Store 3261

Alvin Tollestrup 3-13-2004

Overall losses

This store lasted for about 40 hours and started out with a record luminosity

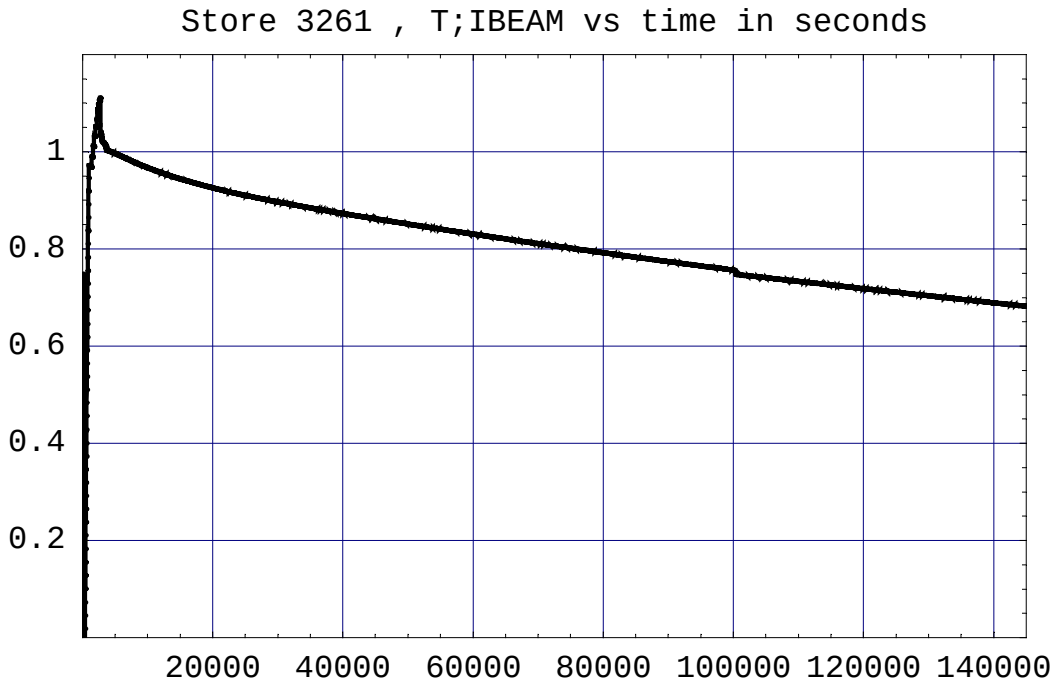


Figure 1

SBDPIS and SBDAIS were fit with a form EXP[power series]. Not there are some discontinuities in t:ibeam ...I don't know what caused these. These smooth curves were deferentiated to get the proton and pbar loss/ second. The luminosity loss and vacuum loss (1000 hour lifetime) were subtracted, giving the losses from all other mechanisms. The following two figures show these losses. The waves were caused by the two small step discontinuities at 55000 and 100000 seconds. The bottom of the curve is near the correct answer. There is a very large loss at the beginning that tapers off at a level of about 1 e7/sec.

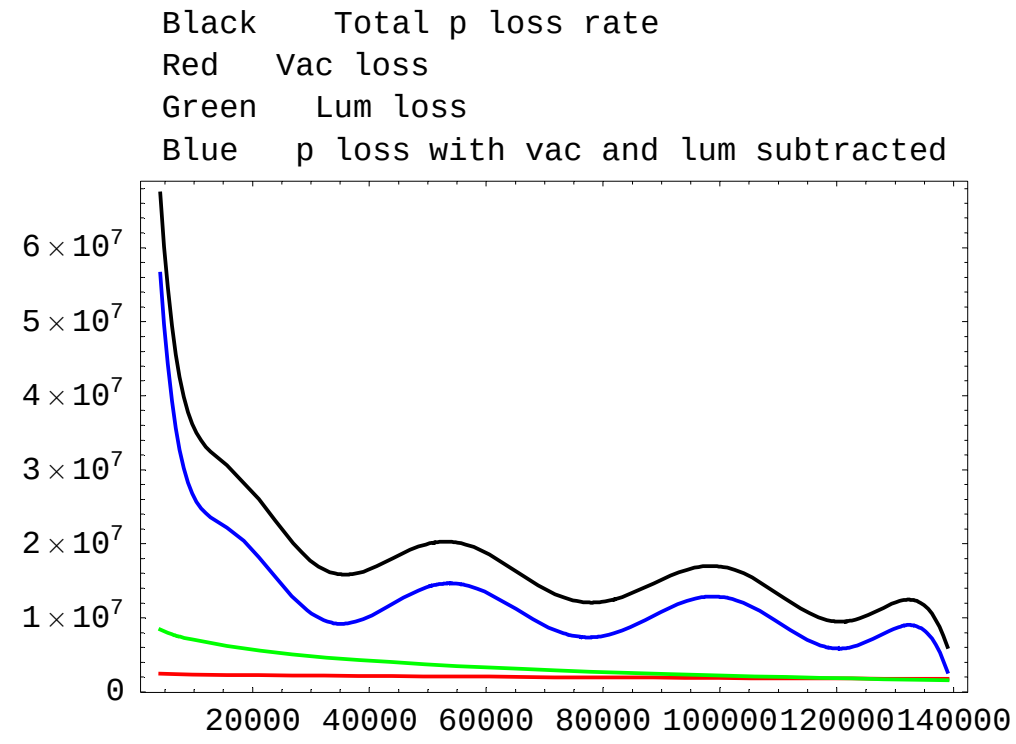


Figure 2

The corresponding loss for pbars is shown in fig 3.

