

Low Energy RHIC electron Cooling (LEReC)

RHIC Time Meeting
January 21, 2020



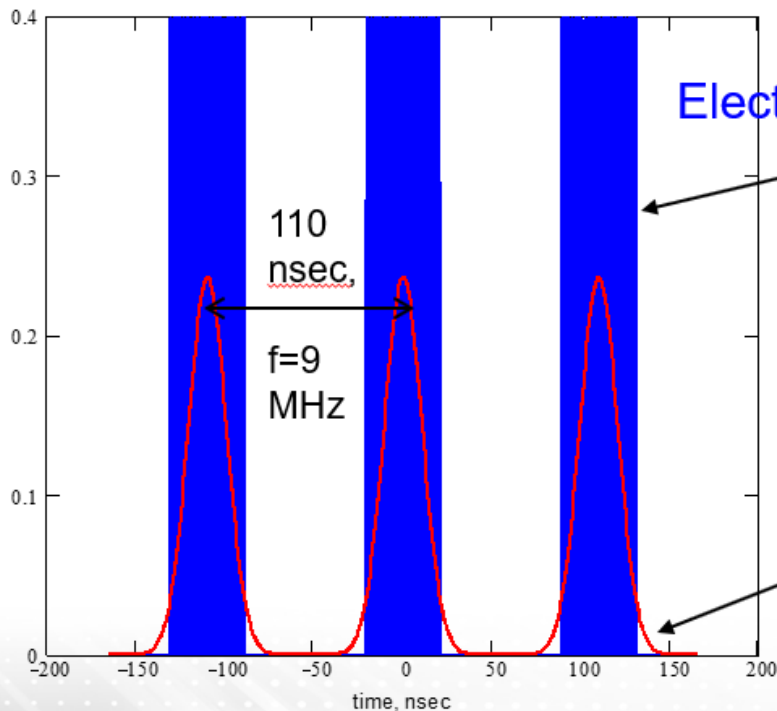
LEReC progress/updates for January 14-20

- Found that larger separation of ion bunches in IP2 is required to avoid parasitic collisions (large beta-functions in IP2 for LEReC lattice). Separation bump of 16mm was implemented.
- Developed independent electron beam optics for Yellow and Blue, needed for the new RF Timing setup with split electron Macro-bunches
- Compared performance with old RF Timing and new Timing system (with reduced number of electron bunches per Macro-bunch, presently limited by hardware)
- To use new Timing system with full number of electron pulses requires new bias controller or building RF feedback system around present controller (requires time for development and tests, and then time for cooling studies and optimization)

