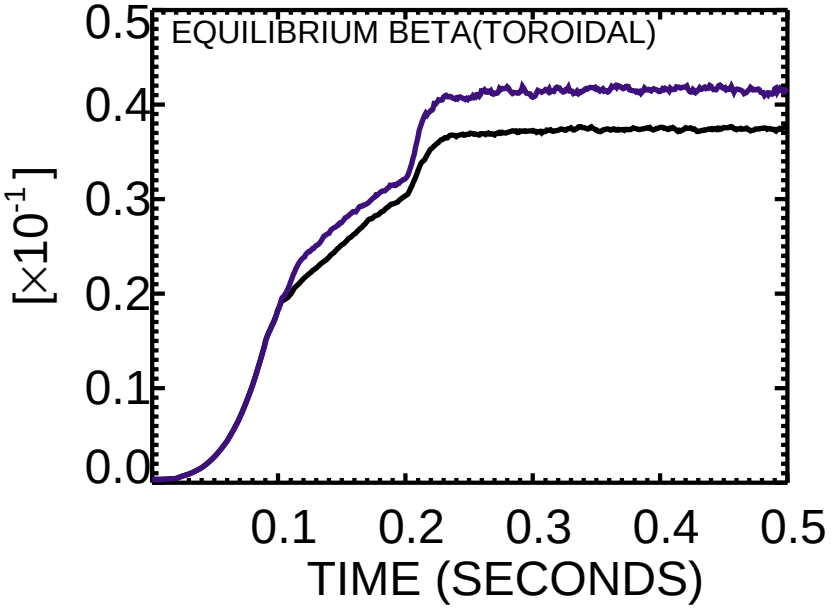


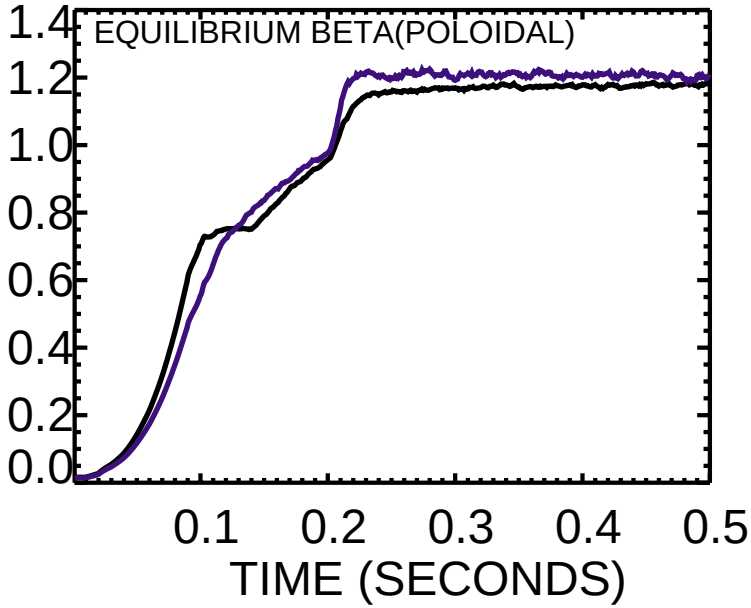
Hold Btor same
Jext: 321kA ==> 271 kA
thermal pressure - same
Zeff same
JOH = 0
Pinj same:
2MW co @ 40 keV
3MW ctr @ 50 keV

