On Pbar Emittance growth during Ramp

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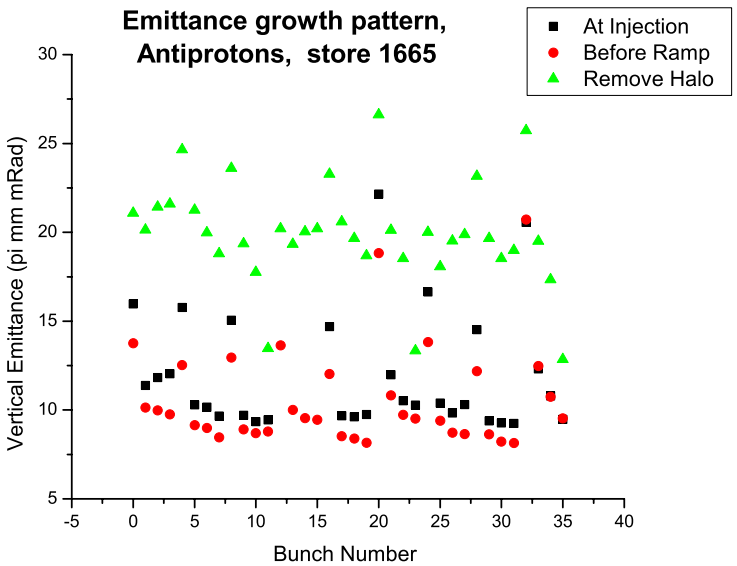
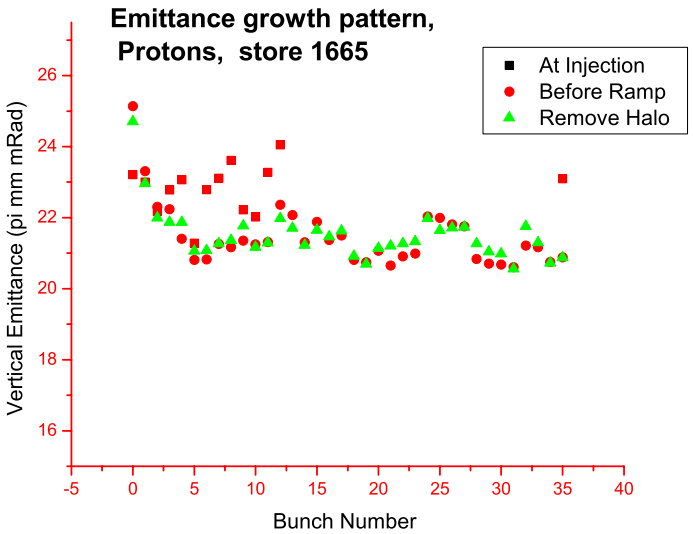
Fermilab

Aug 23 2002

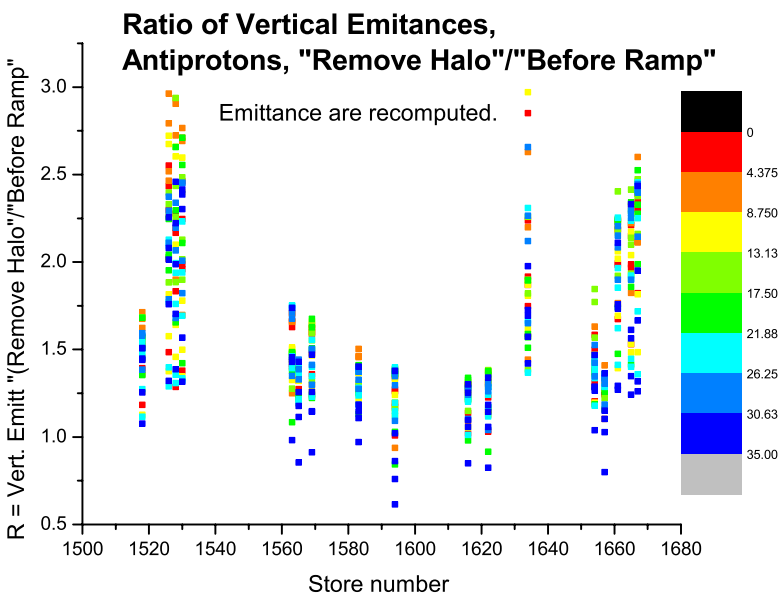
The pbar transverse emittance signficantly increases during the ramp/squeeze..

