On Recent 150 GeV Lifetimes

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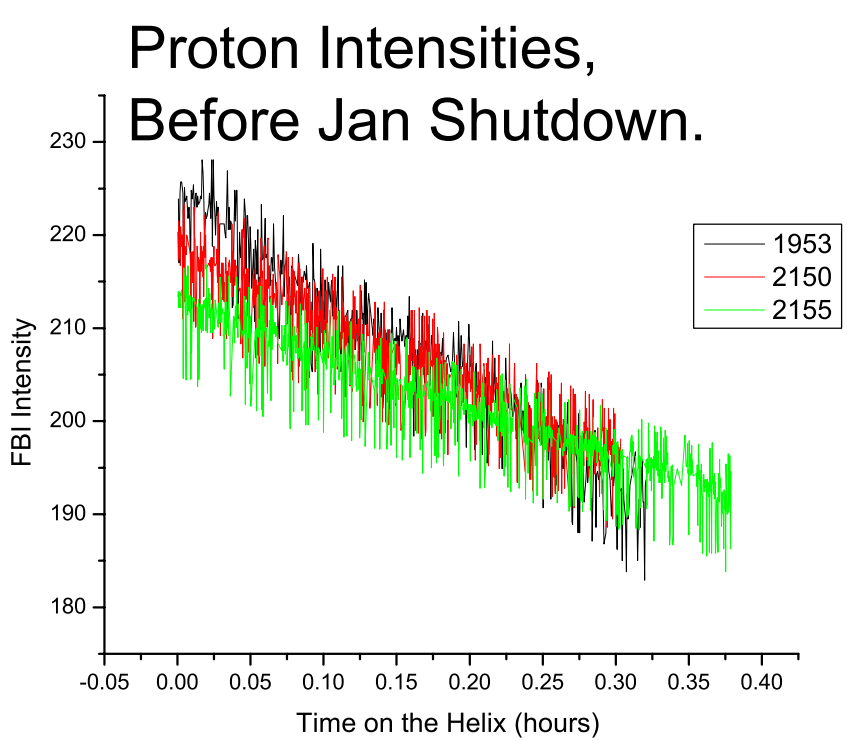
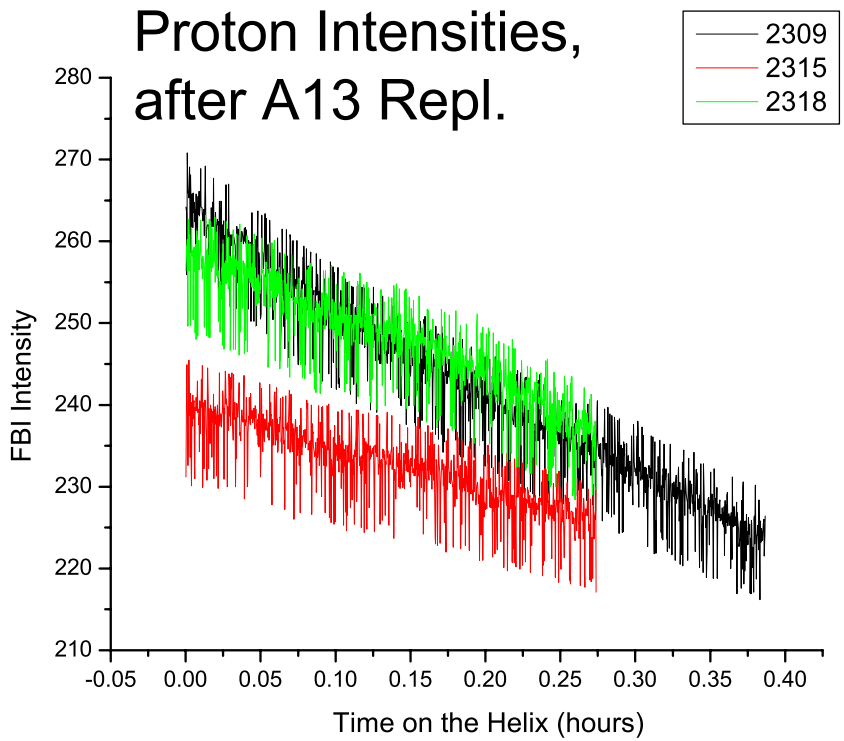
Goal & Scope: Check New Lifetime at 150

- Goals for this SDA exercise:
  - Using recent data, does it make sense to keep talking about the “Sqrt” lifetime ?
  - Did the lifetime improved since we opened C0 physical aperture
  - Show that the correlation between the Pbar efficiencies at 150 and proton current shown in the previous note disappeared.

