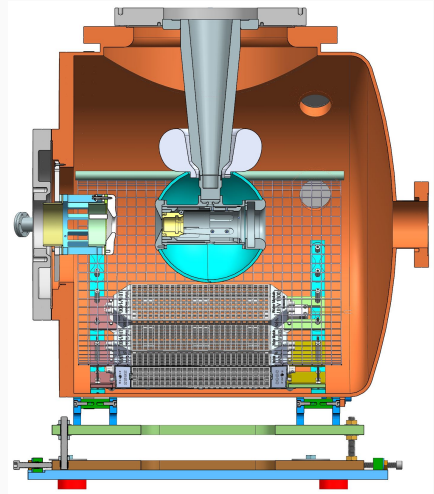


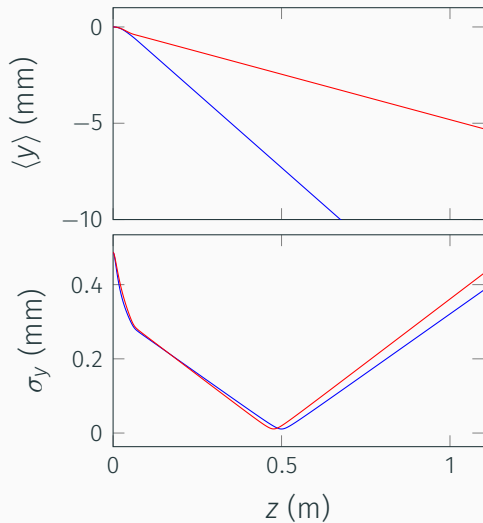
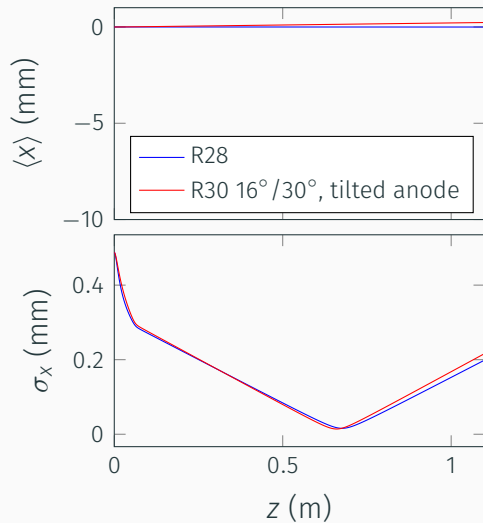
Matching candidate phase spaces to the injector

Max Bruker
Center for Injectors and Sources

February 21, 2024

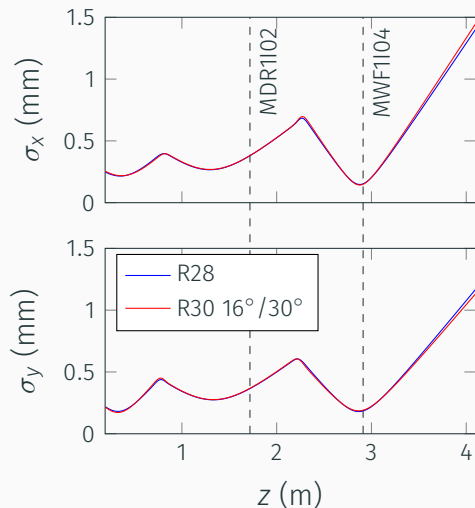


R28 vs. R30-4: drift, no emittance, no space charge



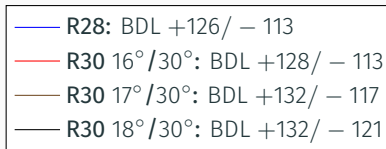
R28 vs. R30-4 at 140 kV: optimized lenses, with emittance, no space charge

- we don't need to understand the whole injector: the first two lenses determine the match
 - could be used as telescope, neglecting dipole
 - or optimized for two waists
- mimic machine setup strategy
- single-wound, as-built FX model
- minimize $\sigma_{x,1}^2 + \sigma_{y,1}^2 + \sigma_{x,2}^2 + \sigma_{y,2}^2$
- BDL: +104, -94 for both cases (Dec 4: +97, -82)

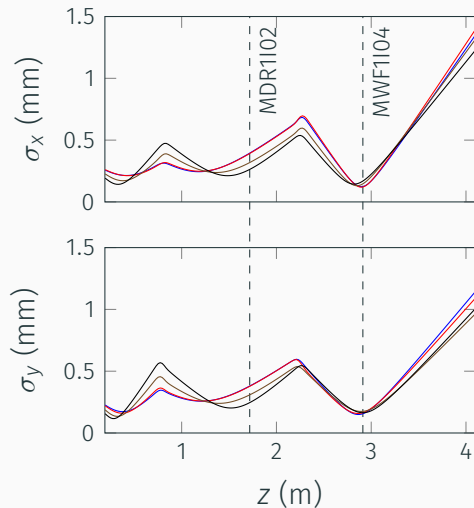


R28 vs. R30-4 at 200 kV: optimized lenses, with emittance, no space charge

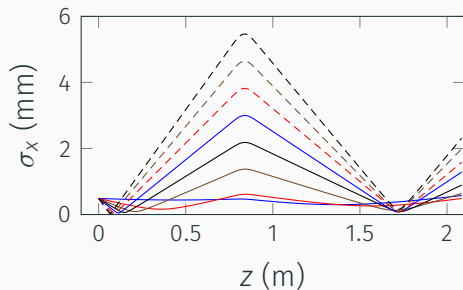
- same optimization



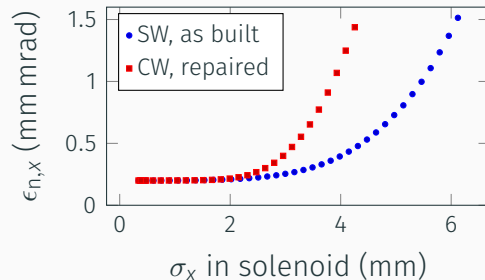
- more gun focusing gives slightly smaller beam size overall
- define constraints / objectives:
 - maximum beam size in first lens
→ next slide
 - maximum beam size in dipole
→ unknown, no field map
 - difference low/high bunch charge



Tolerable beam size in FX solenoids



- single-wound, as-built FX
- convergent beam w/ thermal emittance from toy gun
- optimize for waist in dipole



- $\sigma_x < 1$ mm does not produce a well-defined waist (which is fine)
- $\sigma_x > 2$ mm degrades emittance