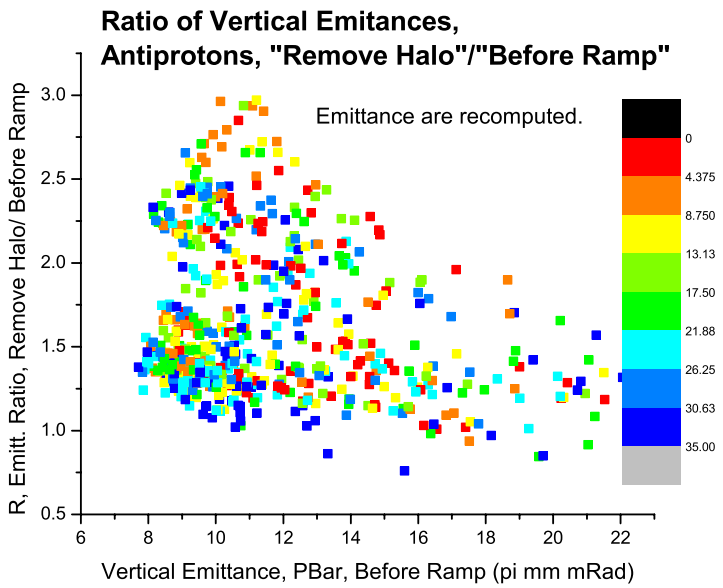




- These are “recomputed” or “corrected Emitance”. We’ll come back to that later..
- This does not occur for protons..

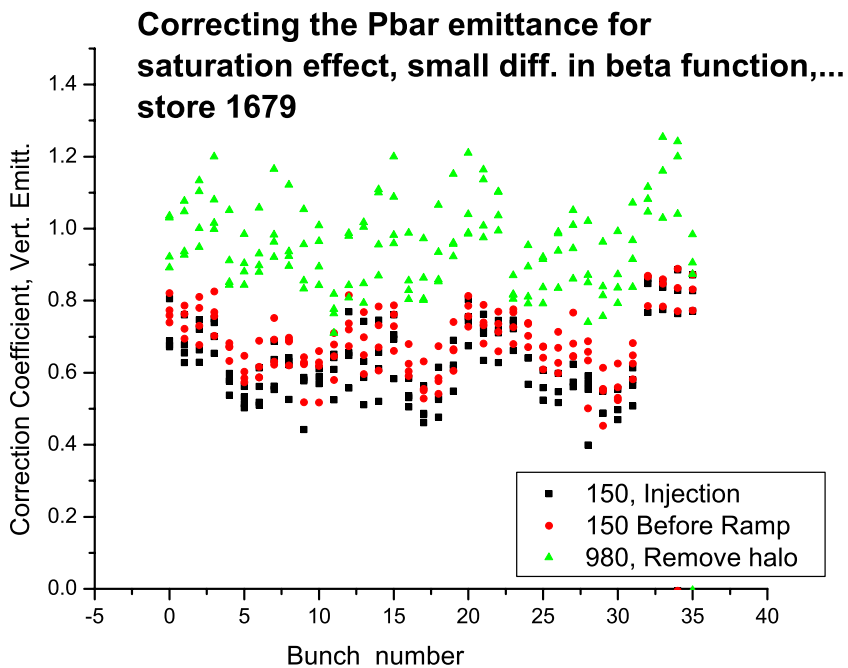
Ratio Emittance after/before Ramp & squeeze, pbar.