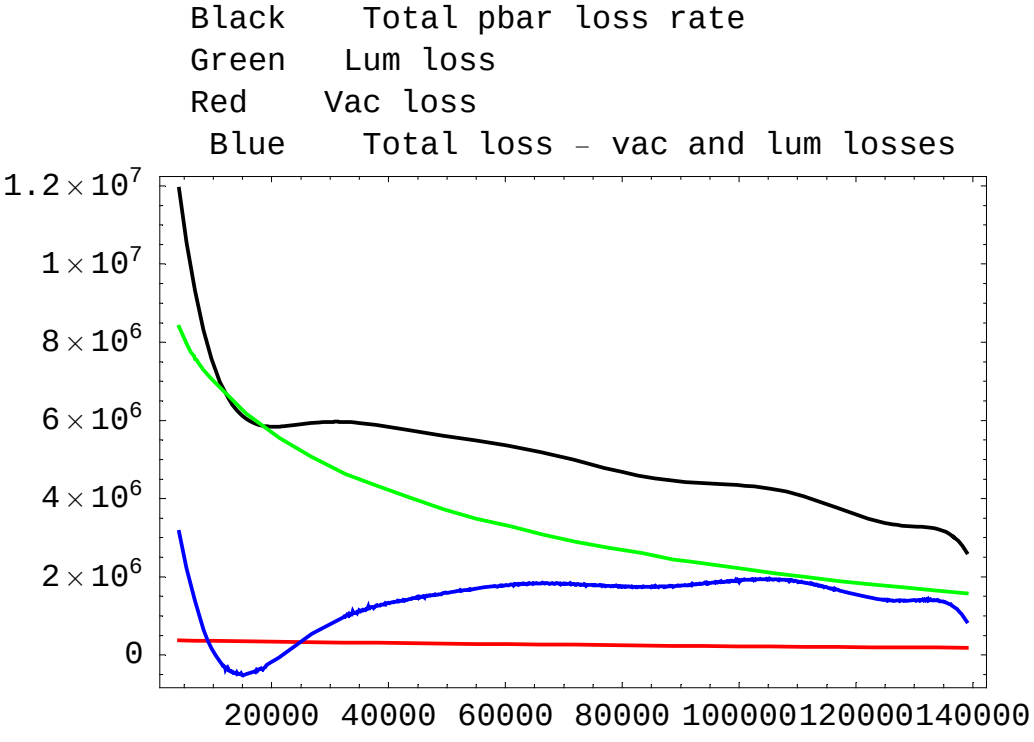
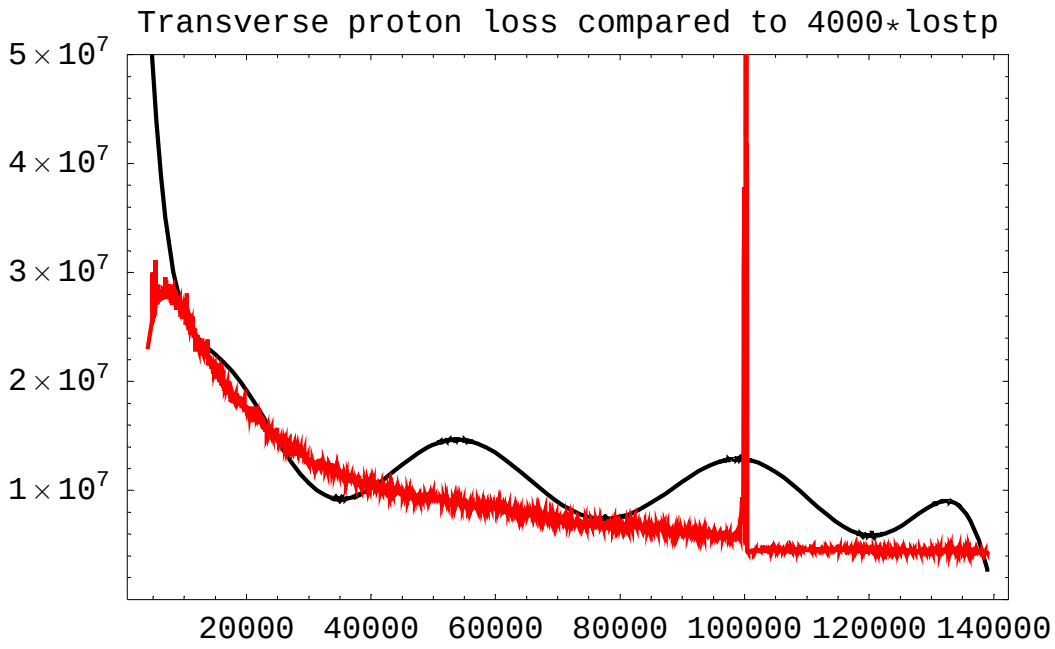


Figure 3

the green curve is caused by the luminosity loss which dominates. However as in the case of the protons there is a large loss rate near the start of the store. Later, the luminosity loss becomes comparable with the sum of the other losses. If these losses could be eliminated, it would improve the L lifetime.

For reference, we give two additional curves. The first shows lostp (orange) and compares it with the proton loss curve, the second shows the abort gap losses E0LABT.



Abort gap counter E0. The structure was due to somethng going on with the TEV long dampers. There could be some question about whether this influences the next section of this note.

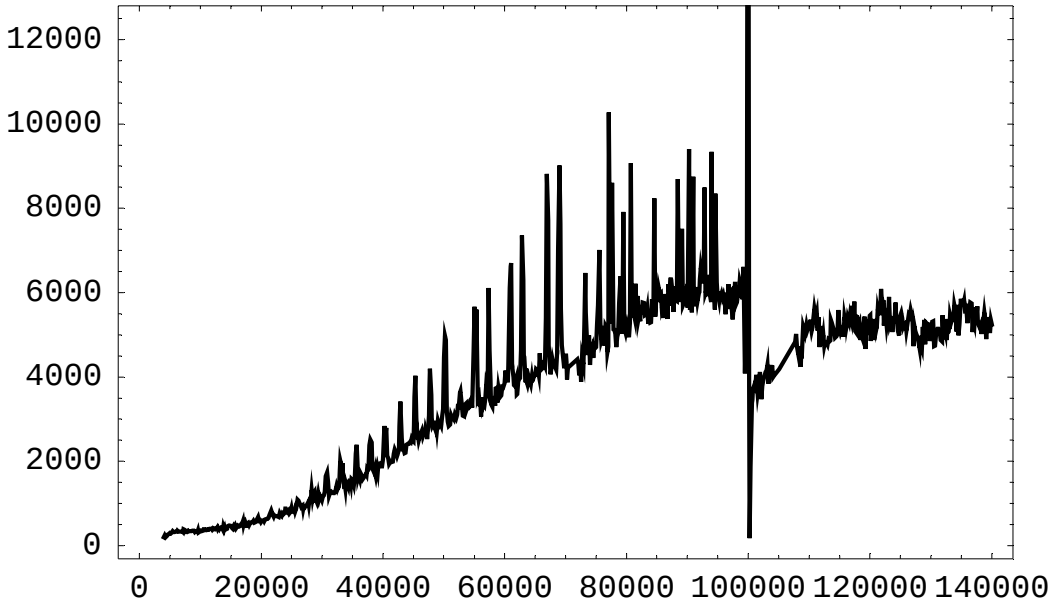


Figure 4

Injection and acceleration

The data here will always consist of superimposed proton and pbar bunches so that the whole 36 bunches are treated as an ensemble. this has the effect of smoothing out the "dancing bunch" effect. The first two curves show the proton and pbar bunches just before and just at the end of cceleration: (The store number should read 3261!)