FLUX SURFACE CONTOURS: (R,Y) MOMENTS EXPANSION



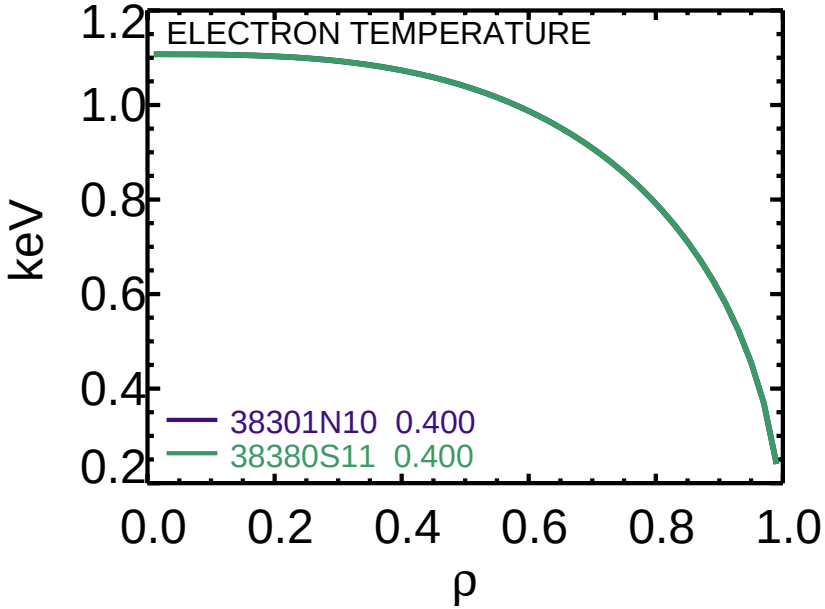


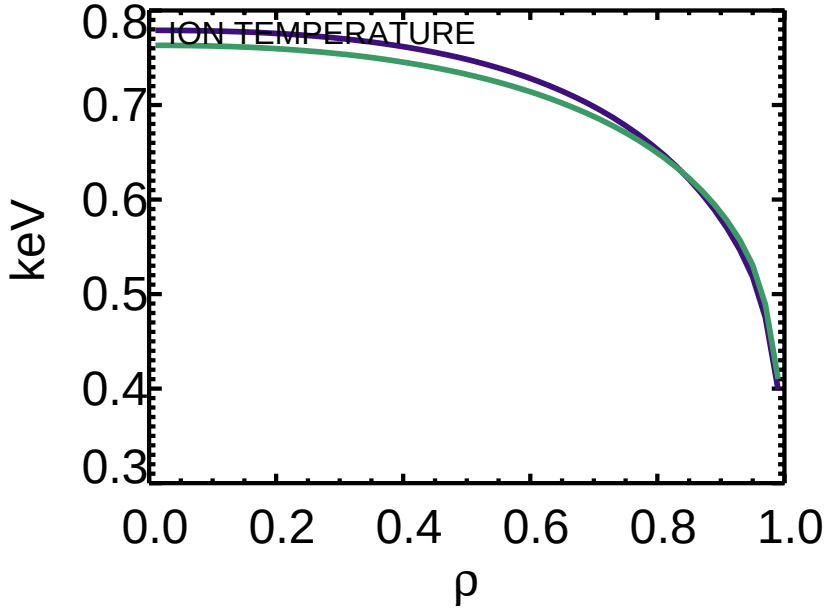


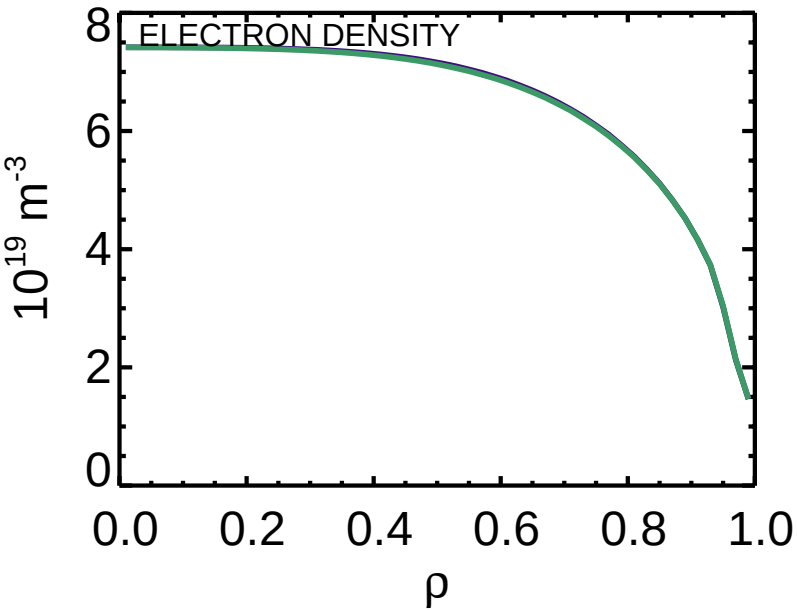