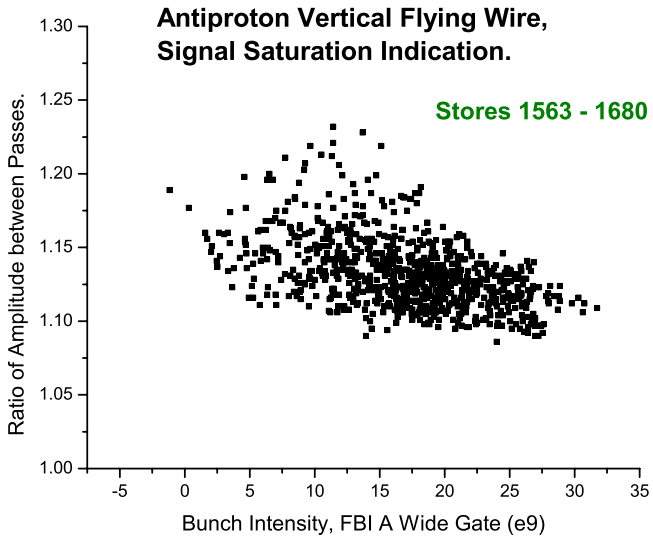
Some stores are better than other.. No dependency on bunch number…
No strong dependency on emittance before we ramp.

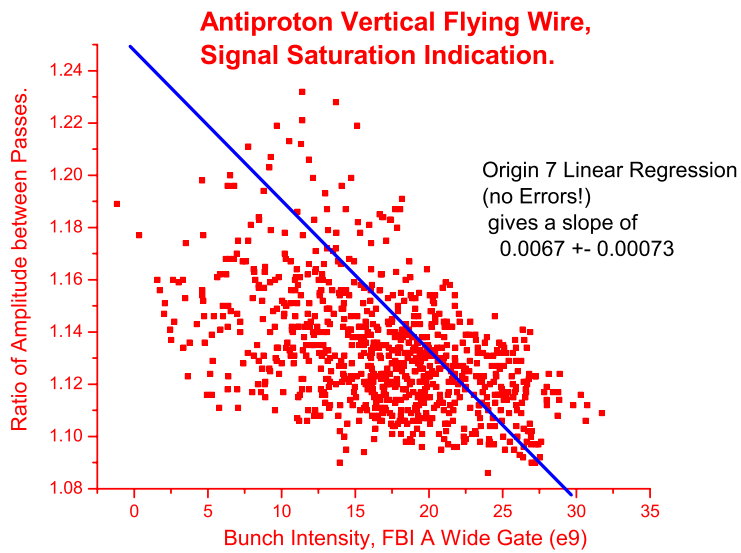
Caveat: Is this instrumental?



We noticed a saturation Effect in FW P.M.:
It does distort the pulse.
See details at http://www-cpd.fnal.gov/personal/lebrun/TransEmitt/FWsCalibPbar.ps
At small pbar intensity, it was a few percent correction on the measured sigma.
This could now be a bigger effect. This correction does not cancel in ratio after/before ramp, because the intensity and the spot size changes.