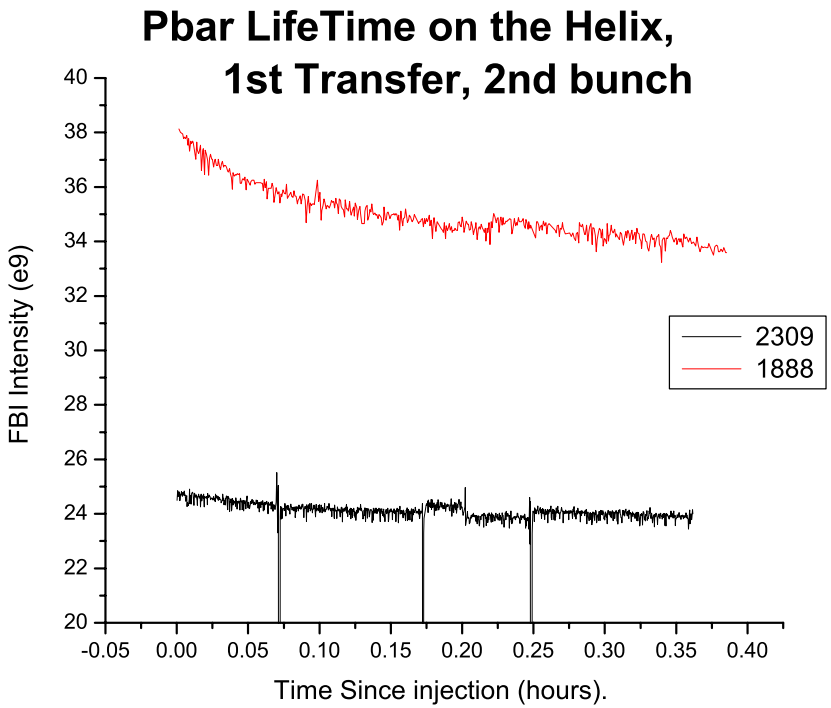
Bunch Intensity vs time on the Helix, Protons.

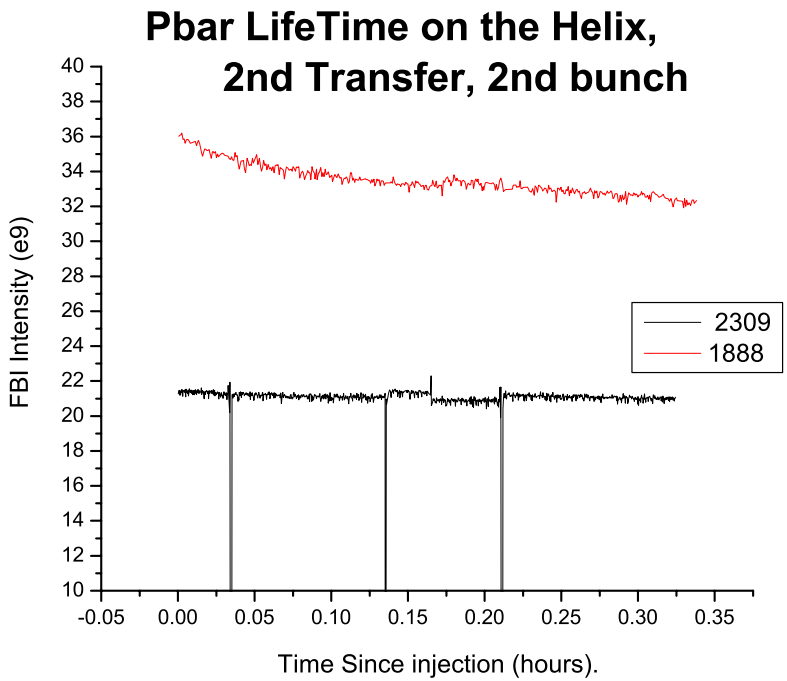




Fast Bunch Integrator, Narrow Gate, vs time.. No evidence for Sqrt Lifetime for protons.