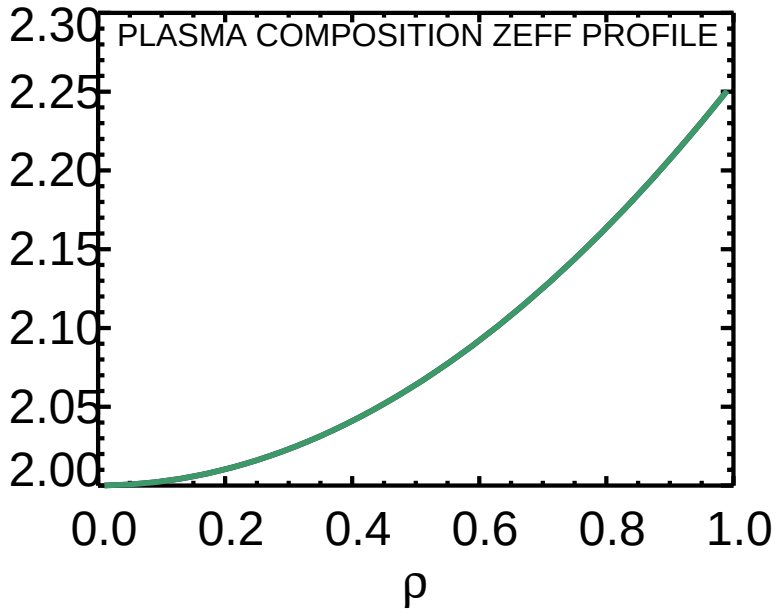
lazarus Mon Jan 29 17:48:54 2001

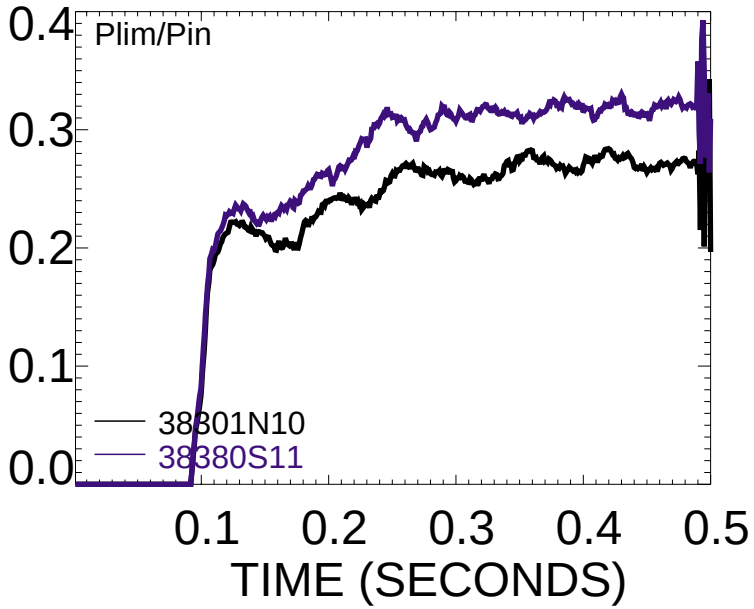
Compare LI383 (38301N10) and 80% device (38380S11) at same pressure.