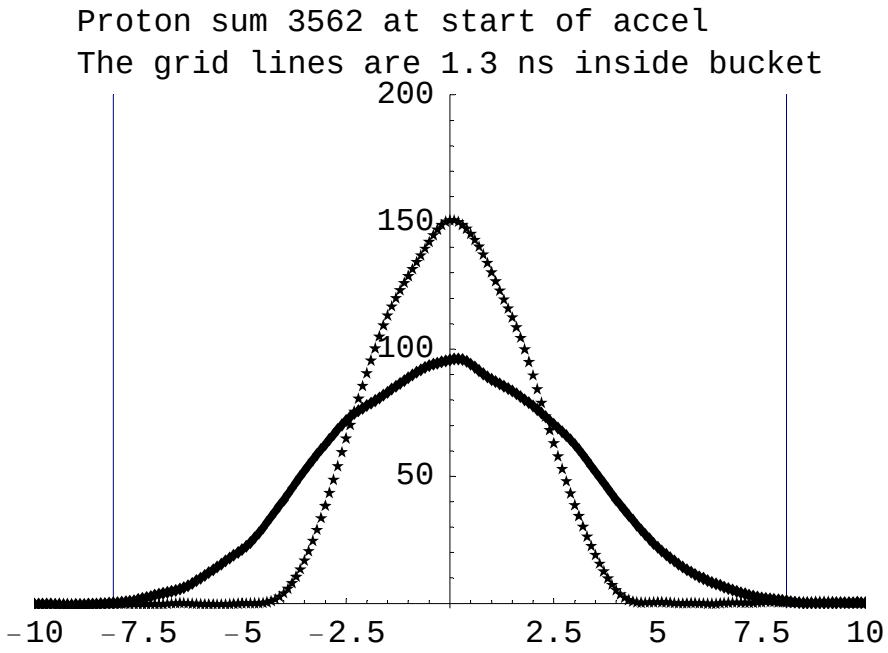


Figure 5

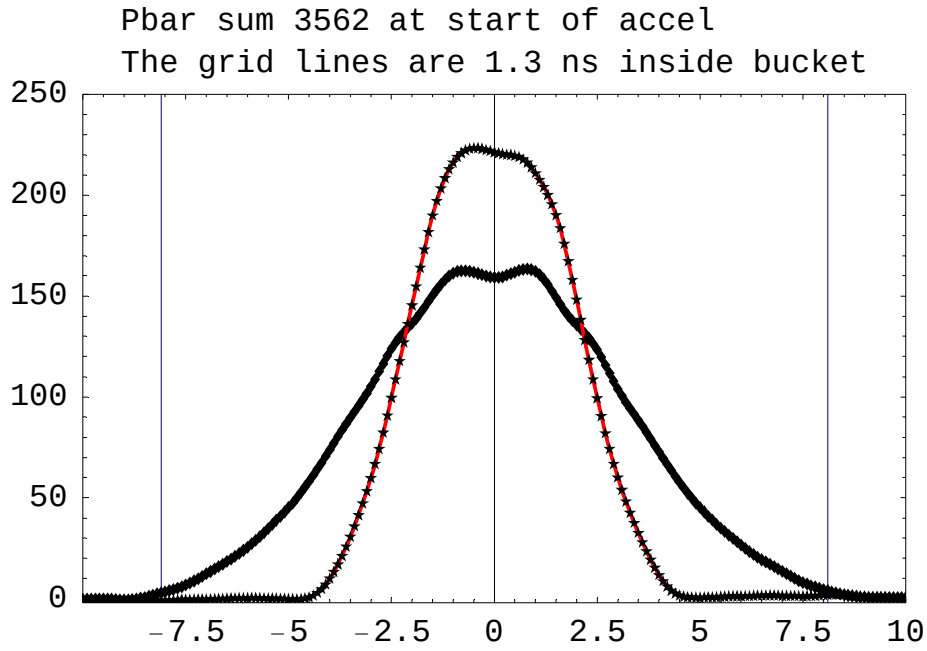


Figure 6

The vertical lines are the limits of what can be accelerated and are 1.3 ns from the bucket boundry. They are equal to an emittance of 4.0 eV-sec. There was a little saturation at 980 of some of the pbar bunches which accounts for some of the flattening at 980. The shape at 150 is ok.

The next two curves show the phase space density vs eV-sec for protons and pbars. The orange curves are at 150 and extend out to 4 eVsec whereas the blue is at 980 and the bucket goes out to 11 eVsec. It is seen thatthere is very little distortion during acceleration