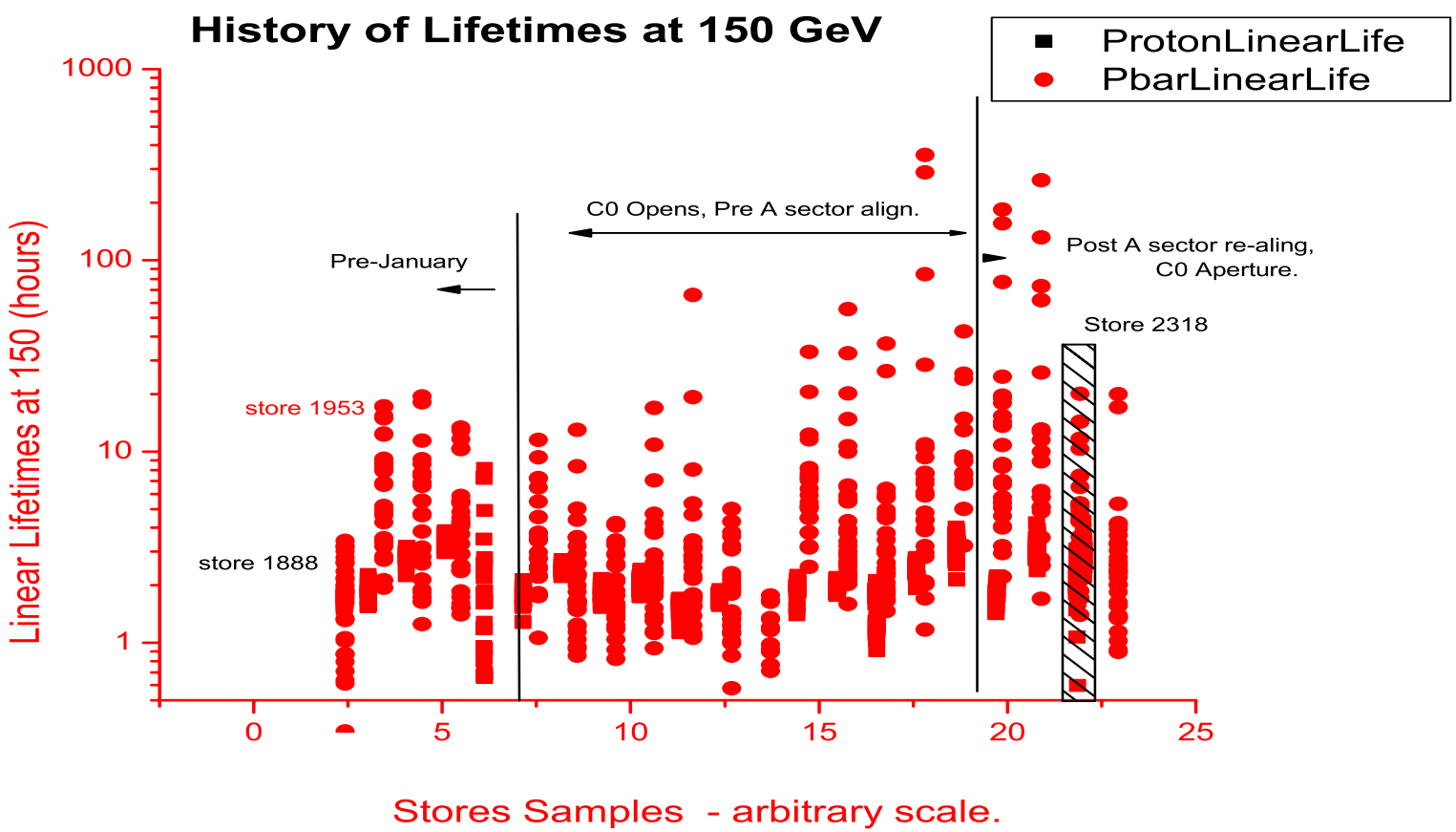
Bunch Intensity vs time on the Helix, Pbars