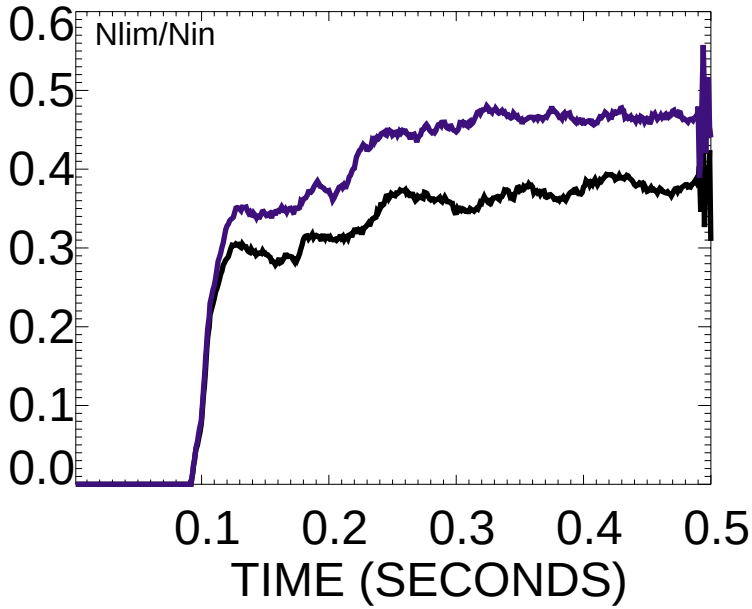


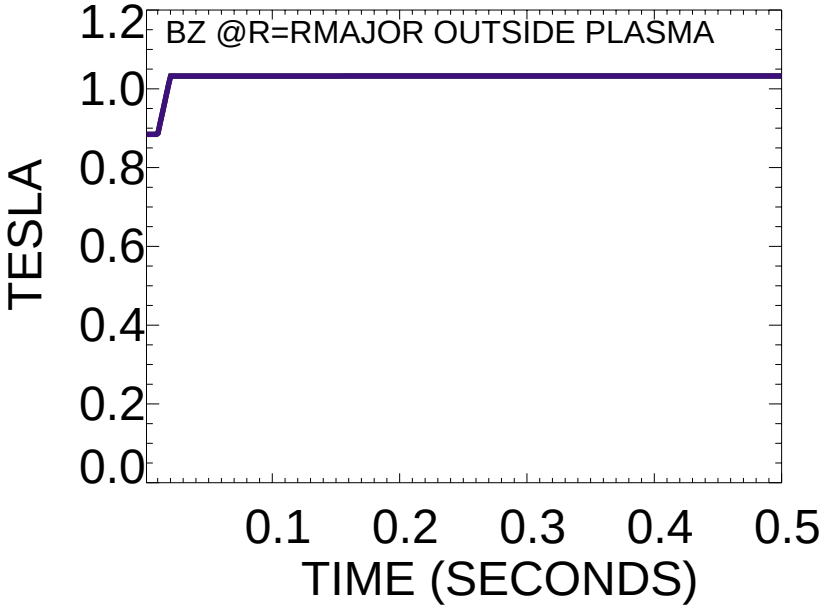


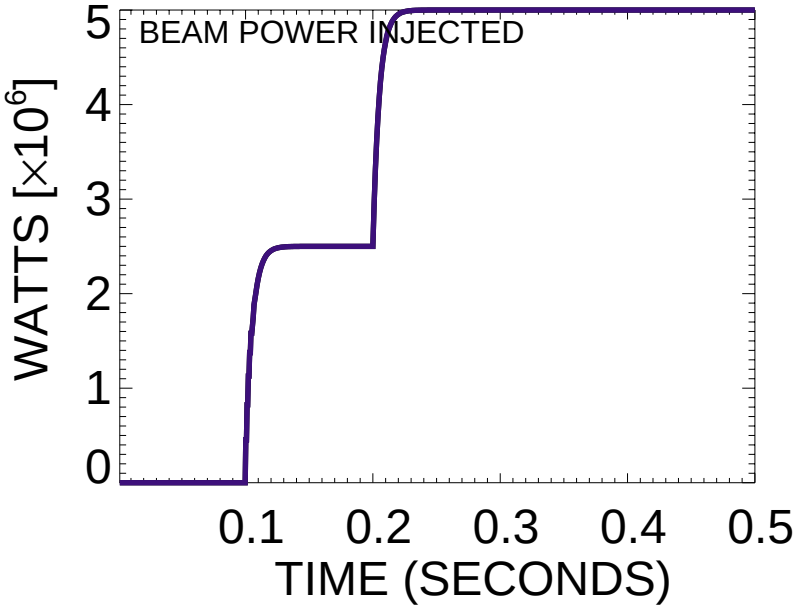




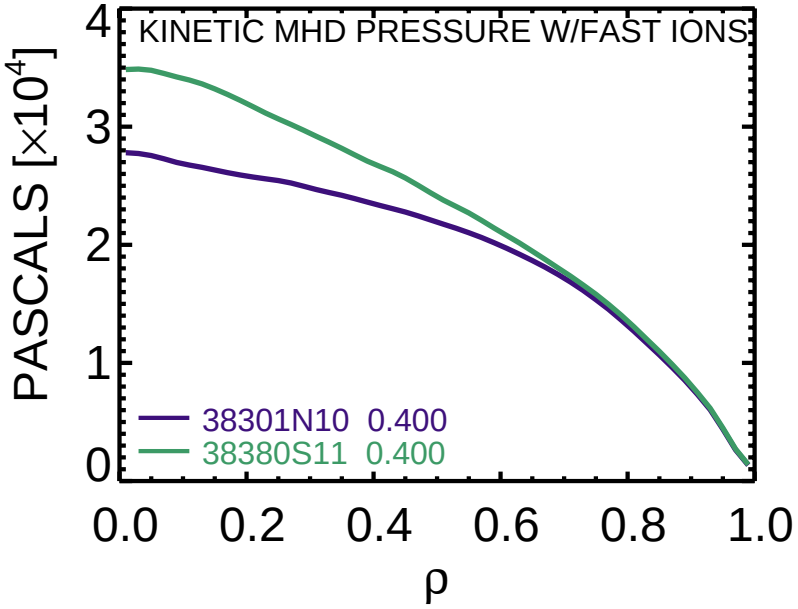


