

**Some issues on accelerator physics
for the next step of ELENA commissioning**

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Few crucial steps for the next ELENA run: electron cooler

- Electron cooling performance
 - cooling speed, equilibrium emittances (important for experiments)
 - effect of toroid kicks (linear kick affects on acceptance, orbit bump around cooler, linear coupling, nonlinear reduces machine acceptance)
 - how well orbit bump works
 - are cooler solenoids aligned properly? Can be seen with variation of magnetic field
 - are beam position monitors inside of cooler usable? (very useful for cooling optimization, and generally for orbit in machine)
 - does orbit bump around cooler work as expected? If not, what's wrong (calibration of related correctors or BPM's, something else)
 - does cooler introduce extra coupling into machine?
- What is the optimal momentum for intermediate plateau with first cooling?

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ELENA commissioning
meeting

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Few crucial steps for the next ELENA run: resonances, nonlinearities, lifetime

- Study of working diagram at extraction energy (one bunch, no bunch rotation). The aim is to identify the most dangerous (not space charge driven) resonances. Can we cross them without losses in the tune range $2.33 < Q_x < 2.46$, $1.33 < Q_y < 1.46$? What is the optimal WP for deceleration?
- Are resonances enhanced with cooler on? Does cooler introduce extra resonances?
- Could we run ELENA with sextupoles off? Is machine sensitive to sextupole settings, especially at low energies?
- Vacuum in ELENA. Beam lifetime at injection energy, at intermediate plateau and at extraction energy
- Stray fields effect on circulated beam (not easy to prove). Do they affect on orbit? How much? Could one correct this effect with orbit correction system? Is local correction possible?
- Do we see nonlinear effects of stray fields? Do they shrink machine acceptance?

Less critical, yet important issues

- Why both the horizontal and the vertical orbits are 3 to 4 times bigger than expected (estimation in design report)? Is something wrong with installation of quadrupoles? Is this due to stray fields?
- Linear coupling, seen with orbit measurements, looks stronger than expected. Misalignment errors? Stray fields? Is coupling stronger at smaller energies?
- What is the emittance of injected beam? How reproducible is it from shot to shot?
- How big is difference between emittance of beam extracted from AD and emittance of beam circulated in ELENA?
- Working point to be defined...