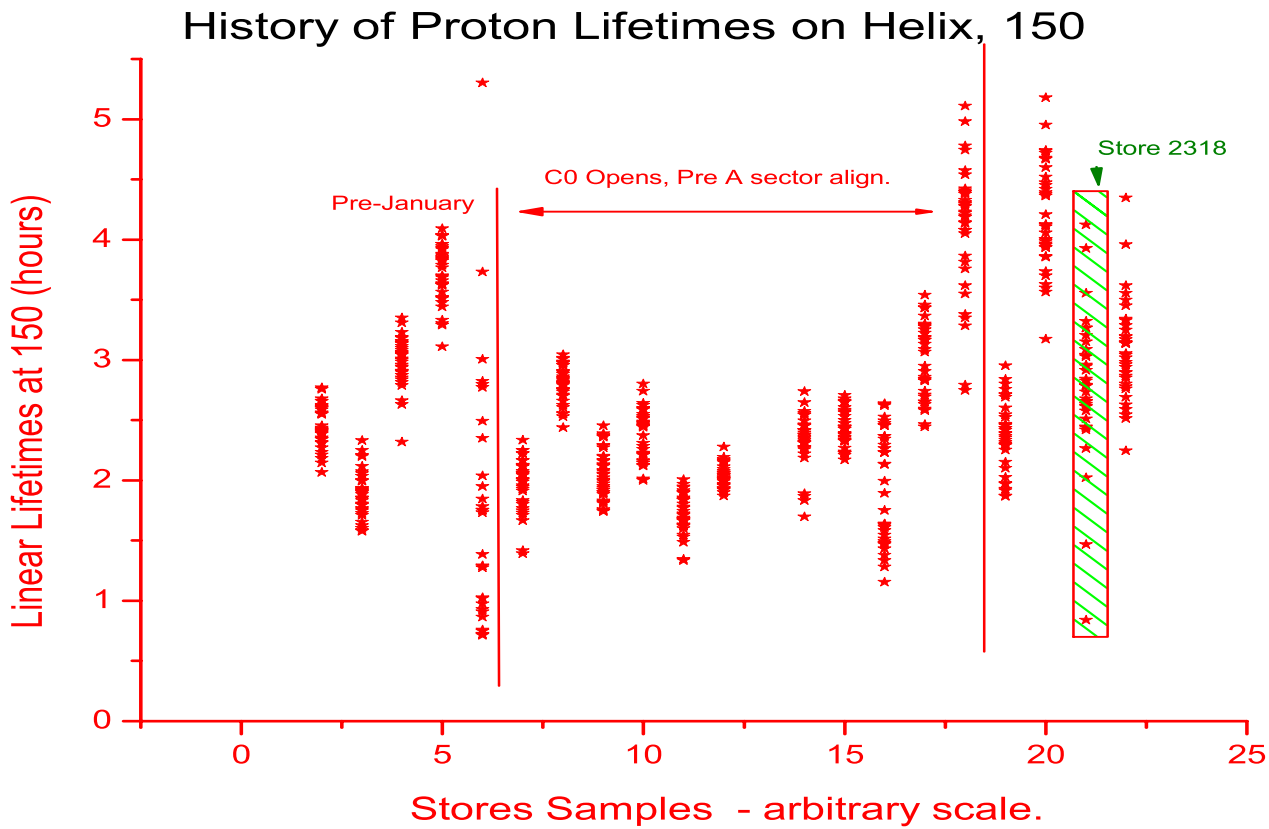


Fast Bunch Integrator, Narrow Gate, vs time.. Evidence for "Sqrt" Lifetime for Antiprotons, for "old" stores!