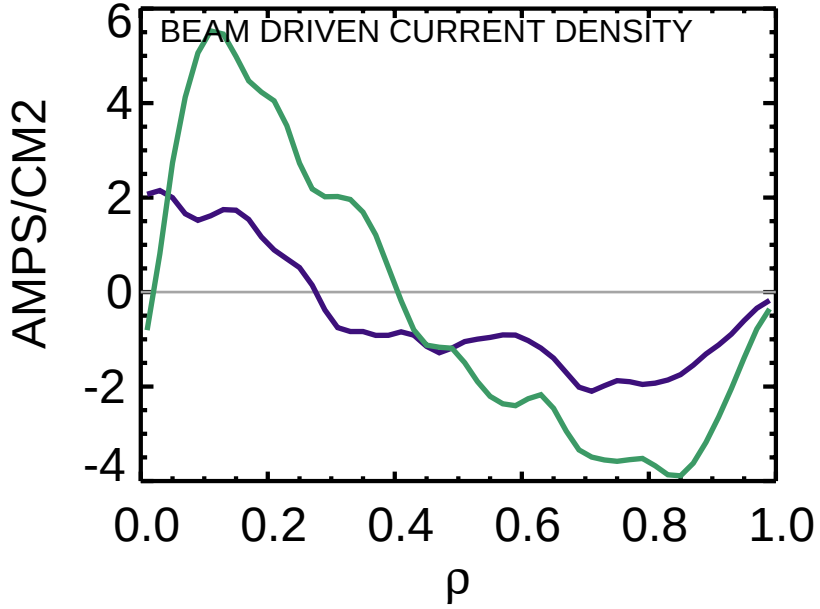


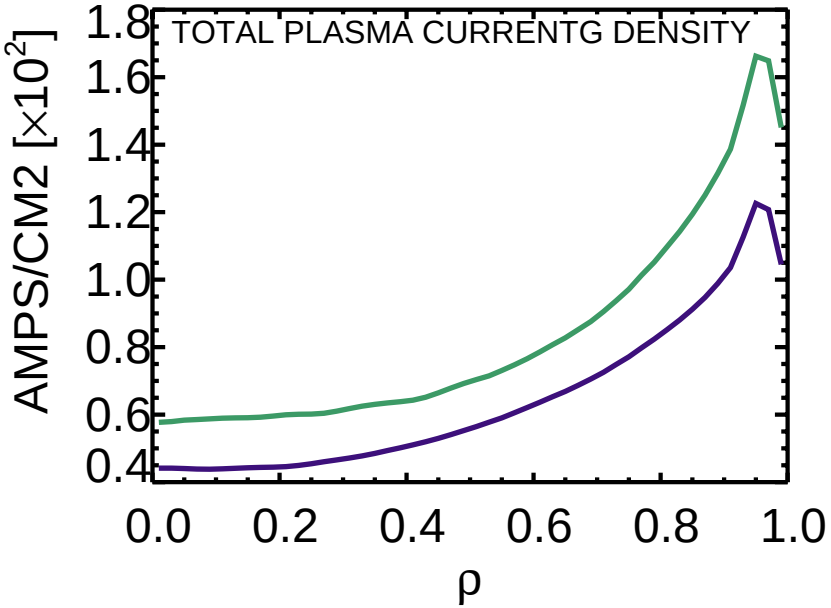


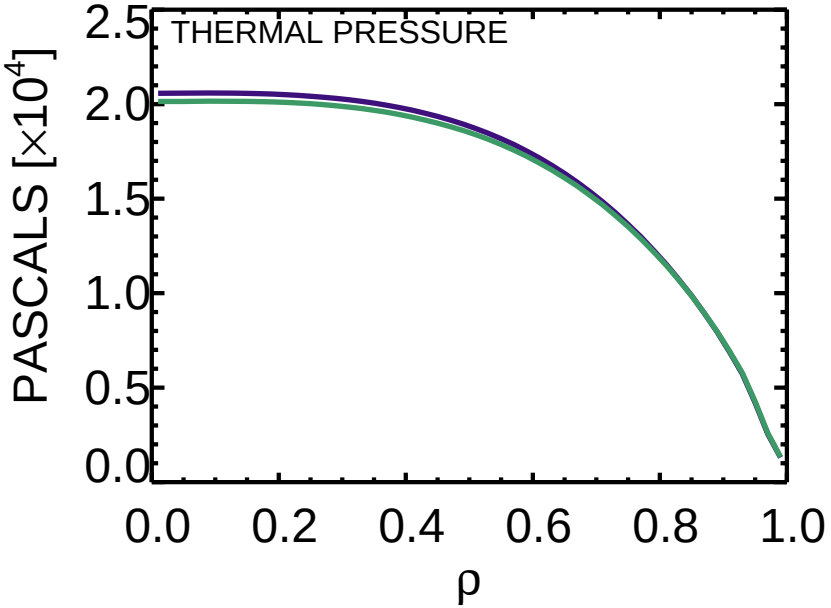


lazarus Mon Jan 29 18:02:41 2001