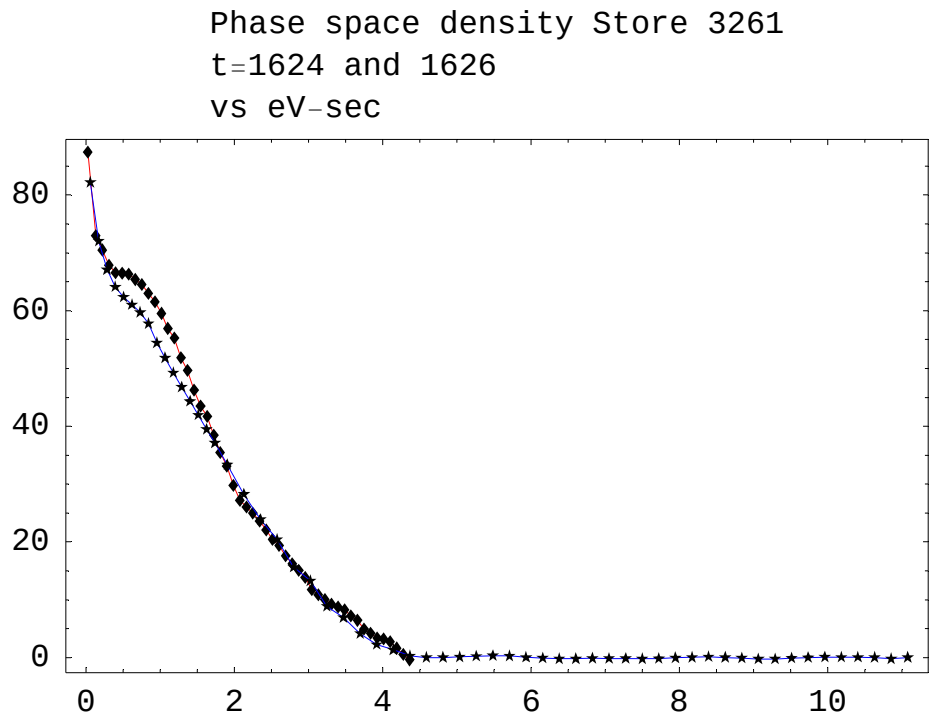


Figure 7

for the pbars, we truncate the plot at 4.5 eVsec.

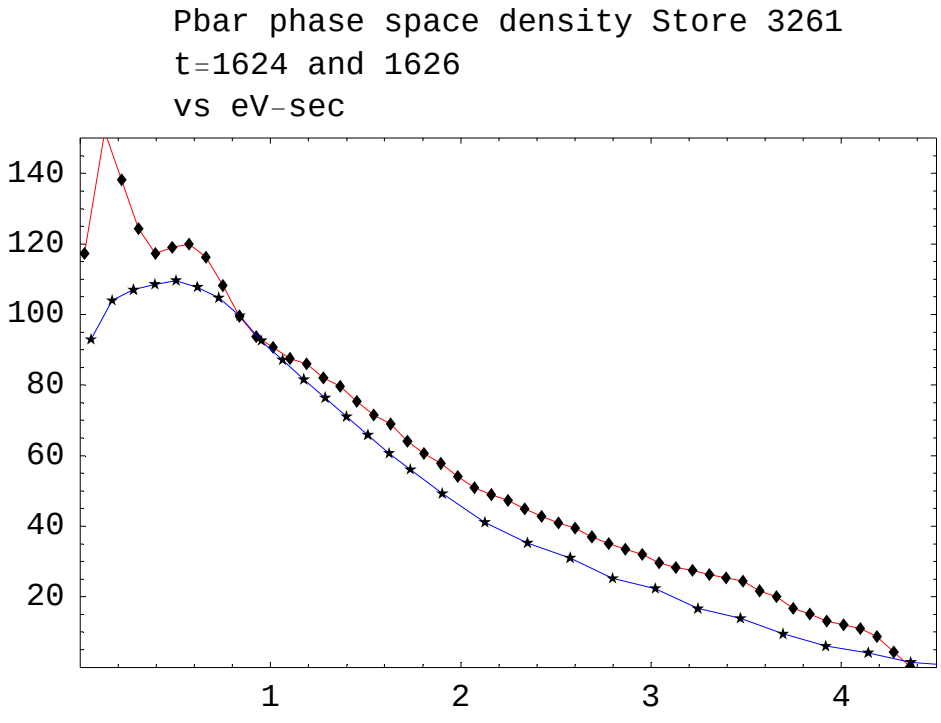


Figure 8

The following is a table sumarizing some of the injection-acceleration numbers for pbars:

	150	980	Ratio intensities
pbarSum	1288.15	1091.77	0.843519
coefPbar	252.322	210.025	0.833109
momDistPbar	3.88477×10^{10}	3.26938×10^{10}	0.841589
rms width ns	2.9967	1.71663	
Mom width	7.76435×10^{7}	1.27898×10^{8}	
Mom/width	2.59096×10^{7}	7.45049×10^{7}	
Energy/Time	2.94161×10^{7}	7.68259×10^{7}	
EoverT at 1ns	3.05361×10^{7}	7.75255×10^{7}	

The first three rows are just the area under the different distributions and the 150/980 ratio. The mom/width is the rms momentum width divided by the rms pulse width. For small time widths, the ratio should just be given by the ratio of the longtidunal phase ellipse axies and is the number in the bottom row. As the pulse gets wider, this ratio falls and the value in the next to last row comes from using the measured Trms with an ellipse to get Prms. The actual ratio is is some 13% different at 150 and is less at 980 due to the narrower pulse widths.. This number is the one used to calculate the contibution of the momentum dispersion when using the flying wires.

Behavior during the store

The following data come from 78 SBD readings taken every 1/2 hour during the store and shows that the beam comes into an equilibrium distribution.