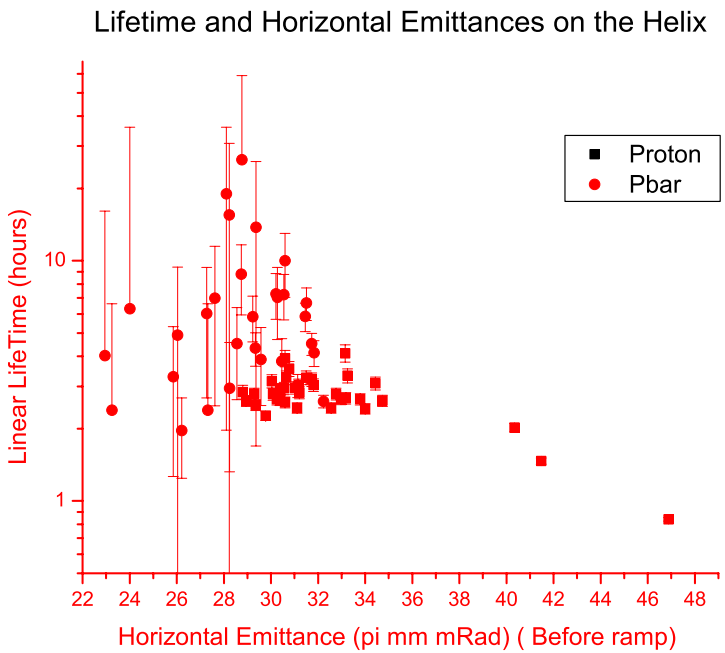
Lifetimes, "Linear" (Simple Exponential)