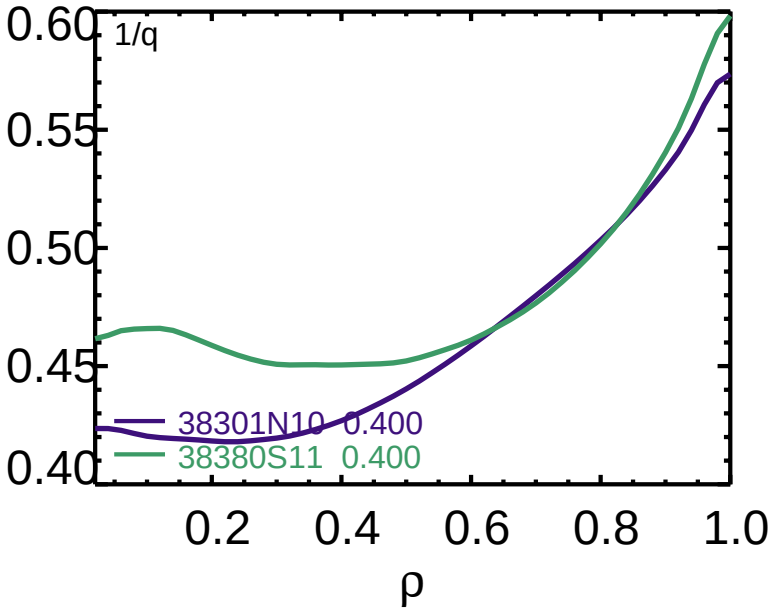


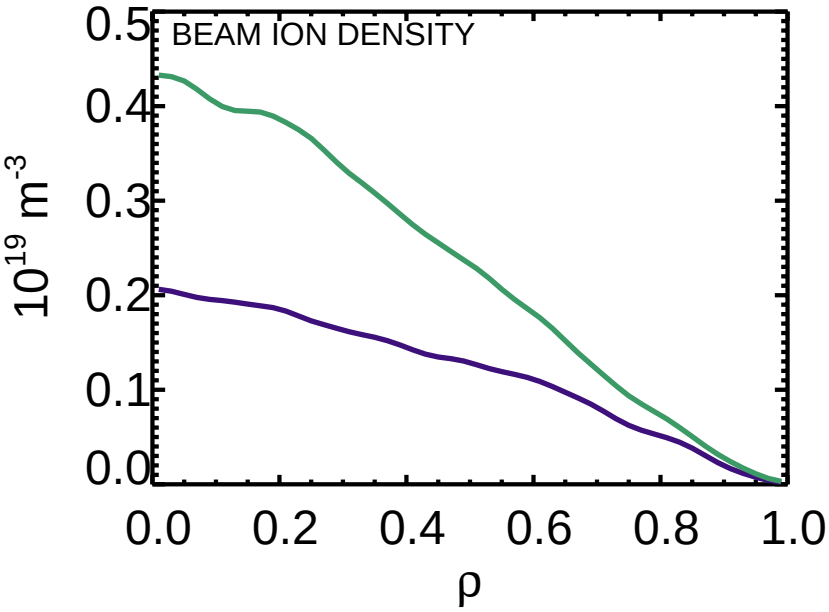


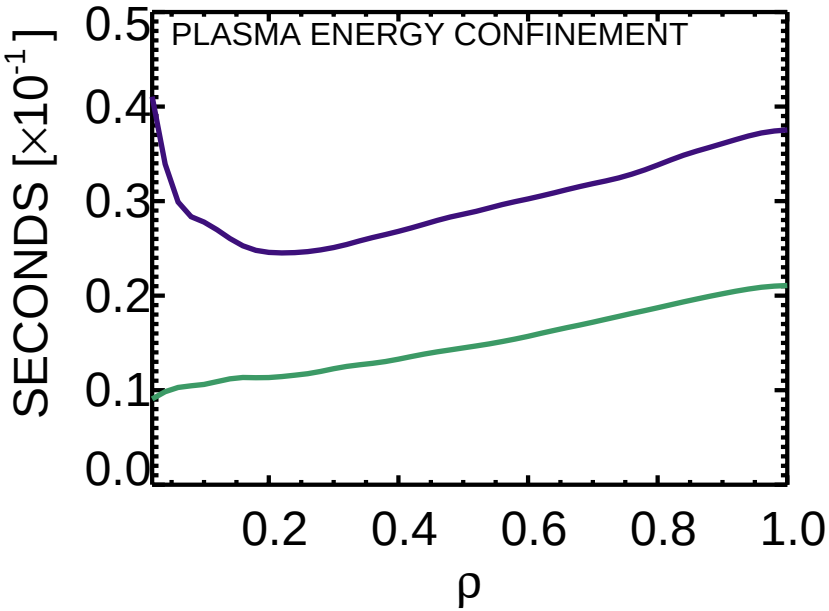
lazarus Mon Jan 29 15:07:52 2001

