



FCC-ee injector baseline parameters

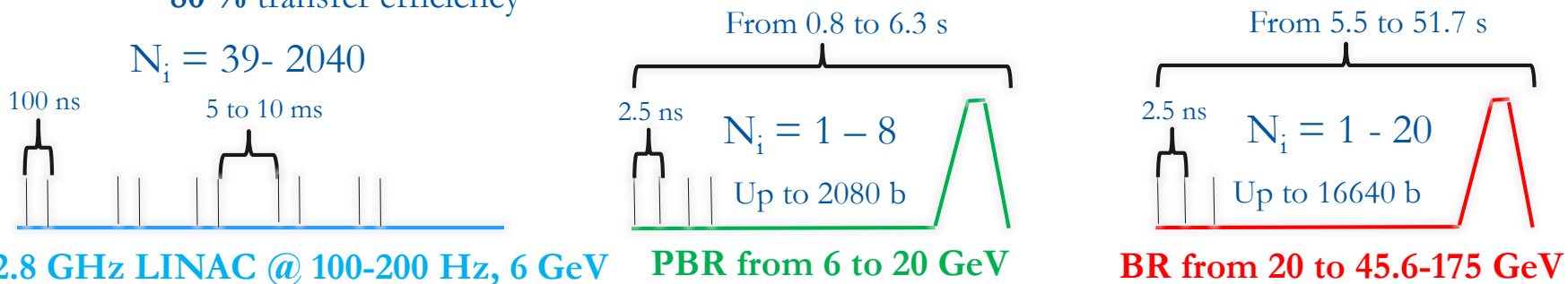
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FCC-ee injector baseline scheme

- **Baseline** established based on SLC/SUPERKEKB-like linac (higher gradient)
 - Longer pulses with **1 or 2** bunches with repetition rate of **100-200 Hz**, **2.8 GHz** RF
 - Maximum linac bunch intensity $\sim 2.13 \times 10^{10}$ particles (both species).
 - Twice as much will be needed for e-beam for e+ production
 - Injected several times (from **39 to 2040**), @ **6 GeV** into of PBR (SPS or new ring) with 1 linac bunch to 1 ring bucket (**400 MHz** RF system), up to **2080** bunches
 - SPS ramp to **20 GeV** with **0.2 s** ramp rate and cycle length **below 6.3 s**
 - Transferred to main Booster (**1 - 8** SPS/PBR cycles), with **400 MHz** RF frequency, to a bunch structure required by the collider (from **39 to 16640** bunches)
 - Accelerated to the corresponding energy with ramp time from **0.32 - 2 s**, and total cycle length up to **51.7 s**
 - Transferred to the collider by accumulating current for the full filling or single injection for top-up
 - **Interleaved** filling of e+/e-
 - Full filling below **20 min** for both species
 - Top-up target time, based on **5 %** of current drop due to corresponding lifetime, always achieved
 - **80 %** transfer efficiency



FCC-ee injector parameters



Accelerator	FCCee-Z		FCCee-W		FCCee-H		FCCee-tt	
Energy [GeV]	45.6		80		120		182.5	
Type of filling	Full	Top-up	Full	Top-up	Full	Top-up	Full	Top-up
LINAC # bunches, with 2.8 GHz RF	2		2		1			
LINAC repetition rate [Hz]	200		100					
LINAC/SPS bunch population [10^{10}]	2.13	1.06	1.88	0.56	1.88	0.56	1.75	1.05
# of LINAC injections	1040		500		393		39	
SPS bunch spacing [ns]	2.5		50		380		280	
# SPS cycles	8		2		1			
SPS # of bunches	2080		1000		393		39	
SPS cycle time [s]	6.3		6.1		4.33		0.79	
SPS duty factor	0.85		0.61		0.35		0.07	
BR # of bunches	16640		2000		393		39	
BR cycle time [s]	51.74		14.4		7.53		5.49	
#of BR cycles	10	1	10	1	10	1	20	1
# of injections/collider bucket	10	1	10	1	10	1	20	1
Total number of bunches	16640		2000		393		39	
Filling time (both species) [sec]	1034.8	103.5	288	28.8	150.6	15.06	219.6	10.98
Injected bunch population [10^{10}]	3.3	0.16	6.0	0.12	8.0	0.16	16.9	0.34

Some further consideration



- Alternative **new PBR** has very similar parameters
- **Linac up to 20 GeV** injecting to MB parameters (cost impact)
- Need to converge to **emittance requirements** across the injectors
 - Including **radiation damping + IBS effect** for PBR/SPS and Main Booster
- **Beam transfer** details are being worked out
- Considerations on RF frequencies for the injectors