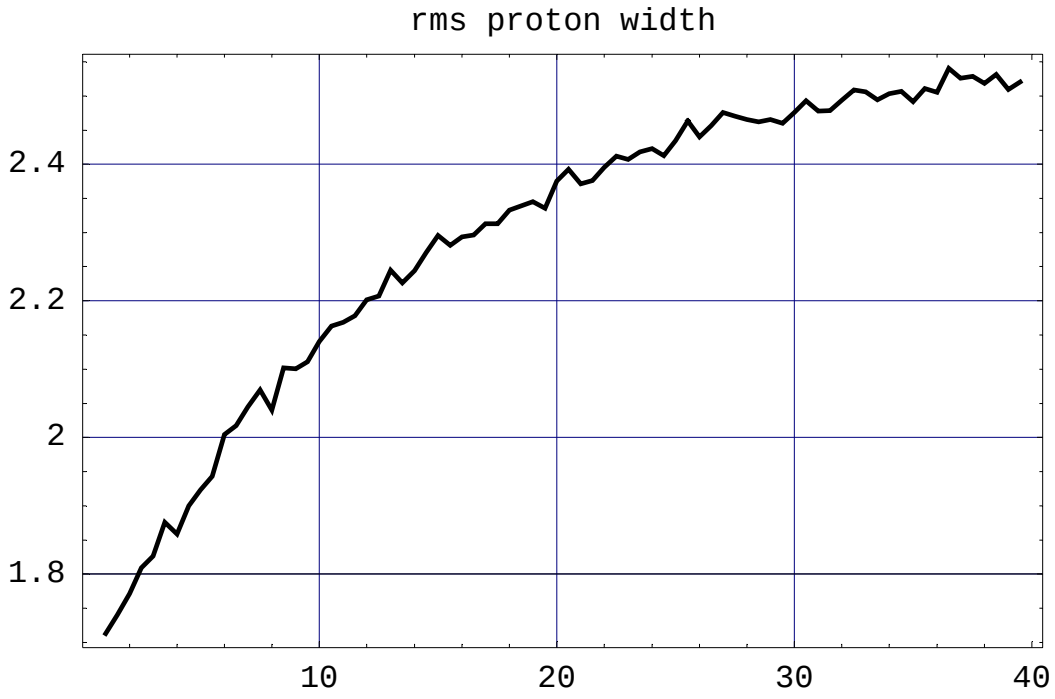


Figure 9

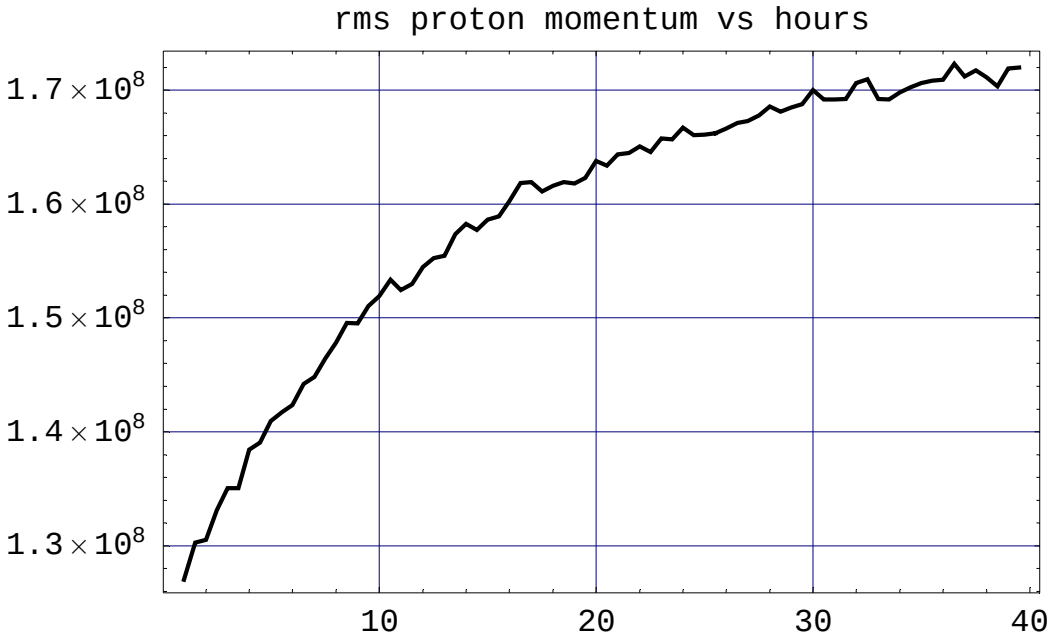


Figure 10

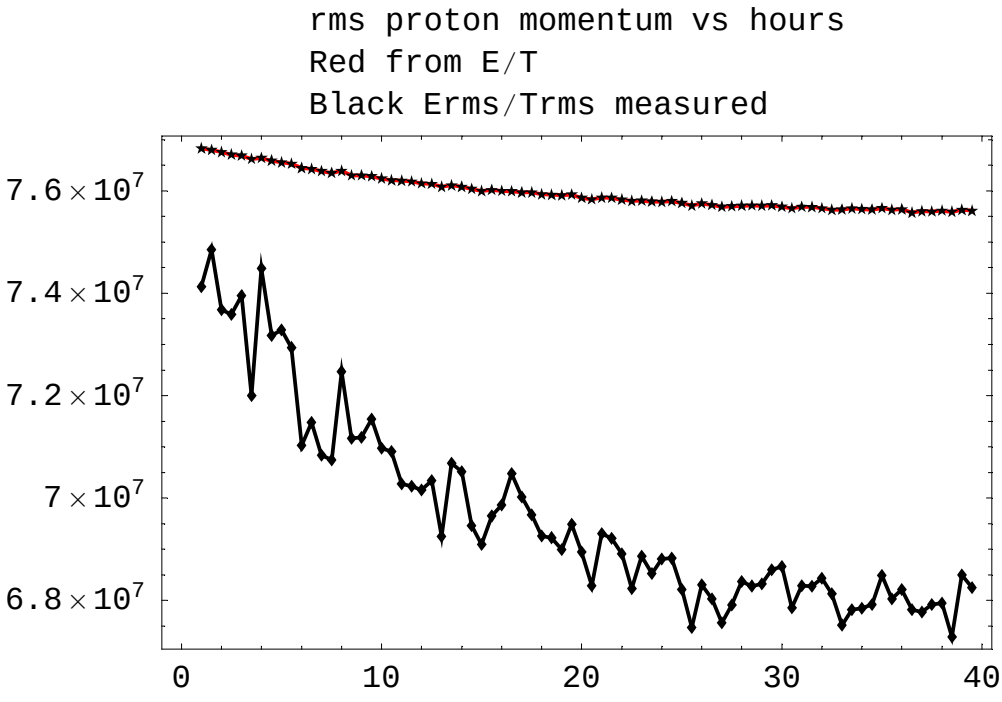


Figure 11

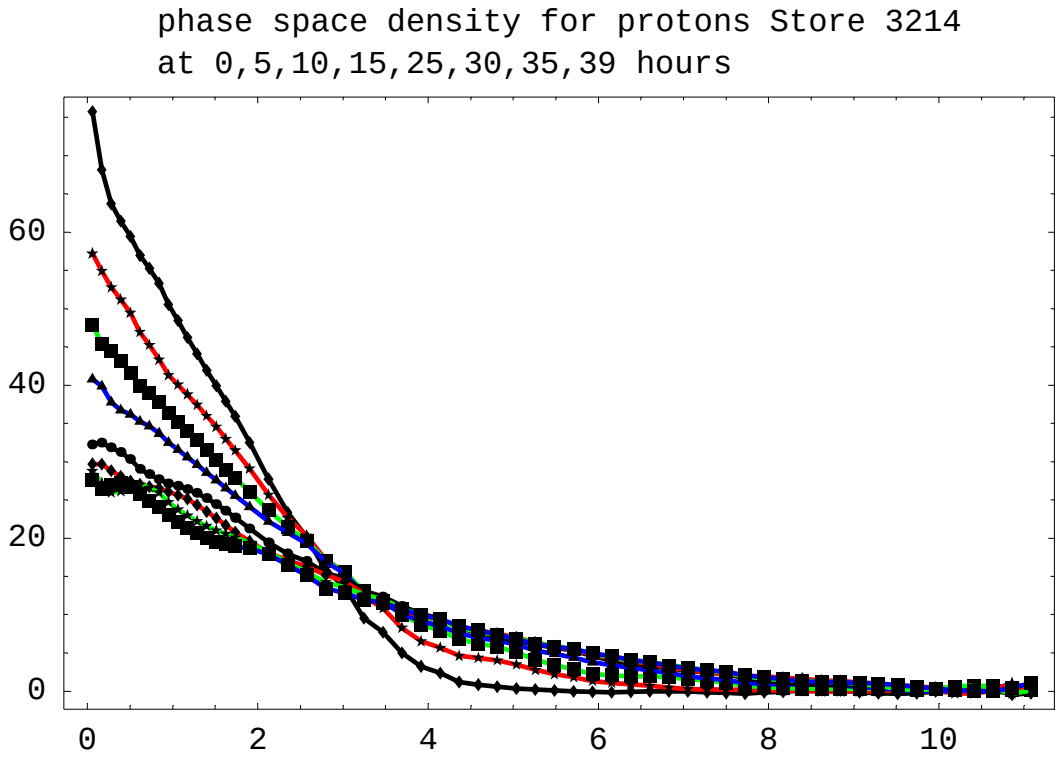