ptowb | curb | cur | pplas

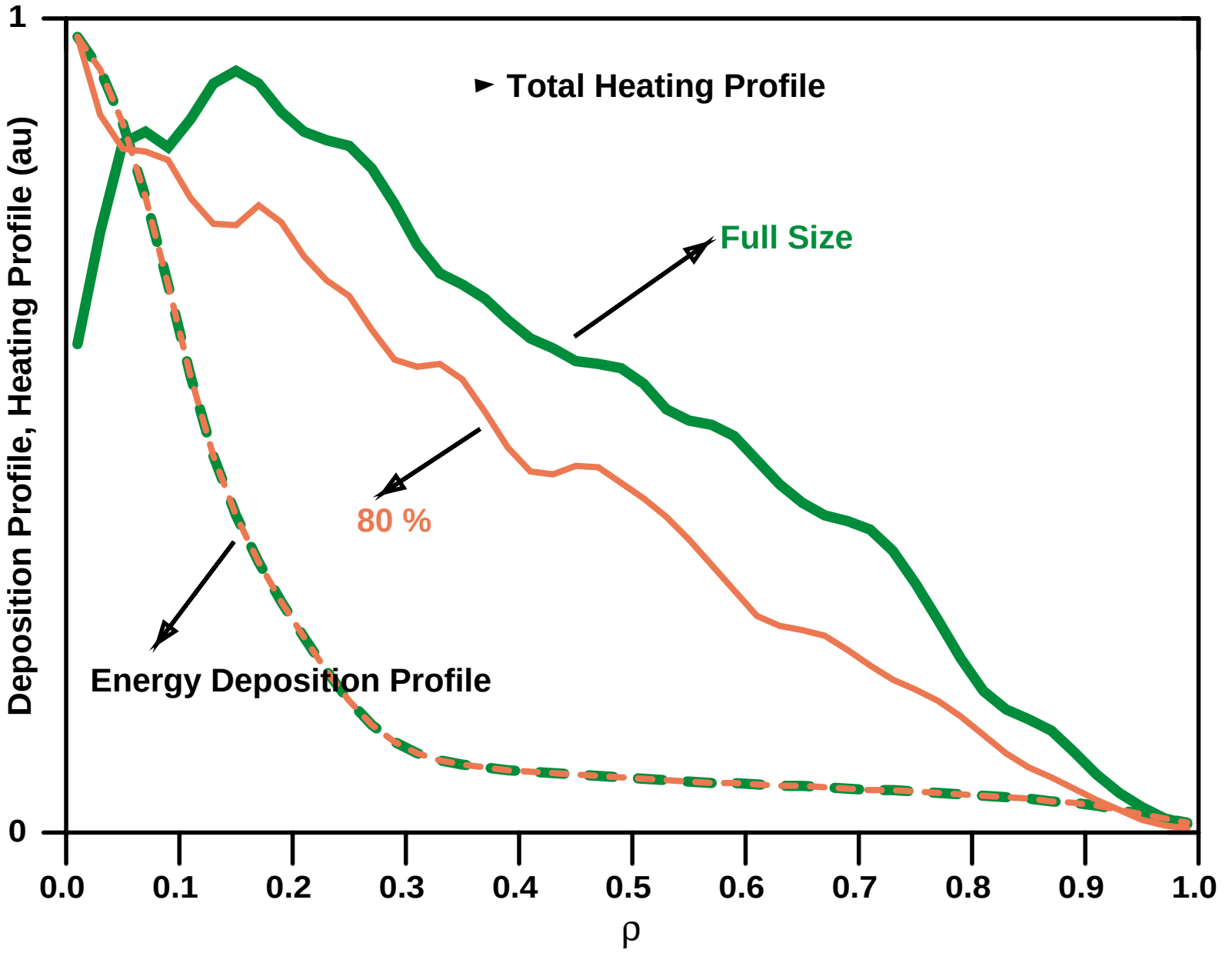
More fast ions and a smaller R lead to higher NBCD







Same Pinj into 1/2 the volume
=> higher fast ion density


1
0
Deposition Profile, Heating Profile (au)
Total Heating Profile
Full Size
80 %
Energy Deposition Profile
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
ρ