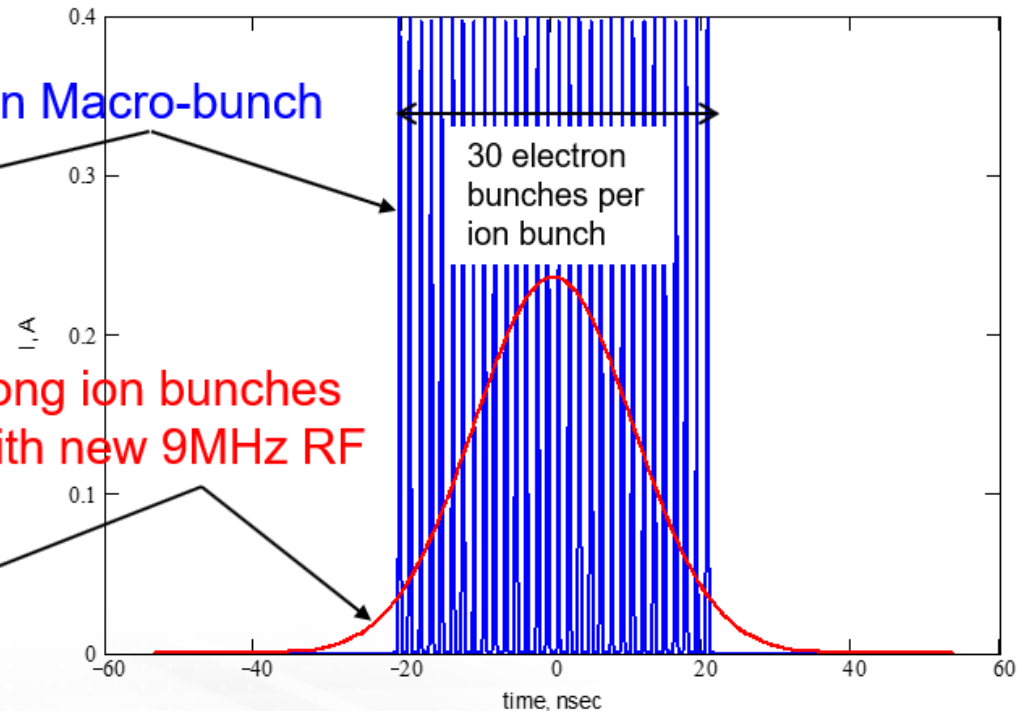
Old vs new RF Timing configuration

- By design, we can have 30-36 electron bunches per single macro-bunch which we synchronize with each ion bunch.
- Due to present hardware limitation of laser 9MHz bias controller, new configuration allows to use only up to 18 electron bunches per macro-bunch. As a result, we effectively loose number of bunches we can use for cooling.
- New bias controller is on order. Another alternative is to develop feedback system around present controller. This should allow use of new configuration with full macro-bunch consisting of 30 electron bunches.