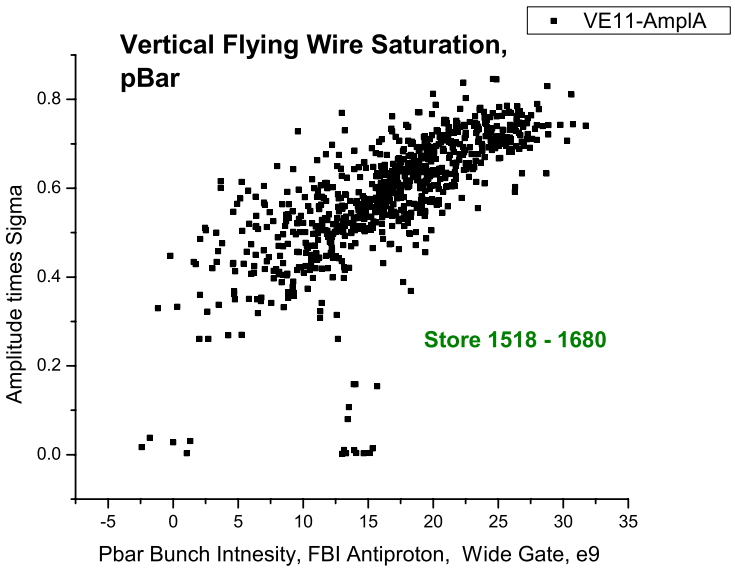
Vertical Flying Wire E11, Saturation effect.

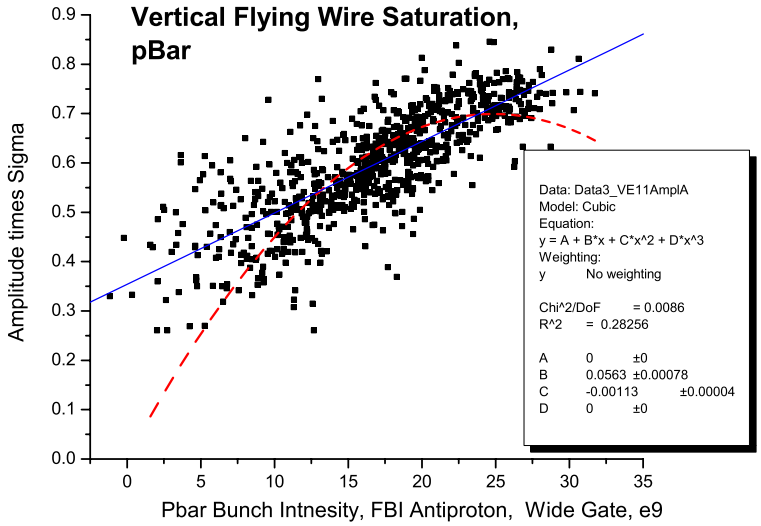




The ratio of the two amplitudes should be constant. Deviation from this is an indication the paddles do not respond linearly to particle density. Same data is shown on both plots. The line on the left comes from a straight linear regression, from Origin and simply shows that it is not constant..

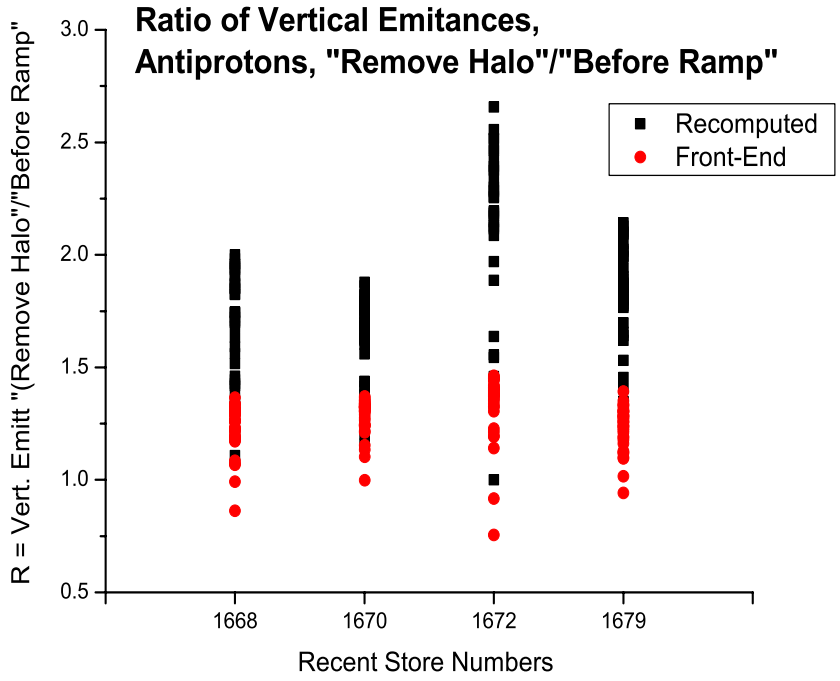
Vertical Flying Wire E11, Saturation effect, II