Figure 12

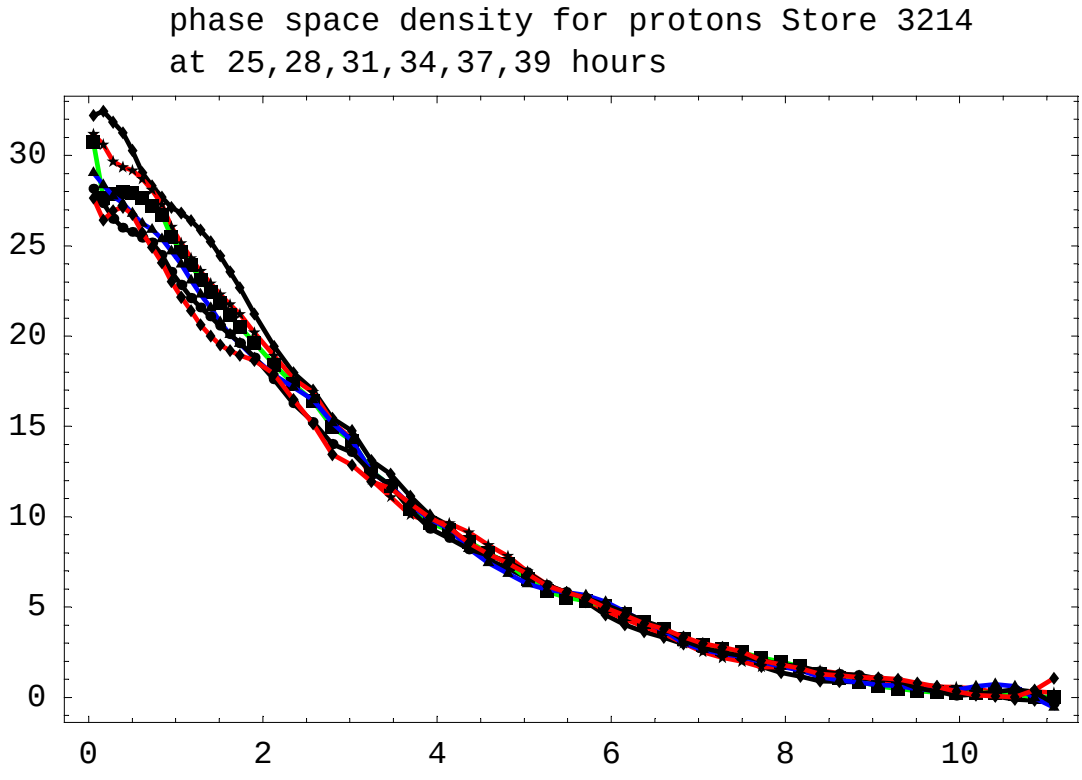


Figure 13

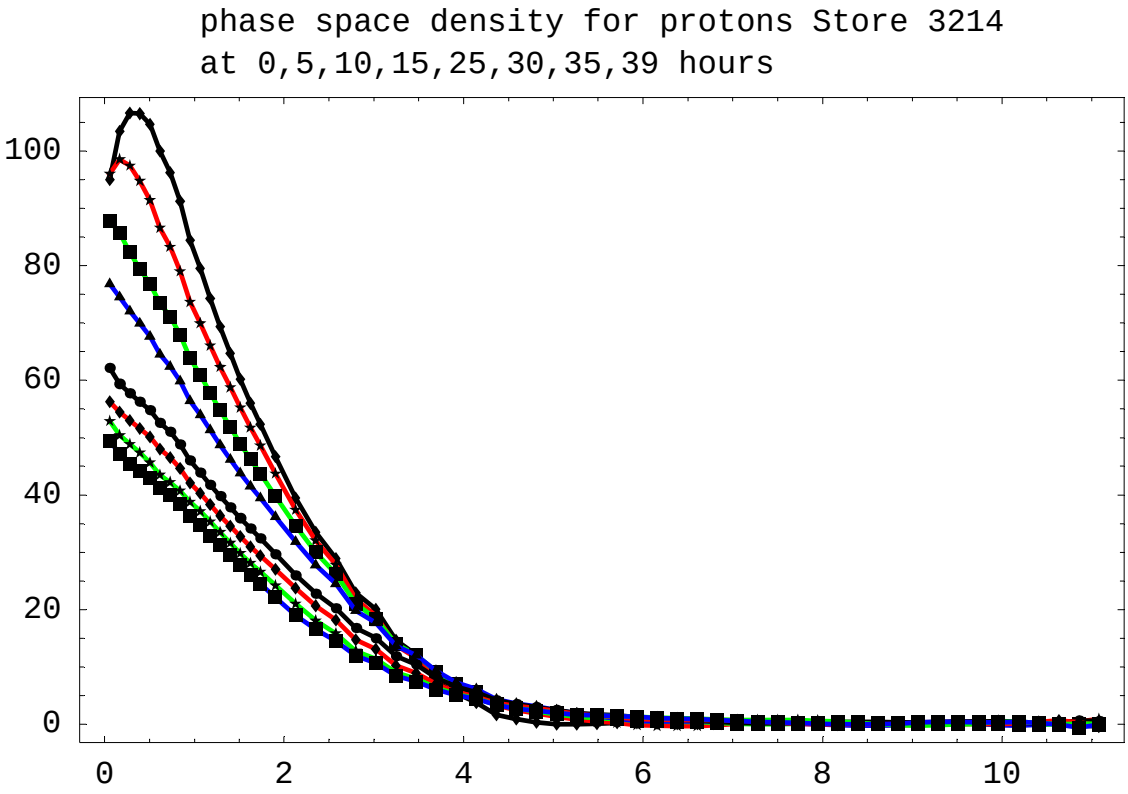

phase space density for protons Store 3214
at 0,5,10,15,25,30,35,39 hours
100
80
60
40
20
0
0
2
4
6
8
10