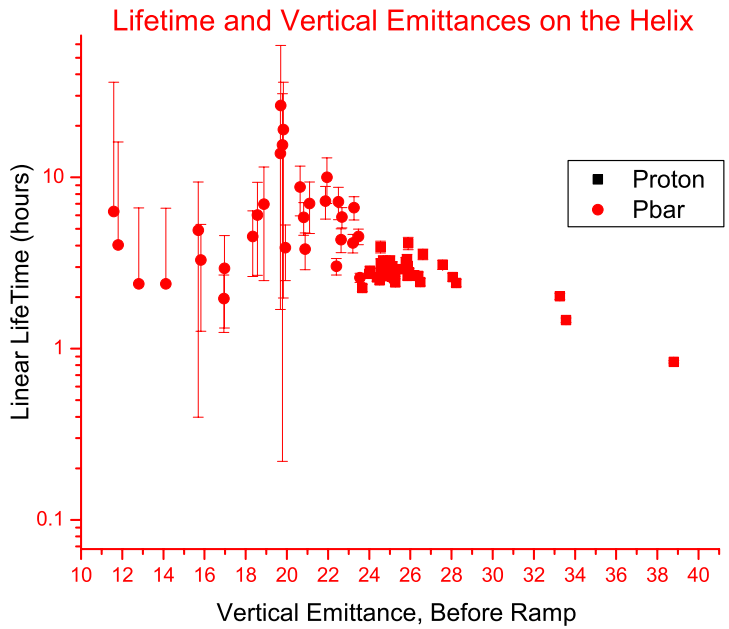


Lifetimes, "Linear" (Simple Exponential) Proton only



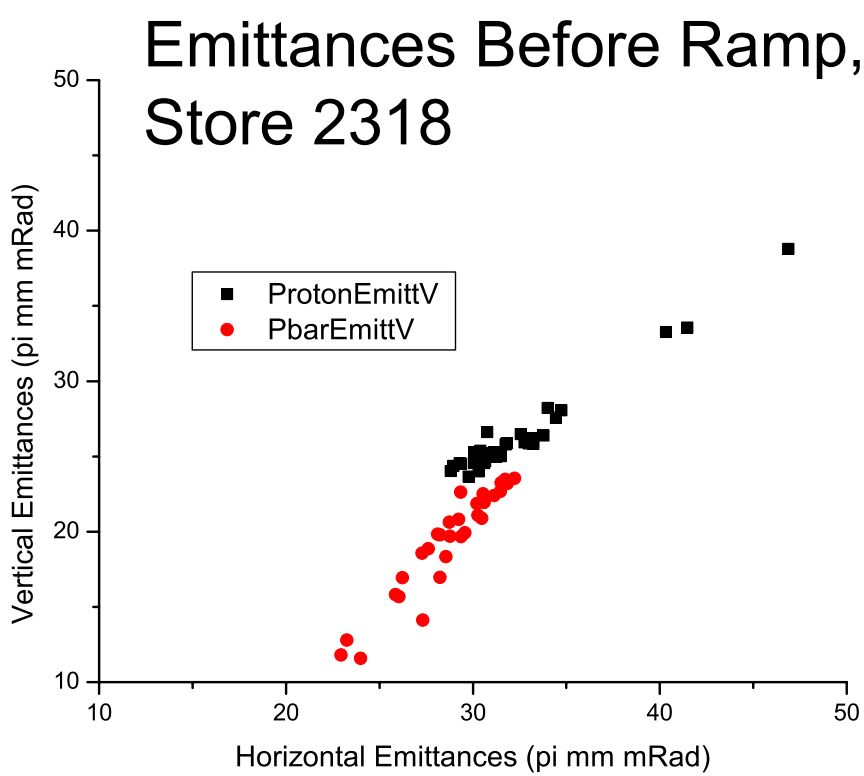
Linear Lifetimes, vs Emittance Before we ramp, Record Store 2318





Lifetimes for pbar and proton about the same! The last three Bunches are significantly more diffused, in both planes, and are short-lived. Overall, lifetimes are now much longer..

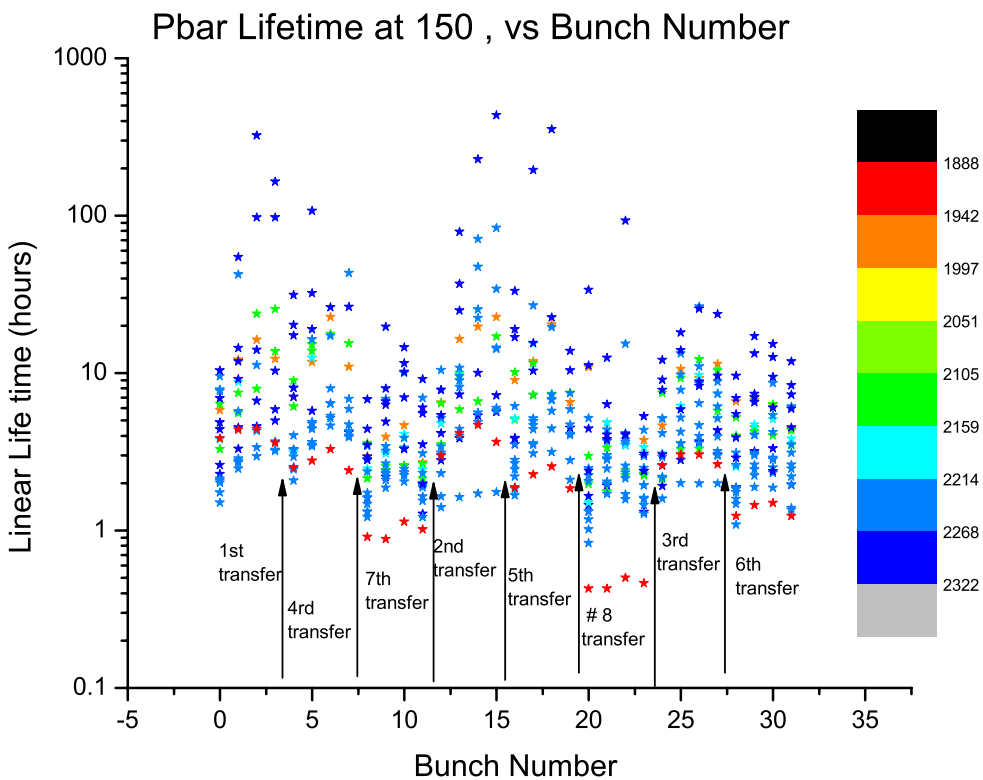
Digression: Emitances at 150, using Valery Lebedev New Lattice functions



Emittance Scale is still a problem! However,
There is a clear correlation Between X and Y planes.

