

Summary Injectors and Injection

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4 contributions:

Transfer line from injector to LESR (P. Kuske)

On axis injection (M. Aiba)

Injector requirements for LE storage ring upgrade projects (Z. Duan)

Booster modifications and commissioning (N. Carmignani / S. White)

Goal: top-up with transparent injection with 100% efficiency.

The chosen injection scheme determines the design of booster (or modifications) and the transfer line.

**Upgrade projects: modifications can be done before „dark periods“
BTR TLs often require renewal of components**

Injector Requirements

Injection scheme	Emittance	Bunch length	Energy spread
4 kicker bump	as small as possible (emittance exchange)	as in SR	as large as in SR
3 kicker bump + anti-septum	as small as possible (emittance exchange)	as in SR	as large as in SR
Non-linear kicker	as small as possible (emittance exchange)	as in SR	as large as in SR
On-axis Swap-out	small vertical (vertical injection)	as in SR	as large as in SR
On-axis Longitudinal	small vertical (vertical injection)	shorter than in SR	smaller than in SR

small natural emittance – large circumference of synchrotron/in the same tunnel

increase horizontal tune

operate off-momentum and change damping partition

operate on coupling resonance – why not emittance exchange?

energy spread usually okay

bunch length either too long or too short

challenge for swap-out – high charge operation

Dedicated accumulator ring (ALS-U) or use of the booster for acceleration+accumulation.

On-axis injection schemes – transverse Twiss-parameters matched to injection straight values

Off-axis injection schemes – 4/3 kicker bump:

$$\beta_{inj} < \beta_{sto}$$

NLK:

$$\beta_{inj} > \beta_{sto}$$

Actual β - and α -values depend on the details of the injection

Linac would be the best choice as injector for off-axis injection and longitudinal on-axis injection – small transverse and longitudinal emittance (MAXIV, Spring8-II).

Injector and injection is very critical for the success of the next generation LS based on diffraction limited SR – don't try to save money by sacrificing diagnostics.