Figure 14

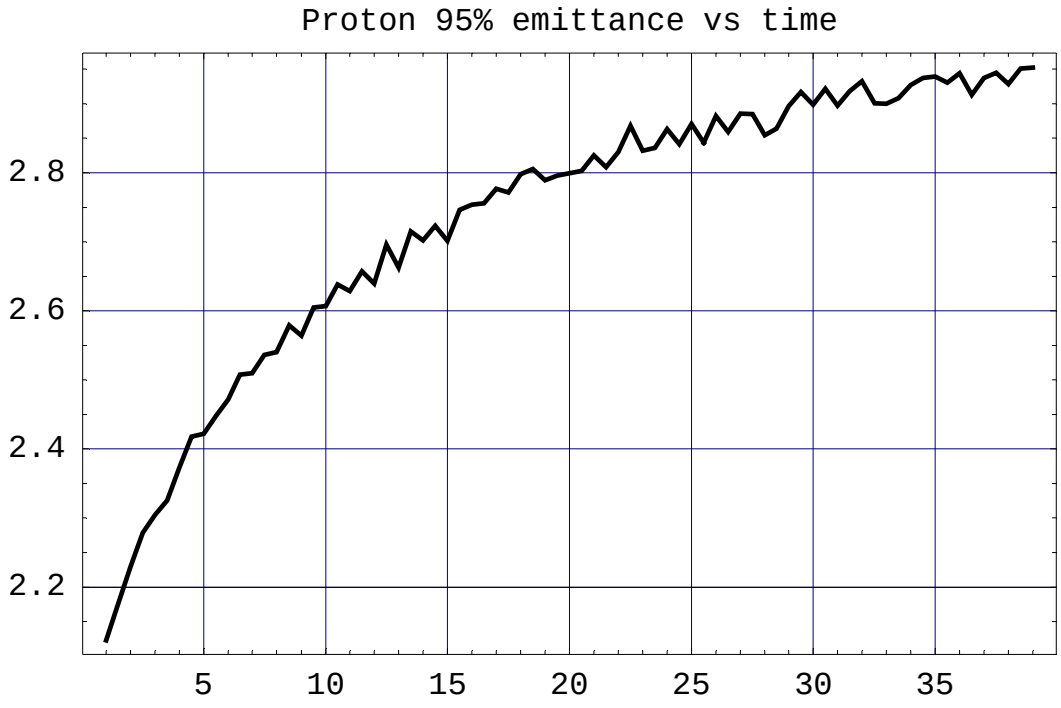


Figure 15

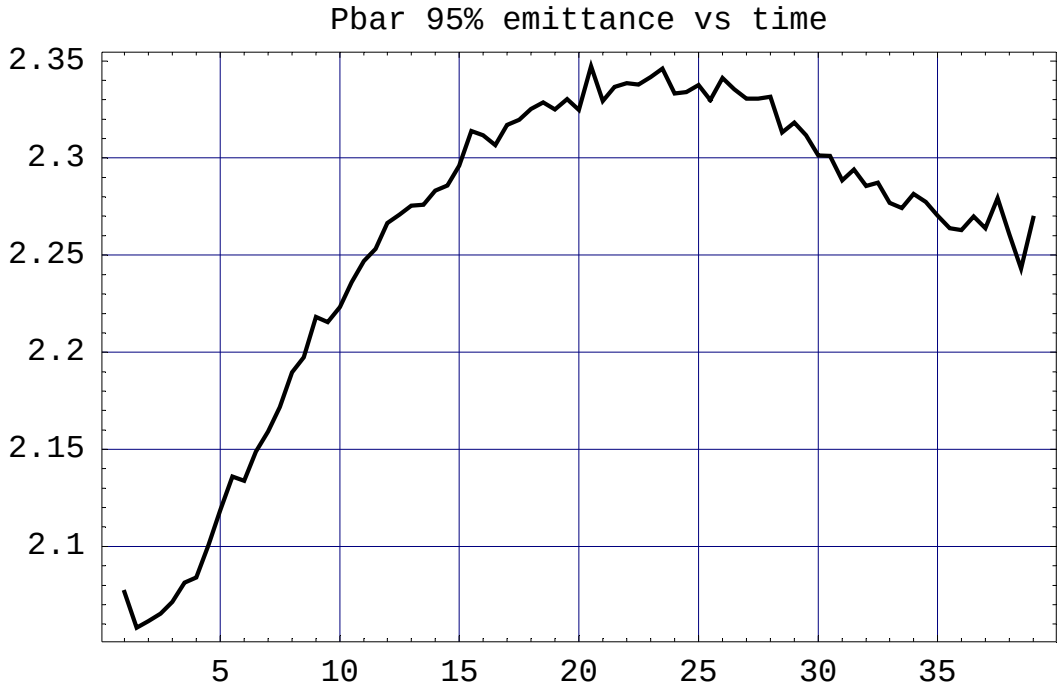


Figure 16

3D proton distribution