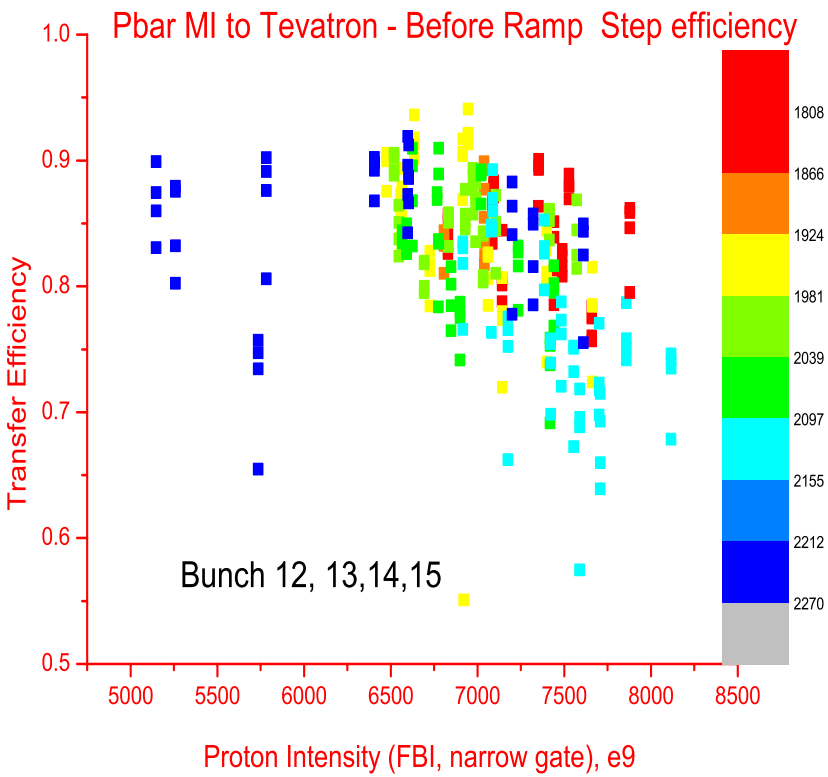
We suspect we are dealing with “round” beams. This Correlation is a clear indication of this.