9 MHz bunch structure

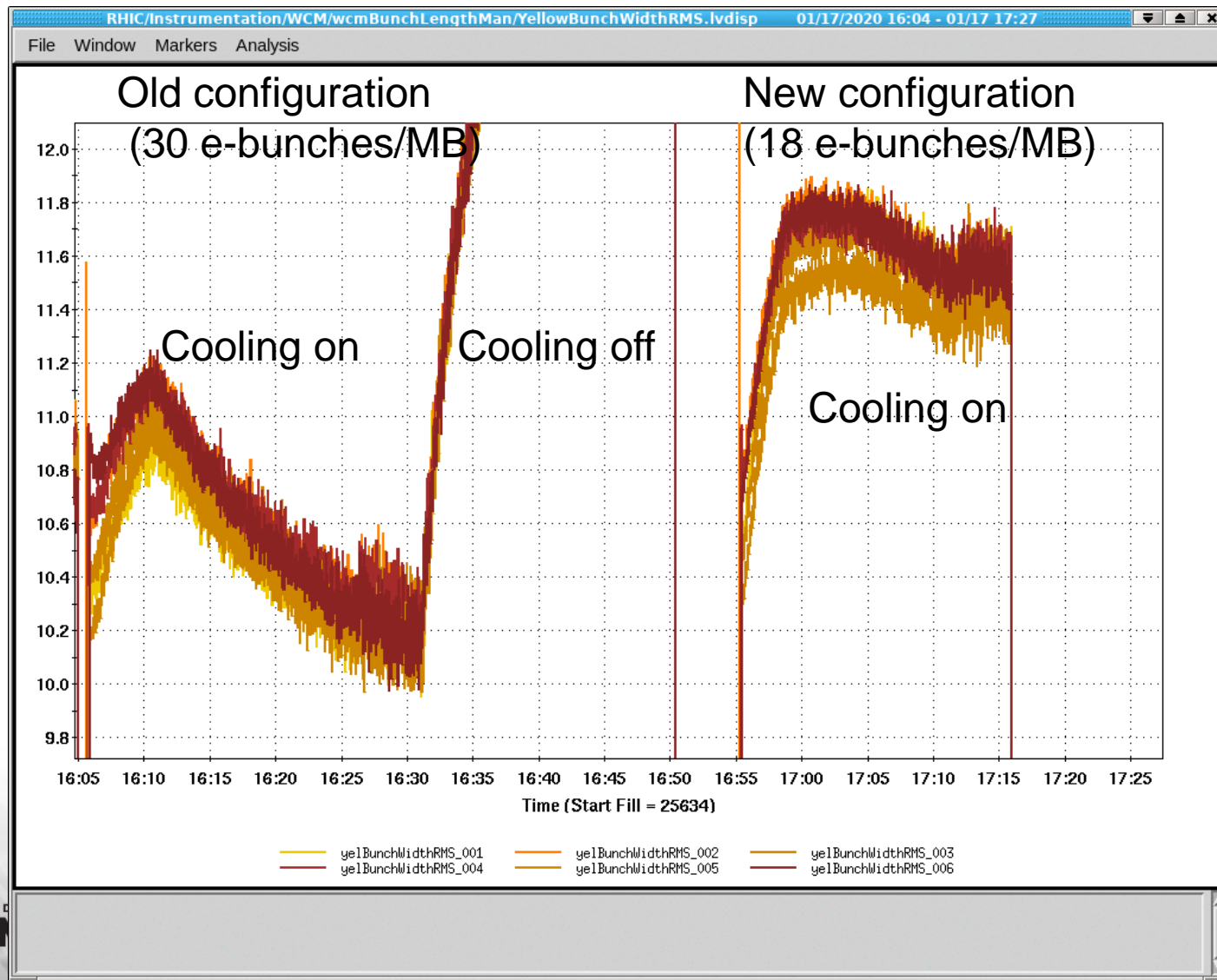


LEReC Beam Structure

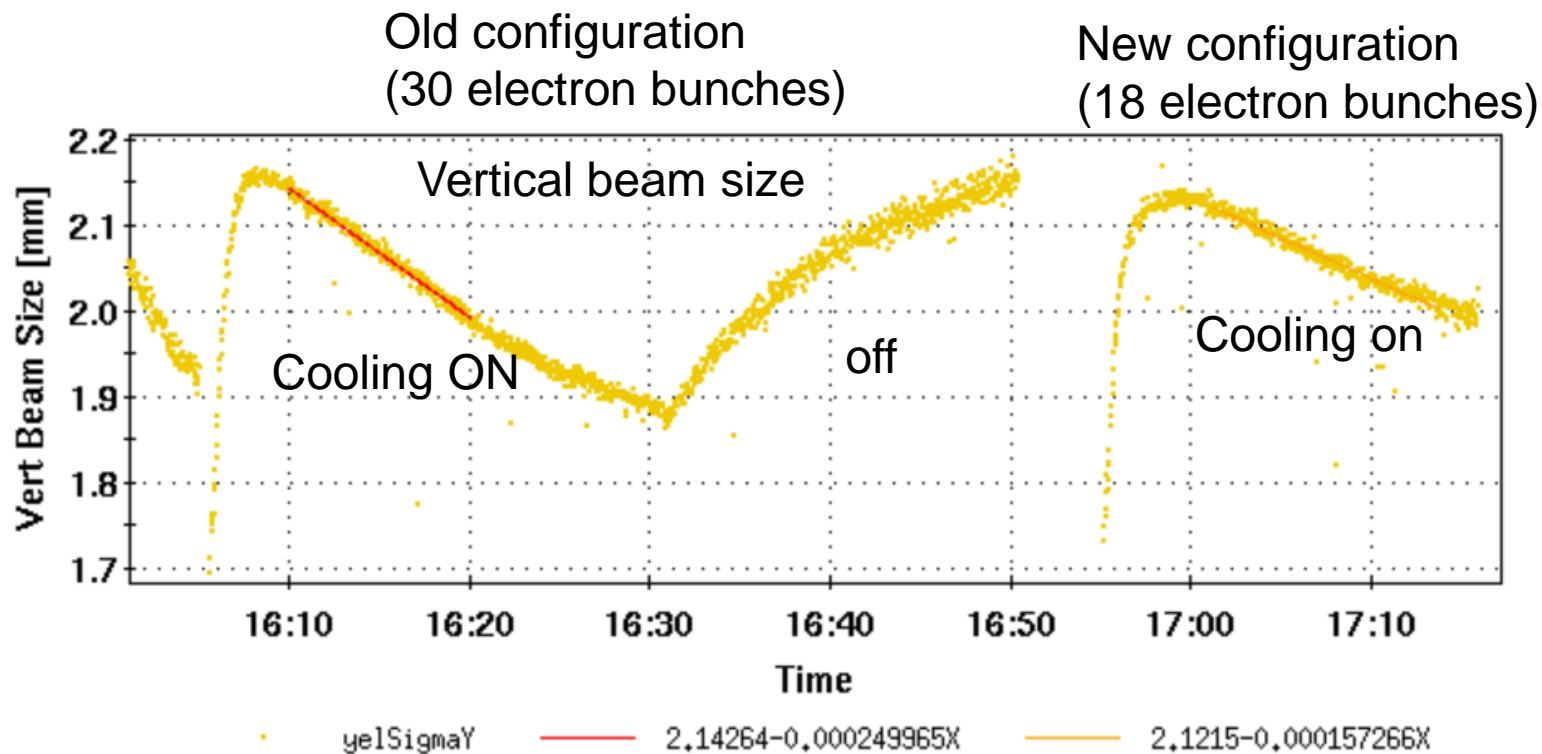


Longitudinal cooling

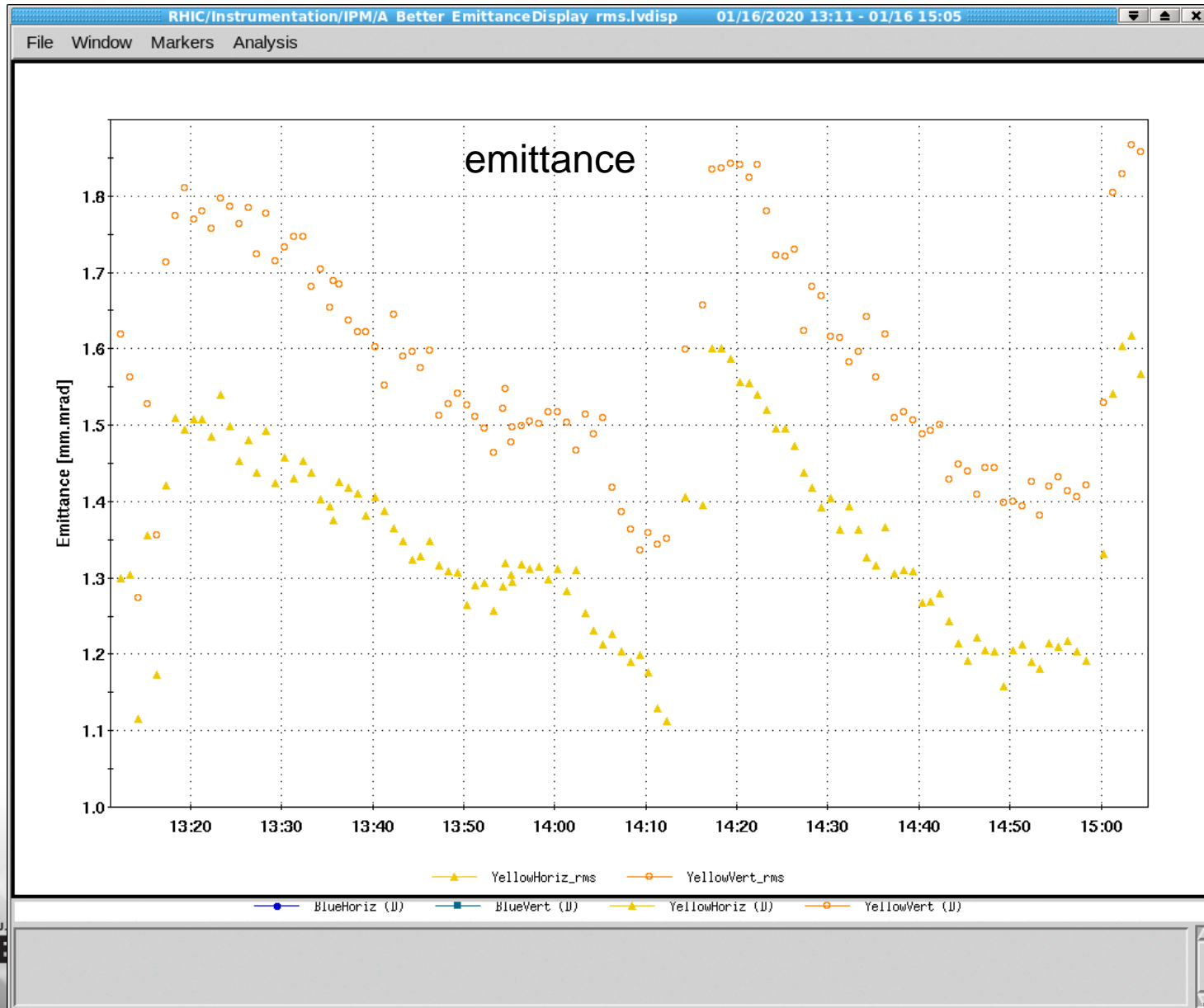
Bunch length



Transverse cooling



Transverse cooling (potential for beta squeeze)



LEReC status and plans

- Developed e-beam optics for new Timing configuration
- Tested old configuration vs new configuration

Plans:

- New bias controller is on order. Another alternative is to develop feedback system around present controller. This should allow use of new configuration with full macro-bunch consisting of 30 electron bunches.

For now, we will continue with old configuration and focus on:

- Work on ion lifetime improvement
- Work on transverse cooling optimization
- Luminosity improvement optimization