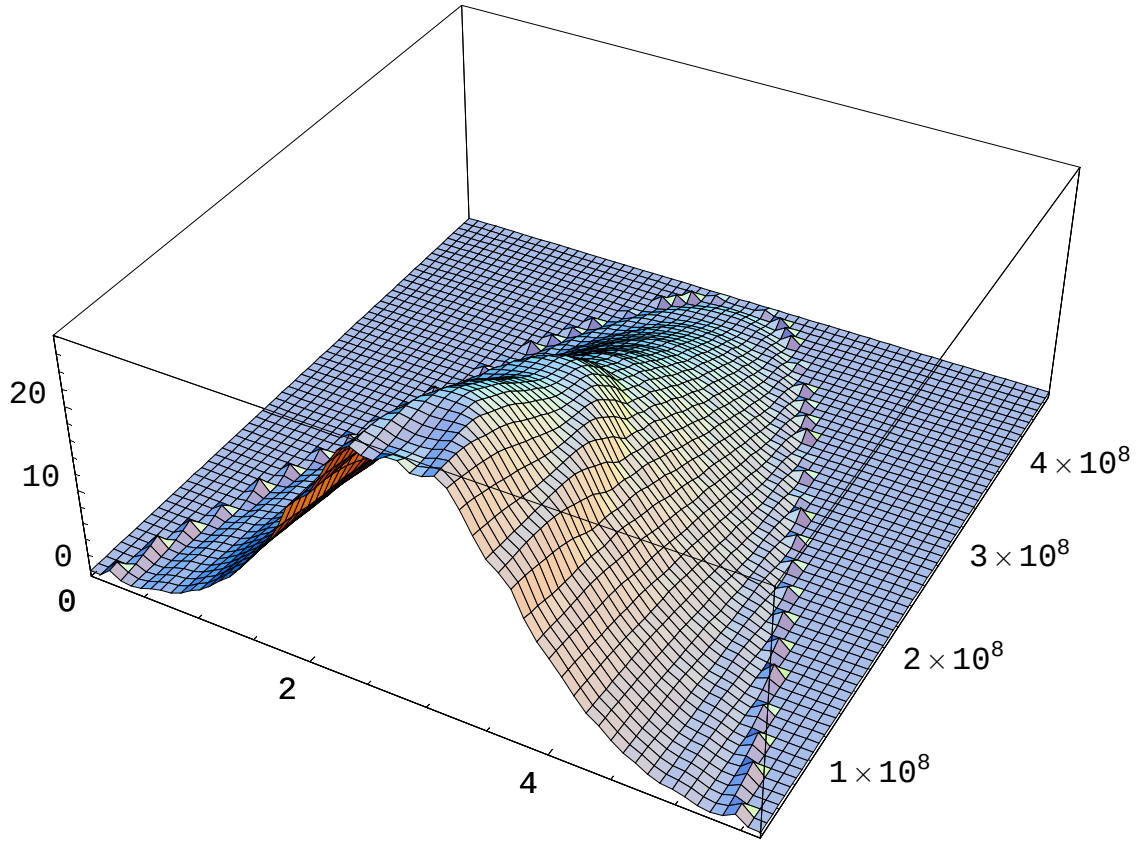
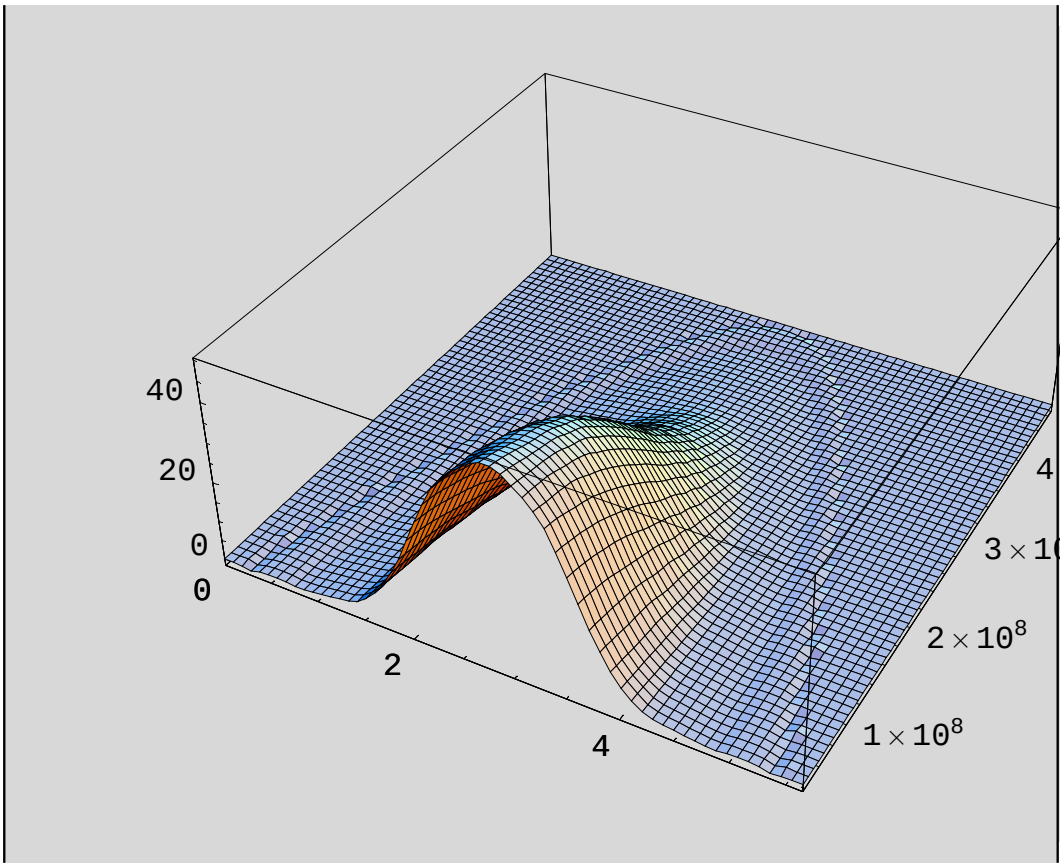


Figure 17

3D pbar:


40
20
0
0
2
4
2×10^8
1×10^8