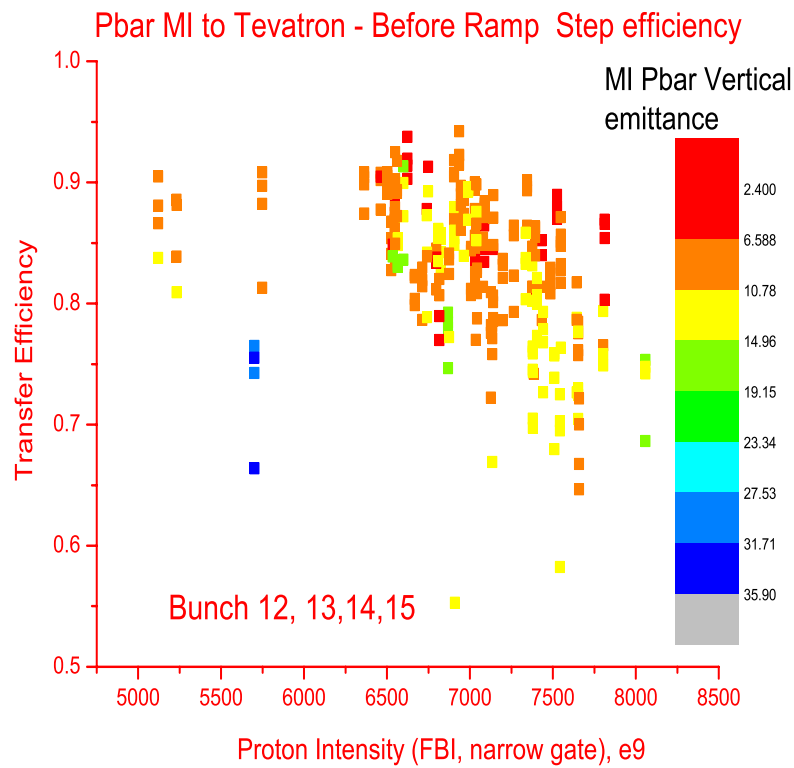
Pbar Lifetimes vs Transfer number



Early transfer tends to have a smaller emittance, And have a long lifetime. For recent stores, some of these bunches have a lifetime consistent with infinity!, despite the fact that we are observing them for ~20 min.

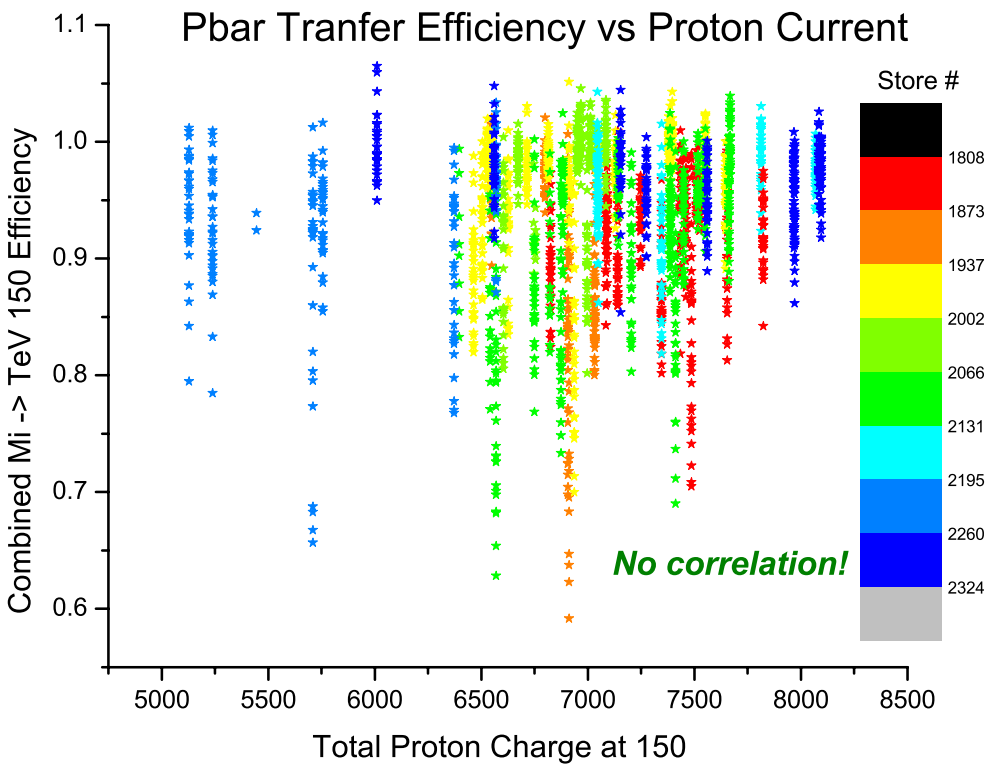
OLD SLIDE: Correlation between 150 TeV Efficiency and Total number of circulating proton.





MI –> TeV at 150, before Ramp FBI (Pbar) efficiency vs the Number of proton, before ramp.

Recent + Old Data on this correlation..



The "simple" evidence for beam-beam effect is now gone!
We added a bit more data, At high proton current.

The TeV was a significantly different machine!

Tentative Conclusions

Beam-beam effects are very interesting. They need to be enhanced, somehow. It is therefore suggested to take the following actions:

- Restrict the physical aperture of the machine.

- Restrict the dynamical aperture by misaligning the machine

- Possibly, increase the transverse impedance, to make things a bit harder.

In this 2 years-long parasitic study, we are making some progress !.