More straightforward: simply plot the average of the two products of the amplitude times the width (sigma) of the profile. This should be directly proportional to the FBI, wide gate, intensity. Non-linearity is really there! The fitting strategy and the correction to be applied to the measurement of sigma is a bit tricky..

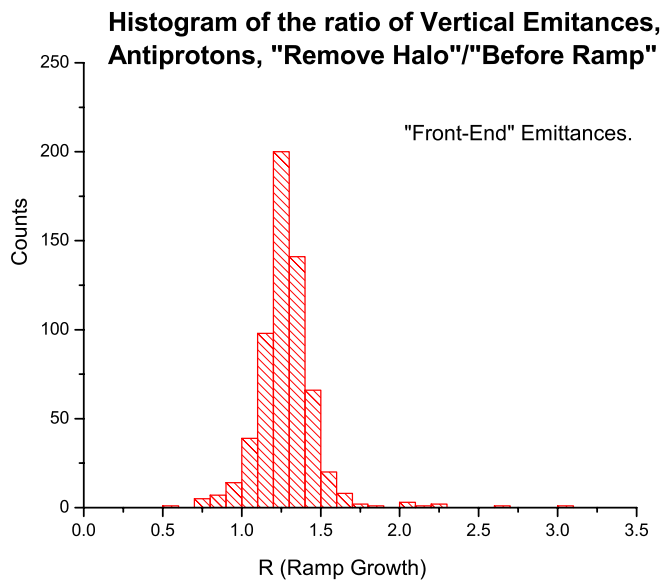
Emittance Correction vs Emittance growth during Ramp/Squeeze

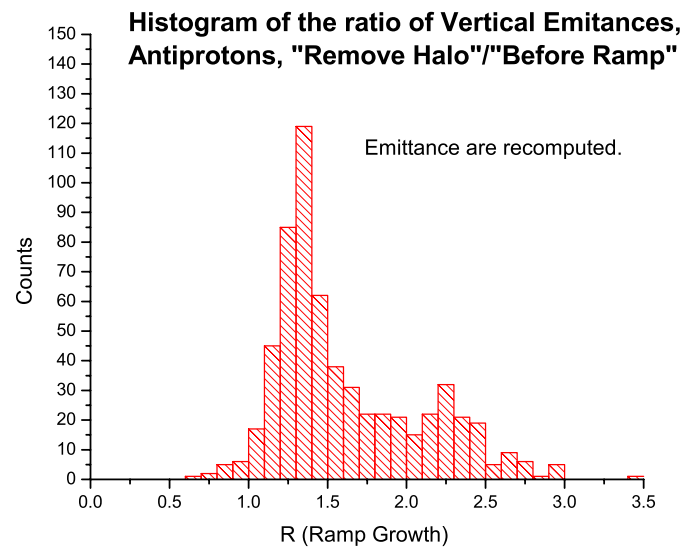


Even if we ignore this correction, there is systematic growth of the vertical emittance for pbar during the Ramp/squeeze.

Note: we have no measurement just after the ramp, before the squeeze (I think).

Emittance Correction vs Emittance growth during Ramp/Squeeze, histograms.





Serious uncertainty from this correction.

Conclusion (tentative, semi-obvious).

- Characterize also the horizontal emittance.
- Install a filter in the pbar FW paddle light-guide, adjust the P.M. gain for current bunch intensities. Check linearity again.
- Fly the wires before squeeze and after ramp (or add this data to SDA)
- If confirmed, think of a scheme to mitigate this emittance growth, if possible…